

Microscopy & Microanalysis

The Official M&M 2017 Proceedings
St. Louis, MO, USA • August 6-10, 2017



Table of Contents

Title Page	i
Copyright Page	ii
MAM Editors	iii
Copyright Information	iv
Contents	v
Welcome from the Society Presidents	lxxvii
Welcome from the Program Chairs	lxxviii
Plenary Sessions	lxxix
Microscopy Society of America	lxxxii
Microanalysis Society of America	lxxxviii
International Field Emission Society	xcii
Meeting Awards	xciii
Abstracts	2
Author Index	2324

Plenary Session

- 2 *Imaging Cellular Structure and Dynamics from Molecules to Organisms*; E Betzig
- 4 *Detecting Massive Black Holes via Attometry: Gravitational Wave Astronomy Begins*; K Riles

Analytical and Instrumentation Science Symposia

Vendor Symposium

- 6 *Probing the Element Distribution at the Organic-Inorganic Interface Using EDS*; M Falke, A Kaepfel, B Yu, T Salge, R Terborg
- 8 *ZEISS Crossbeam – Advancing Capabilities in High Throughput 3D Analysis and Sample Preparation*; T Volkenandt, F Pérez-Willard, M Rauscher, PM Anger
- 10 *A Dedicated Backscattered Electron Detector for High Speed Imaging and Defect Inspection*; M Schmid, A Liebel, R Lackner, D Steighöfer, A Niculae, H Soltau
- 12 *Large Area 3D Structural Characterization by Serial Sectioning Using Broad Ion Beam Argon Ion Milling*; P NOWAKOWSKI, ML Ray, PE Fischione
- 14 *New Scios Cryo™ - Dedicated FIB/SEM for Advanced Cryo-Lamella Preparation in Structural Biology*; JM Mitchels, D van Rossum, A Rigort
- 16 *Advances in Serial-Section Broad-Ion-Beam Tomography*; T Hosman, S Coyle, M Hassel-Shearer, JA Hunt, A Gholinia, P Withers
- 18 *Three Dimensional Optical Microstructure Analysis of Ferrite and Pearlite Phases in a Medium Carbon Steel*; B Turner, S Ganti, B Davis, V Sundar
- 20 *Temporal Compressive Sensing Instrumentation for TEM*; DJ Masiel, RS Bloom, ST Park, BW Reed
- 22 *Developments in AZtec: New Solutions for EBSD*; J Goulden, A Bewick, P Trimby
- 24 *A Detection System with Controlled Surface Sensitivity for a New UHR SEM*; P Sytař, J Jiruše, J Páral
- 26 *Correlative In-Situ AFM & SEM & EDX Analysis of Nanostructured Materials*; M Winhold, M Leitner, A Lieb, P Frederix, F Hofbauer, T Strunz, J Sattelkov, H Plank
- 28 *Automated Image Analysis Using a Tabletop Low Voltage TEM*; M Columb-Delsuc, G Kylberg, M Ryner, I-M Sintorn
- 30 *Progress in a New Method of Thickness Measurement by X-ray Analysis in TEM*; S Lozano-perez, P Pinard, J Holland, PJ Statham, JT Sagar

- 32 *Developments in Reel-to-Reel Electron Microscopy Infrastructure*; CS Own, MF Murfitt, LS Own, J Cushing
- 34 *Numerical Procedures to determine Potential Distribution from Electronic Field Vectors observed in Differential Phase Contrast (DPC) imaging*; A Ishizuka, M Oka, K Ishizuka, T Seki, N Shibata
- 36 *Wide Field-of-View Reflection-Mode Ptychographic Imaging Microscope with Tabletop 12.7 nm High Harmonic Illumination*; M Tanksalvala, CL Porter, M Gerrity, GP Miley, X Zhang, CS Bevis, ER Shanblatt, R Karl
- 38 *A New SEM Column Combining Ultra-High Resolution and Flexible Scanning*; P Sytař, J Jiruše, A Závodný
- 40 *Hardware and Software Advances in Commercially Available Atom Probe Tomography Systems*; RM Ulfig, TJ Prosa, Y Chen, KP Rice, I Martin, DA Reinhard, BP Gieser, E Oltman
- 42 *Atom Probe Tomography with the Easier to Operate EIKOS™*; KP Rice, Y Chen, RM Ulfig, D Lenz, J Bunton, M van Dyke, DJ Larson
- 44 *Development of an X-ray Based Spectroscopy MicroXRF System with LA-ICP-MS Capabilities: Trace-Level Microns-scale Mapping and Femtogram Detection Sensitivity*; S Lau, SJ Lewis, W Yun, B Stripe, J Kirz, A Lyon, D Reynolds, RI Spink
- 46 *Improving sensitivity and productivity with high count rate X-ray spectrum images*; SR Burgess, M Hiscock, P Pinarđ
- 48 *3D Mapping Grain Morphology and Grain Orientations by Laboratory Diffraction Contrast Tomography*; L Lavery, N Gueninchault, H Bale, C Holzner, F Bachmann, E Lauridsen
- 50 *Silicon Drift Detectors: Limitations For Throughput And Resolution*; J Rafaelsen
- 52 *Development of Fast Pixelated STEM Detector and its Applications using 4-Dimensional Dataset*; R Sagawa, H Yang, L Jones, M Simson, M Huth, H Soltau, PD Nellist, Y Kondo
- 54 *Stable and Flexible Side-Entry Stage for Nion STEMs*; MT Hotz, G Corbin, N Delby, TC Lovejoy, G Skone, J-D Blazit, M Kociak, O Stephan
- 56 *STEM and TEM: Disparate Magnification Definitions and a Way Out*; E Voelkl, D Hoyle, J Howe, H Inada, T Yotsuji
- 58 *Advanced 4D STEM Imaging with the pnCCD (S)TEM Camera*; R Ritz, M Huth, M Simson, J Schmidt, H Ryll, H Soltau, L Strüder, H Yang
- 60 *Advantages of Direct Detection and Electron Counting for Electron Energy Loss Spectroscopy Data Acquisition and the Quest of Extremely High-Energy Edges Using EELS*; JL Hart, A Lang, RD Twesten, ML Taheri
- 62 *Development of Multiple New 120 kV Transmission Electron Microscope Configurations Applicable for a Wide Range of Fields*; K Tamura, T Fujii, H Mise, I Nagaoki, K Kageyama, A Wakui, M Shirai, H Matsumoto

- 64 *A New Core Facility For Electron And Ion Microscopy At The University Of Arizona*; TJ Zega, BB Massani, Y-J Chang, K Domanik, K Nebesny, P Wallace, N Armstrong, E Corral
- 66 *In situ Thermal Shock of Lunar and Planetary Materials Using A Newly Developed MEMS Heating Holder in A STEM/SEM*; J Howe, MS Thompson, S Dogel, K Ueda, T Matsumoto, H Kikuchi, M Reynolds, H Hosseinkhannazer
- 68 *High Spatial Resolution and Wide Range EDS Analysis with FE-SEM*; S Takeuchi, Y Hashimoto, M Sasajima, K Hosoya, Y Dan, S Miyasaka, S Yamaguchi
- 70 *Application of Temperature Controlled Stage in Atmospheric Scanning Electron Microscopy*; M Sakaue, S Miyoshi, Y Ominami
- 72 *High Performance Silicon Drift Detectors*; A Pahlke, T Eggert, R Fojt, M Fraczek, L Höllt, J Knobloch, N Miyakawa, J Rumpff
- 74 *Improved Pump Down Time with Evactron® Turbo Plasma™ Cleaning*; E Kosmowska, M Cable, B Armbruster, R Vane
- 76 *A Compact High Solid Angle EDX Detector System for SEM and TEM*; A Schöning, R Lackner, A Bechteler, A Liebel, A Niculae, H Soltau
- 78 *Improved Characterization of Steel Samples by SEM/EDS Through the Use of a Silicon Drift Detector*; J Konopka
- 80 *X-ray Fluorescence Analysis in an Electron Microscope: Improved Spotsizes of Polycapillary Focusing Optics at the IfG Modular X-ray Source (iMOXS/2®)*; M Menzel, A Bjeoumikhov

Compressive Sensing, Machine Learning & Advanced Computation in Microscopy

- 82 *Implementing Sub-sampling Methods for Low-Dose (Scanning) Transmission Electron Microscopy (S/TEM)*; ND Browning, A Stevens, L Kovarik, A Liyu, L Mehdi, B Stanfill, S Reehl, L Bramer
- 84 *Compressively Sensed Video Acquisition in Transmission Electron Microscopy*; BW Reed, ST Park, RS Bloom, DJ Masiel
- 86 *Super-Resolution Electron Microscopy using Multi-Resolution Data Fusion*; CA Bouman
- 88 *Resolution Versus Error for Computational Electron Microscopy*; L Luzi, A Stevens, H Yang, ND Browning
- 90 *Spatial Resolution Smaller Than the Pixel Size? Yes we can!*; L Strueder, J Davis, R Hartmann, P Holl, S Ihle, D Kalok, H Soltau
- 92 *Design and Development of Coded Aperture Compressive Sensing Acquisition for High Frame Rate TEM Imaging*; L Kovarik, A Stevens, A Liyu, J Davidson, R Bilhorn, N Browning
- 94 *Phase imaging: A compressive sensing approach*; SG Schneider, A Stevens, ND Browning, D Pohl, K Nielsch, B Rellinghaus

- 96 *Acquisition of STEM Images by Adaptive Compressive Sensing*; W Xie, Q Feng, R Srinivasan, A Stevens, ND Browning
- 98 *Controlling the Reaction Process in Operando STEM by Pixel Sub-Sampling*; BL Mehdi, A Stevens, L Kovarik, A Liyu, B Stanfill, S Reehl, L Bramer, ND Browning
- 100 *An Information Theoretic Approach for Creating 3D Spatial Images from 4D Time Series Data*; W Wriggers, J Kovacs, F Castellani, PT Vernier, DJ Krusienski
- 102 *Computer Vision Techniques Applied to the Reconstruction of the 3-D Structure of Dislocations.*; E Oveisi, Zanet, S de P Fua, C Hébert
- 104 *A framework to learn physics from atomically resolved images*; L Vlcek, AB Maksov, M Pan, S Jesse, SV Kalinin, RK Vasudevan
- 106 *Denoising electron-energy loss data using non-local means filters*; N Mevenkamp, B Berkels, M Duchamp
- 108 *Compressive Classification for TEM-EELS* ; W Hao, A Stevens, H Yang, M Gehm, ND Browning
- 110 *A Method for Separating Crystallographically Similar Phases in Steels using EBSD and Machine Learning*; J Goulden, K Mehnert, K Thomsen, H Jiang
- 112 *Sparsity, Parsimony and Data Reduction – Applications across Multi-Dimensional Electron Microscopy*; PA Midgley
- 114 *Scanning Precession Electron Diffraction Study of Hybrid Precipitates in a 6xxx Series Aluminium Alloy*; JK Sunde, DN Johnstone, CD Marioara, AT van Helvoort, PA Midgley, R Holmestad
- 116 *Data Clustering and Scanning Precession Electron Diffraction for Microanalysis*; BH Martineau, DN Johnstone, JF Einsle, PA Midgley, AS Eggeman
- 118 *Combining a Convolutional Neural Network and Watershed Segmentation for Identifying U-Bearing Particles in Secondary Ion Mass Spectrometry Images*; JG Tarolli, BE Naes, D Willingham
- 120 *A Convolutional Neural Network Approach to Thickness Determination using Position Averaged Convergent Beam Electron Diffraction*; W Xu, J LeBeau
- 122 *3D Deconvolution for Cryo-Scanning Transmission Electron Tomography*; B Waugh, SG Wolf, S Rubin, E Branlund, J Sedat, M Elbaum
- 124 *Scanning Electron Microscope Point Spread Function Determination Through the Use of Particle Dispersions*; MD Zotta, E Lifshin
- 126 *Viability of Point Spread Function Deconvolution for SEM*; MC Nevins, MD Zotta, RK Hailstone, E Lifshin
- 128 *GENFIRE: A Generalized Fourier Iterative Reconstruction Algorithm for High-Resolution 3D Electron and X-ray Imaging*; AP Pryor, Y Yang, A Rana, M Gallagher-Jones, J Zhou, YH Lo, G Melinte, JA Rodriguez

- 130 *Auto-encoders for Noise Reduction in Scanning Transmission Electron Microscopy*; JP Buban, S-Y Choi
- 132 *Dragonfly Segmentation Trainer - A General and User-Friendly Machine Learning Image Segmentation Solution*; N Piche, I Bouchard, M Marsh
- 134 *A particle extraction method with an improved auto-encoder in neural networks with the aid of HOG feature analysis*; S Tezuka, G Maeda, M Baba, N Baba
- 136 *Under-sampling and Image Reconstruction for Scanning Electron Microscopes*; Y Zhanag, D Godaliyadda, Y Nashed, N Ferrier, EB Gulsoy, C Phatak
- 138 *Segmentation and Contour Extraction in Biological Transmission Electron Microscope Images with 'Bag-of-Features' Method in Machine Learning*; G Maeda, S Tezuka, S Sakamoto, M Baba, N Baba
- 140 *Deep Learning Segmentation for Epifluorescence Microscopy Images*; Y Kassim, O Glinskii, V Glinskii, V Huxley, K Palaniappan
- 142 *Real-time Video Enhancement and Computer Vision for In-Vivo Microscopy*; H Osman
- 144 *A Route to Integrating Dynamic 4D X-ray Computed Tomography and Machine Learning to Model Material Performance*; NL Cordes, K Henderson, BM Patterson
- 146 *Digital super-resolution in EELS*; SG Schneider, D Pohl, A Stevens, ND Browning, K Nielsch, B Rellinghaus
- 148 *Adaptive Biharmonic In-Painting for Sparse Acquisition Using Variance Frames*; A Barnum, J Jiao
- 150 *High-Throughput Large Volume SEM Workflow using Sparse Scanning and In-painting Algorithms Inspired by Compressive Sensing*; F Boughrobel, P Potocek, M Hovorka, L Strakoš, J Mitchels, T Vystavěl, B Lich, T Dahmen
- 152 *Implementation of Sparse Image Acquisition in a Conventional Scanning Transmission Electron Microscope*; MA Tanner, S Hwang, CW Han, SV Venkatakrisnan, CA Bouman, V Ortalan
- 154 *In-Chamber Reel-to-Reel System for Random-Access Volume Electron Microscopy*; S Mikula
- 156 *The usage of modern data science in segmentation and classification: Machine Learning and Microscopy*; MG Andrew, S Bhattiprolu, D Butnaru, J Correa
- 158 *Reliable event detection for incomplete and streaming (S)TEM images*; SM Reehl, B Stanfill, D Ries, M Johnson, L Mehdi, N Browning, L Bramer
- 160 *Quantifying Feature Uncertainty in Sub-sampled Low-dose (S)TEM Images*; B Stanfill, S Reehl, M Johnson, N Browning, L Mehdi, L Bramer

Big, Deep, and Smart Data in Microscopy

- 162 *Computational Methods for Large Scale Scanning Transmission Electron Microscopy (STEM) Experiments and Simulations*; C Ophus, H Yang, Reis, R dos Y Meng, Jr, A Pryor J Miao, TC Pekin, AM Minor

- 164 *Joint Denoising and Distortion Correction for Atomic Column Detection in Scanning Transmission Electron Microscopy Images*; C Zhang, B Berkels, B Wirth, PM Voyles
- 166 *Less is More: Bigger Data from Compressive Measurements*; A Stevens, ND Browning
- 168 *Acquisition and Fast Analysis of Multi-Dimensional STEM Data*; AR Lupini, AY Borisevich, JC Idrobo
- 170 *Reconstruction of Randomly and Partially Sampled STEM Spectrum-Images*; E Monier, T Oberlin, N Brun, M Tencé, N Dobigeon
- 172 *Robust Nanostructure from High Throughput Powder Diffraction Data*; S Billinge
- 174 *Statistical analyses of electron nanodiffraction patterns to examine order and structural variability in amorphous materials.*; AC Liu, ED Bojesen, P Harrowell, TC Petersen
- 176 *Multivariate Statistical Analysis of a Multimodal Diffraction and X-ray Spectral Series Data Set*; PG Kotula, Bentham, MH Van
- 178 *Leveraging first principles modeling and machine learning for microscopy data inversion*; MK Chan
- 180 *Accurate Diffraction Peak Identification for Scanning Electron Nanodiffraction Based on Automated Image Processing and Feature Detection*; R Yuan, Y Meng, J Zhang, J-M Zuo
- 182 *Autonomous Experimentation Applied to Carbon Nanotube Synthesis*; B Maruyama
- 184 *G-mode – Full Information Capture Applied to Scanning Probe Microscopy*; S Somnath, SV Kalinin, S Jesse
- 186 *Combinatorial Microscopy in Liquids with Low Energy Electrons*; E Strelcov, H Guo, A Yulaev, J Wang, N Appathurai, S Urquhart, J Vinson, S Sahu
- 188 *Physic-Based Image Reconstruction of SiC Grain Boundaries*; A Ziabari, JM Rickman, JP Simmons, CA Bouman
- 190 *What Can We Learn from the Shapes of Secondary Electron Puddles on Direct Electron Detectors?*; A Datta, SW Chee, B Bammes, L Jin, D Loh
- 192 *Rapid measurement of I-V curves via complete information acquisition*; S Somnath, P Maksymovych, S Kalinin, S Jesse, R Vasudevan
- 194 *Separation of Hard to Distinguish Phases in Automated Feature Analysis*; M Hiscock, S Burgess, C Lang
- 196 *Understanding and exploiting the interaction of electron beams with low-dimensional materials – from controlled atomic-level manipulation to circumventing radiation damage*; T Susi, A Mittelberger, C Kramberger, C Mangler, C Hofer, TJ Pennycook, J Kotakoski, JC Meyer
- 198 *Supervised Component Analysis for EELS mapping*; S Wang
- 200 *Processing a Five Dimensional X-ray Image: Big Data Challenges and Opportunities*; J Davis, J Schmidt, M Huth, R Hartmann, H Soltau, L Strüder

- 202 *Inter-phase Relationships Revealed in 3-Dimensional Orientation Spaces*; R Krakow, RJ Bennett, DN Johnstone, PA Midgley, R Hielscher, CM Rae
- 204 *In situ Transmission Electron Microscopy Graphene Liquid Cell on Chemical Sodiation of Nickel Oxide Nanoparticle*; FJ Mweta, JH Chang, HK Seo, SJ Kim, JY Cheong, I-D Kim, J Yuk, JY Lee

Advances in Programming of Quantitative Microscopy for Biological and Materials Science

- 206 *Recent advances of the open source MULTEM program to provide accurate and fast electron microscopy simulations*; IP Lobato Hoyos, J Verbeeck, Aert, S Van
- 208 *Creation of an XAS and EELS Spectroscopy Resource within the Materials Project using FEFF9*; AK Dozier, K Persson, SP Ong, K Mathew, C Zheng, C Chen, J Kas, F Vila
- 210 *Stereographic Methods for 3D Characterization of Dislocations*; BP Eftink, GT Gray, SA Maloy
- 212 *EMsoft: Open Source Software for Electron Diffraction/Image Simulations*; S Singh, F Ram, Graef, M De
- 214 *Electron Microscopy (Big and Small) Data Analysis With the Open Source Software Package HyperSpy*; F de_la_Peña, T Ostasevicius, VT Fauske, P Burdet, P Jokubauskas, M Nord, M Sarahan, E Prestat
- 216 *Mapping Data with Heavily Overlapped Spectral Features*; P Kikongi, H Demers, R Gauvin, R Gosselin, N Braidy
- 218 *The Fluorescence Correction of Multilayer Materials for Quantitative X-ray Microanalysis*; Y Yuan, H Demers, R Gauvin
- 220 *Standard Bundles Simplify Standards-base Quantification in NIST DTSA-II*; NW Ritchie, MJ Mengason, DE Newbury
- 222 *tomviz: Providing Advanced Electron Tomography by Streamlining Alignment, Reconstruction, and 3D Visualization*; Y Jiang, E Padgett, MD Hanwell, C Quammen, C Harris, S Waldon, DA Muller, R Hovden
- 224 *Pycroscopy – An Open Source Approach to Microscopy and Microanalysis in the Age of Big Data and Open Science*; S Somnath, CR Smith, S Jesse, N Laanait
- 226 *The ImageJ Ecosystem: An Open and Extensible Platform for Biomedical Image Analysis.*; CT Rueden, KW Eliceiri
- 228 *Gesture-Based Control of Scanning Electron Microscopes Using Leap Sensors*; S Cater, BC Breton, DM Holburn, NH Caldwell
- 230 *MIPAR™: 2D and 3D Image Analysis Software Designed by Materials Scientists, for All Scientists*; JM Sosa, DE Huber, BA Welk, HL Fraser
- 232 *A Specific Image Processing Code in MatLab to Perform Advanced Nodularity and Nodule Count Analysis of Austempered Ductile Iron Castings*; B Cetin, H Kurtuldu, G Durkaya, K Davut

- 234 *Open Source Software for Quantitative X-ray Microanalysis: openMicroanalysis*; H Demers, P Pinard, S Richter, R Gauvin
- 236 *Quantification of Thin Specimens in a Scanning Transmission Electron Microscope at Low Accelerating Voltage using the f-ratio Method*; N Brodusch, H Demers, R Gauvin
- 238 *On-line digital-darkfield TEM determination of nanocrystal 3D-lattices*; PB Fraundorf
- 240 *A Semi-Automated Workflow for Segmenting Contents of Single Cardiac Cells from Serial-Block-Face Scanning Electron Microscopy Data*; A Hussain, E Hanssen, V Rajagopal
- 242 *Detection of Protein Secondary Structure Patterns from 3D Cryo-TEM Maps at Medium Resolution – Combining the Best of SSETracer and VolTrac*; C Spillers, W Wriggers, J He
- 244 *Gesture-Based Control of ImageJ Using Leap Sensors*; R Brookes, BC Breton, DM Holburn, NH Caldwell
- 246 *The Dragonfly Macro Engine for Executing Recorded Tasks in Image Processing and Visualization*; M Gendron, N Piche, M Marsh
- 248 *Eye Gaze Pattern Analysis of Whole Slide Image Viewing Behavior in PathEdEx Platform*; I Ersoy, M Kovalenko, C-R Shyu, R Hammer, D Shin

Advances in FIB Instrumentation and Applications in Materials and Biological Sciences

- 250 *Site Specific Cryo-FIB Preparations Aimed at in situ Cryo-Electron Tomography*; J Mahamid, J Arnold, JM Plitzko
- 252 *Multi-modal SEM/FIB-SEM for Precise Targeting of Cell-Cell Junctions in Human Pancreatic Islets*; JW Hughes, MS Joens, JA Fitzpatrick, DW Piston
- 254 *3D Microanalysis of Porous Copper Using FIB-Tomography in Combination with X-ray Computed Tomography*; A Wijaya, B Eichinger, J Rosc, B Sartory, M Mischitz, R Brunner
- 256 *Potential of application focused ion beam in forensic science area*; M Kotrly
- 258 *In-situ TEM analyses over FIB lamellae - Investigating High Temperature Conversion of Solution Processed Mo-precursor to MoS₂ Semiconductor Films.*; A Pokle, M Canavan, D Daly, O Gomes, M Marinkovic, V Wagner, V Nicolosi
- 260 *Building with Ions in the Helium Ion Microscope*; OS Ovchinnikova
- 262 *Nanofabrication Limits in Layered Ferroelectric Semiconductors via He-ion Beam*; H Hysmith, A Belianinov, MJ Burch, AV Ievlev, V Iberi, MA Susner, MA McGuire, P Maksymovych
- 264 *Rapid Screening of Nanoporous Structures in SiO₂ Catalyst Particles via Helium Ion Microscopy*; MJ Burch, AV Ievlev, H Hysmith, K Mahady, PD Rack, L Luo, A Belianinov, S Yakolev
- 266 *A Plan-view TEM Specimen Preparation Method Using Focused Ion Beam*; L-H Lee, C-H Yu, Y-T Hong, C-Y Wen

- 268 *Targeted Ion Milling of Ex Situ Lift-Out FIB Specimens*; CS Bonifacio, MJ Campin, P Nowakowski, M Boccabella, LA Giannuzzi, PE Fischione
- 270 *A Comparison of Current and Emerging Ion and Laser Beam Techniques for High Throughput Material Removal*; S Subramaniam, MP Echlin, K Muthur, K Johnson
- 272 *Improvements in Characterization of FIB Prepared Surfaces of Aluminum Using Xe⁺ Plasma FIB*; B Van Leer, R Passey
- 274 *Comparison of Characteristics of Neon, Argon, and Krypton Ion Emissions from Gas Field Ionization Source with Single Atom Tip*; H Shichi, S Matsubara, T Hashizume
- 276 *Cold-Atom Ion Sources for Focused Ion Beam Applications*; JJ McClelland, WR McGehee, VP Oleshko, CL Soles, S Takeuchi, O Kirilov, D Gundlach, E Strelcov
- 278 *HIM-SIMS: Correlative SE/Chemical Imaging at the Limits of Resolution.*; D Dowsett, T Wirtz, L Yedra
- 280 *Sample preparation for nano-mechanical testing on radioactive materials*; P Hosemann, D Frazer, A Reichardt, H Vo, C Howard
- 282 *Novel Setup for High Performance Simultaneous 3D EBSD and 3D EDS Acquisition*; R Váňa, J Dluhoš, L Hladík, J Lindsay, J Goulden
- 284 *Developments in Large Volume 3D Analysis via P-FIB: EBSD & EDS*; J Lindsay, T Burnett, J Goulden, P Frankel, A Garner, B Winiarski, PJ Withers
- 286 *Automated 3D block preparation procedure for Focused Ion Beam 3D analyses*; XL Zhong, PJ Withers, X Zhang, SB Lyon, TL Burnett, X Zhou, MG Burke
- 288 *A Comparison of Ga FIB and Xe-Plasma FIB of Complex Al Alloys*; A Ernst, M Wei, M Aindow
- 290 *Focused Ion Beam Prepared Cross-Sectional Transmission Electron Microscopy Preparation On CaGe₂ On Ge(111) Grown By Molecular Beam Epitaxy*; RE Williams, J Xu, A Hanks, A Ahmed, IV Pinchuk, DW McComb, R Kawakami, J Katoch
- 292 *Cross Sectional Analysis of Cation Doped Transition Metal Oxide Mesoporous Catalyst Materials*; S Poges, B Dutta, H Khanna, E Moharreri, M Aindow, SL Suib
- 294 *TEM Specimen Preparation for In Situ Heating Experiments Using FIB*; S Vijayan, JR Jinschek, S Kujawa, J Greiser, M Aindow
- 296 *Ga⁺ and Xe⁺ FIB Milling and Measurement of FIB Damage in Aluminum*; B Van Leer, A Genc, R Passey
- 298 *Applications of an in-situ Low Energy Argon Ion Source for Improvement of TEM and SEM Sample Quality*; A Prokhotseva, J Mulders, T Vystavěl
- 300 *Accurate Removal of Implanted Gallium and Amorphous Damage from TEM Specimens after Focused Ion Beam (FIB) Preparation*; P Nowakowski, CS Bonifacio, MJ Campin, ML Ray, PE Fischione

- 302 *Narrow-Beam Argon Ion Milling of Carbon-Supported Ex Situ Lift-Out FIB Specimens*; MJ Campin, CS Bonifacio, HH Kang, P Nowakowski, M Boccabella, PE Fischione
- 304 *Towards Automatic Lamella Thinning Using Live Thickness Measurements and Smart End-Point Detection*; T Volkenandt, F Pérez-Willard, M Rauscher, PM Anger
- 306 *Optimizing Van der Waals Forces For FIB ex situ Lift Out*; LA Giannuzzi, T Clark
- 308 *A Novel Approach in Sample Preparation of Li Content Materials for TEM Research*; S-C Liou, C-F Lin, W-A Chiou, G Rubolff
- 310 *FIB/SEM Imaging of Microbial Induced Calcite Precipitation in Sandy Soil*; L Li, K Wen, C Li, F Amini
- 312 *Investigating 3D Printing with Microscopy and Spectroscopy Techniques*; BW Arey, CA Barrett, I Arslan, Z Kennedy, M Warner, H Schroder
- 314 *Analysis of Void Volume in Composite Electrode of All-solid-state Lithium-ion Battery Employing FIB-SEM and Union Operation Image Processing*; Y Yamamoto, Y Iriyama, S Muto

Bridging Length Scales with 2D, 3D, and 4D Multiscale/Multimodal Microscopy

- 316 *Secondary Ion Mass Spectrometry in the TEM: Isotope Specific High Resolution Correlative Imaging*; L Yedra, S Eswara, D Dowsett, QH Hoang, T Wirtz
- 318 *Application of Serial Sectioning Microscopy to Additively Manufactured Metallic Samples*; M Chapman, JM Scott, E Schwalbach, M Groeber, S Donegan, M Uchic
- 320 *Solidification in 4D: from Dendrites to Eutectics*; Y Sun, A Shahani, J Gibbs, A Cecen, S Kalidindi, X Xiao
- 322 *3D Imaging of Titanium Alloys Multi-Layered Structures (MLS) Via X-Ray Microscopy*; S Prikhodko, Rad, M Norouzi P Markovskiy, D Savvakina, N Julian, O Ivasishin
- 324 *Multimodal 3D Time-Lapse Studies of Corrosion Pitting and Corrosion-Fatigue Behavior in 7475 Aluminum Alloys*; TJ Stannard, H Bale, T Chengattu, S Niverty, J Williams, X Xiao, A Merkle, E Lauridsen
- 326 *The use of LOM, SEM, FIB and APT to clarify the sequences of failure of a hot dip galvanized structural steel section*; M Panzenböck, C Freitag
- 328 *In situ mechanical studies of plastic bonded explosive, multiscale 3D imaging and modeling*; BM Patterson, K Henderson, N Cordes, D Walters, DJ Luscher, V Manner, B Tappan, JD Yeager
- 330 *Correlative 3D Imaging and Characterization of Human Dentine*; IN Boona, F Scheltens, J Sosa, TL Burnett, PJ Withers, JS Earl, DW McComb
- 332 *Correlative Microscopy in 3D: Recent Advancements in Multi-Scale Materials Science*; J Gelb, T Volkenandt, A Merkle
- 334 *Correlated Electron Microscopy across Length Scales to Elucidate Structural, Electrical and Chemical Properties of Oxide Grain Boundaries*; WJ Bowman, MN Kelly, GS Rohrer, CA Hernandez, A Darbal, PA Crozier

- 336 *A Novel Strategy to Effectively Characterize FinFET Device by Multidirectional Comprehensive Analytical TEM in Semiconductor Wafer-foundries*; WW Zhao, B Fu, Y Wei, I Brooks
- 338 *Cross-scale Integrated Biomaging by 3D Light-, X-ray and Electron Microscopy - From Organisms, Organs and Tissue to Cells, Organelles and Macromolecular Complexes*; M Auer
- 340 *Integrated Dynamic 3D Imaging of Microbial Processes and Communities in Rhizosphere Environments: The Argonne Small Worlds Project*; K Kemner, M Hereld, N Scherer, O Cossairt, B Glick, N Ferrier, R Wilton, P Noirot
- 342 *Correlative tomography for additive manufacturing of biomedical implants*; BB Winiarski, G Pyka, M Benedetti, TL Burnett, D Laeveren, M Dallago, PJ Withers
- 344 *Dissecting the Cellular Behaviour of Colorectal Cancer via Multimodal Imaging and Correlative Microscopy*; F Braet
- 346 *Electron Ptychography: From 2D to 3D reconstructions*; S Gao, F Zhang, AI Kirkland, X Pan, P Wang
- 348 *Symmetry-Breaking Nanoregions in Single-Phase High Entropy Alloys Determined using Scanning Convergent Beam Electron Diffraction*; Y-T Shao, J-M Zuo
- 350 *Multiscale Microstructural Analysis of Austempered Ductile Iron Castings*; K Davut, A Yalcin, B Cetin
- 352 *3D Nanotomography of Porous Polymer Composite using FIB/HIM and FIB/SEM*; D Wei, S Kraemer, C Cao, C Huynh
- 354 *Accelerating 3D microstructure acquisition via fully automated serial sectioning*; LT Nguyen, DJ Rowenhorst
- 356 *A Robust 3D Scanning Technique for SEM*; G Moldovan
- 358 *Correlative Imaging of Murine Pulmonary Valve Extracellular Matrix*; Y Liu, Y-U Lee, CK Breuer, DW McComb
- 360 *eC-CLEM: Flexible Multidimensional Registration Software for Correlative Microscopies with Refined Accuracy Mapping*; X Heiligenstein, P Paul-Gilloteaux, M Belle, G Raposo, J Salamero
- 362 *Development of an Efficient Methodology for the Mapping and Digital Analysis of 3D Surfaces via SEM*; D Stalla, K Banks, J Brown, F Bunyak, E Giuliano, T White

Materials Characterization using Atomic-Scale EDX/EELS spectroscopy

- 364 *Understanding Properties of Functional Materials with Atomic-Resolved Electron Energy Loss Spectroscopy*; G Botton, M Bugnet, H Liu
- 366 *Enhanced Sensitivity of Atomic-Resolution Spectroscopic Imaging by Direct Electron Detection*; DJ Baek, BH Goodge, D Lu, Y Hikita, HY Hwang, LF Kourkoutis
- 368 *The Heterogeneous Nucleation Sequence at the Interface of TiB₂ in Al Alloys*; J Li, FS Hage, QM Ramasse, P Schumacher

- 370 *Atomic-scale characterization of thermoelectric oxides using high spatial and energy resolution STEM-EELS*; Q Ramasse, DM Kepaptsoglou, JD Baran, M Molinari, SC Parker, T Mizoguchi, F Azough, R Freer
- 372 *Atomic Resolution STEM-EELS Studies of Defects and Local Structural Distortions in Oxide Interfaces*; G Sanchez-Santolino, MA Roldan, Q Qiao, L Begon-Lours, MA Frechero, JI Salafranca, R Mishra, C Leon
- 374 *Mapping Giant Oscillator Excitons in Semiconducting Nano Wires*; MF Chisholm, J Ge, M Tian, HP Wagner, G Duscher
- 376 *Emergence of the Collective Oscillations in Electron Energy Loss Spectra of d-electrons in III-V Nitrides*; R Dhall, JH Dycus, D Vigil-Fowler, JM LeBeau
- 378 *Plasmon Energy Mapping in Aluminum and Indium with Sub-Nanometer Resolution*; B Zutter, M Mecklenburg, BC Regan
- 380 *Fundamental limit to single-atom analysis by STEM-EDX spectroscopy*; M Watanabe, RF Egerton
- 382 *Atomistic understanding of structural evolution in alnico alloys using advanced AC-STEM*; L Zhou, W Tang, P Lu, I Anderson, M Kramer
- 384 *Mapping the Chemistry Within, and the Strain Around, Al-alloy Precipitates at Atomic Resolution by Multi-frame Scanning Transmission Electron Microscopy*; L Jones, S Wenner, M Nord, PH Ninive, OM Løvvik, C Marioara, R Holmestad, P Nellist
- 386 *From Nanometer to Atomic Resolution X-ray EDS Analysis of Al in Ni-rich Layered Oxide Li-Ion Cathodes*; P Mukherjee, P Lu, N Faenza, N Pereira, GG Amatucci, F Cosandey
- 388 *Absolute-Scale Comparison with Simulation for Quantitative Energy-Dispersive X-Ray Spectroscopy in Atomic-Resolution Scanning Transmission Electron Microscopy*; SD Findlay, Z Chen, M Weyland, X Sang, W Xu, JH Dycus, JM LeBeau, LJ Allen
- 390 *Numerical Modeling of Specimen Geometry for Quantitative Multiple Detector EDS*; W Xu, JH Dycus, JM LeBeau
- 392 *Probing the Effects of Electron Channelling on EDX Quantification*; KE MacArthur, HG Brown, SD Findlay, LJ Allen
- 394 *Improving Atomic-Scale Elemental Mapping Resolution of STEM-EDS through Optimizing Experimental Conditions*; P Lu, R Yuan, JM Zuo
- 396 *A Combined Atomic-Resolution STEM and First-Principles Approach Towards Understanding the Origins of the First Solar-System Solids*; T Zega, V Manga, K Watanabe, K Domanik, P Mane, A Hanawa, H Inada, J Howe
- 398 *Microstructure and Hardness of Al_{2024} -0.25 Mg Alloy after Plastic Deformation*; CG Garay-Reyes, IK Gómez-Barraza, MA Ruiz-Esparza-Rodríguez, I Estrada-Guel, JP Flores-De-los-Ríos, MC Maldonado-Orozco, R-MS Martínez-Sánchez
- 400 *Effect of Mg Addition and Solution Heat Treatment Time on Microstructure and Hardness of Al_{2024} Alloy*; CG Garay-Reyes, IK Gómez-Barraza, MA Ruiz-Esparza-Rodríguez, I Estrada-Guel, JP Flores-De-Los-Ríos, MC Maldonado-Orozco, R Martínez-Sánchez

- 402 *Characterization of Partitioning in a Medium-Mn Third-Generation AHSS*; JT Benzing, J Bentley, JR McBride, D Ponge, J Han, D Raabe, J Wittig
- 404 *Microscopic Analyses of 316 L Stainless Steel Powder from Additive Layer Manufacturing Process*; HM Davies, S Mehmood, A Khaliq, SA Ranjha
- 406 *EDS-Lite, Quantitative Energy Dispersive Spectroscopy of Light Elements*; Jeor, St. VL
- 408 *STEM SI Warp: a Digital Micrograph script tool for warping the image distortions of atomically resolved spectrum image*; Y Wang, U Salzberger, V Srot, W Sigle, P van Aken
- 410 *Simplifying Electron Beam Channeling in STEM*; RJ Wu, A Mittal, ML Odlyzko, A Mkhoyan
- 412 *Layer Count Mapping of Multilayer Hexagonal Boron Nitride Thin Films*; N Cross, A Mohsin, L Liu, G Gu, G Duscher
- 414 *Determining the Electron Density and Volume Expansion at Grain Boundaries Using Electron Energy-Loss Spectroscopy*; P Nandi, E Hoglund, X Sang, R Unocic, J Howe
- 416 *Microstructural Characterization of Hardened AISI 4140 using CrN/CSi Coatings*; JL Bernal, AI Martínez, EE Vera, S Borjas

Advances and Applications of Aberration-Corrected Electron Microscopy

- 418 *Applications of High Precision STEM Imaging to Structurally Complex Materials*; J Feng, C Zhang, D Zhou, Z Xu, D Morgan, P Voyles
- 420 *Mapping Picometer Scale Periodic Lattice Distortions with Aberration Corrected Scanning Transmission Electron Microscopy*; BH Savitzky, Baggari, I El AS Admasu, J Kim, S-W Cheong, R Hovden, LF Kourkoutis
- 422 *Atomic Resolution Imaging of YAlO₃:Ce in the Chromatic and Spherical Aberration Corrected PICO Transmission Electron Microscope*; L Jin, KW Urban, CL Jia, J Barthel
- 424 *Three-Dimensional Point Defect Imaging by Large-angle Illumination STEM*; R Ishikawa, SJ Pennycook, AR Lupini, SD Findlay, N Shibata, Y Ikuhara
- 426 *Atomap - Automated Analysis of Atomic Resolution STEM Images*; M Nord, PE Vullum, I MacLaren, T Tybell, R Holmestad
- 428 *Aberration-Corrected STEM/EELS at Cryogenic Temperatures*; L Kourkoutis, Baggari, I El BH Savitzky, DJ Baek, BH Goodge, R Hovden, MJ Zachman
- 430 *Direct Solid-State Nucleation From Preexisting Coherent Precipitates in Aluminium*; L Bourgeois, Y Chen, Z Zhang, Y Zhang, N Medhekar
- 432 *Evaluation of aberration-corrected optical sectioning for exploring the core structure of $\frac{1}{2}[111]$ screw dislocations in BCC metals*; D Hernandez-Maldonado, R Gröger, QM Ramasse, PB Hirsch, PD Nellist

- 434 *Quantitative Mapping of Strain, Polarization, and Octahedral Distortion at unit cell resolution by Scanning Electron Diffraction*; J Ciston, Reis, R dos Y Meng, C Ophus, LW Martin
- 436 *Towards a Direct Visualization of Charge Transfer in Monolayer Hexagonal Boron Nitride using a Fast Pixelated Detector in the Scanning Transmission Electron Microscope*; GT Martinez, TJ Pennycook, TC Naginey, L Jones, H Yang, J Yates, RJ Nicholls, M Huth
- 438 *Enhanced Resolution from Full-Field Ptychography with an Electron Microscope Pixel Array Detector*; Y Jiang, Y Han, Z Chen, V Elser, DA Muller
- 440 *Quantitative Relation Between Differential Phase Contrast Images Obtained by Segmented and Pixelated Detectors*; T Seki, G Sánchez-Santolino, R Ishikawa, Y Ikuhara, N Shibata
- 442 *Quantitative Specimen Electric Potential Maps Using Segmented and Pixel Detectors in Scanning Transmission Electron Microscopy*; HG Brown, N Shibata, Z Chen, M Weyland, TC Petersen, DM Paganin, MJ Morgan, H Sasaki
- 444 *Theory and Practice of Diffractometry on Single Tungsten Atoms using Electron Microscope Pixel Array Detectors*; MC Cao, Y Han, Y Jiang, KX Nguyen, P Purohit, MW Tate, SM Gruner, V Elser
- 446 *Imaging of Individual Vacancies Using Electron Channeling Contrast in STEM*; JM Johnson, J Hwang
- 448 *Electron Microscopy with Structured Electrons*; BJ McMorran, P Ercius, TR Harvey, M Linck, C Ophus, J Pierce
- 450 *Three-dimensional confocal imaging using coherent elastically scattered electrons*; C Zheng, L Sorin, Y Zhu, J Etheridge
- 452 *Sub-Nanometer-Resolution Magnetic Field Observation Using Aberration-Corrected 1.2-MV Holography Electron Microscope with Pulse Magnetization System*; T Tanigaki, T Akashi, A Sugawara, K Miura, J Hayakawa, K Niitsu, T Sato, X Yu
- 454 *Aberration Corrected Lorentz Microscopy to Investigate Magnetic Domain Walls in Co-Pt Nano-Chessboards*; I Kashyap, JA Floro, YM Jin, Graef, M De
- 456 *New STEM/TEM Objective Lens for Atomic Resolution Lorentz Imaging*; N Shibata, Y Kohno, S Morishita
- 458 *Low-Voltage TEM/STEM for Imaging and Spectroscopy of Low-Dimensional Materials*; K Suenaga
- 460 *A new detection scheme for van der Waals heterostructures, imaging individual fullerenes between graphene sheets, and controlling the vacuum in scanning transmission electron microscopy*; G Argentero, K Mustonen, R Mirzayev, A Mittelberger, T Susi, GT Leuthner, Y Cao, M Monazam
- 462 *Etching and Mending of Graphene Edges by Cu and Pt Atoms*; E Kano, A Hashimoto, M Takeguchi
- 464 *Quantification of Low Voltage Images of 2-dimensional Materials in Aberration Corrected Scanning Transmission Electron Microscopy.*; MP Oxley, NG Cross, G Duscher, LJ Allen, MF Chisholm
- 466 *Development of Compact Cs/Cc Corrector with Annular and Circular Electrodes*; T Kawasaki, R Yoshida, T Kato, T Nomaguchi, T Agemura, T Kodama, M Tomita, T Ikuta

- 468 *Performance of Low-kV Aberration-corrected STEM with Delta-corrector and CFEG in Ultrahigh Vacuum Environment*; K Suenaga, K Kimoto, M Mukai, Y Kohno, S Morishita, T Sasaki
- 470 *Phase retrieval quantitative comparison between tilt-series imaging in TEM and position-resolved coherent diffractive imaging in STEM*; E Liberti, G Martinez, C O'Leary, P Nellist, A Kirkland
- 472 *A Novel Method for Higher Order Aberration Correction in Electron Microscopes*; S Hoque, H Ito, A Takaoka, R Nishi
- 474 *Analysis of Phase Difference Variations for Strong Dynamical Objects Using Wigner Distribution Deconvolution Ptychography*; GT Martinez, H Yang, PD Nellist
- 476 *A Comparison of Phase-retrieval Algorithms for Focused-probe Electron Ptychography*; GT Martinez, MJ Humphry, PD Nellist
- 478 *Depth-Dependent Contrast in Probability-Current Imaging from Channeling in Crystalline Materials*; Z Chen, KX Nguyen, CS Chang, MC Cao, DA Muller
- 480 *Better Contrast for Imaging Defects by ABF*; P Gao
- 482 *Z-contrast imaging for elemental analysis: Single atoms to clusters*; MC Akatay, W Sinkler, SI Sanchez, SA Bradley
- 484 *Facet Selective Growth of Iridium Chains/Wires of Single-Atom Width on the {10-10} Surfaces of ZnO Nanowires*; J Xu, Y Song, H Wu, J Liu
- 486 *Z-contrast Imaging of Incommensurately Modulated Structure in Plagioclase Feldspars*; H Xu, S Jin
- 488 *Atomic Resolution Microscopy of Clathrate-I Type Borosilicides*; R Ramlau, W Jung, Y Grin

Standards, Reference Materials, and Their Applications in Quantitative Microanalysis

- 490 *Current Status of ISO/TC202 – Microbeam Analysis*; P Camus, D Meier, R Marinenko
- 492 *Creating and Using Secondary Reference Materials for EPMA and LA-ICPMS*; JW Singer
- 494 *Natural and Synthetic Glass and Crystal Reference Materials for Trace Element Microanalysis*; WO Nachlas
- 496 *Use of Mineral Reference Standards in EPMA: Instrumental Calibration, Standards Comparison, and Quality Control*; PK Carpenter, EP Vicenzi
- 498 *Status of the Smithsonian Microbeam Standards 2017 with a Discussion of the Venerable VG-2 Basalt Glass*; T Rose, C Brown
- 500 *Relative Uncertainties in Mass Attenuation Coefficients and their Influence on Quantitative EDS and WDS Analysis*; R Terborg, J Dellith, A Scheffel, M Abratis

- 502 *Minerals from the Kakanui Volcanic Breccia: A 2017 Look at Geological Reference Materials for EPMA*; J Fournelle, J Scott
- 504 *Application of SIMS-SSAMS to Characterization of Surrogate Pre- and Post-Detonation Urban Debris Standard Reference Materials*; EE Groopman, KS Grabowski, AJ Fahey
- 506 *ζ Factor and k-Factor Determination Using Needle Samples*; HO Colijn, DW McComb
- 508 *Synthetic and Natural Reference Materials for EPMA, LA-ICPMS, LA-MC-ICPMS, SIMS, and Spectroscopic Microanalysis*; JM Hanchar
- 510 *Thoughts on Standards Materials and Analytical Routines for Electron Backscatter Diffraction (EBSD)*; MM Nowell, SI Wright
- 512 *Standardless EDS Composition Analysis using Quantitative Annular Dark-Field Imaging*; JH Dycus, W Xu, JM LeBeau
- 514 *Practical Utilization of Uranium-Containing Particulate Test Samples for SEM/EDS and SIMS Automated Particle Analysis Method Validation*; MS Wellons, M DeVore, RM Rogers, J Hewitt, TL Williamson, TJ Tenner, T Darroudi
- 516 *Measuring Carbon in Steel Using Calibration Curves on the Microprobe; Failed Cap Screw Study*; RP Grant, JM Rodelas, DF Susan, NR Sorensen, JR Michael
- 518 *Inspection tool for testing an electron beam in an objective lens of electron microscope*; C Han, J-M Jeong, S-C Lee, J-G Kim
- 520 *Collection Efficiency of the Twin EDS Detectors for Quantitative X-ray Analysis on A New Probe-Corrected TEM/STEM*; J Howe, T Ramprasad, A Hanawa, H Inada, J Jimenez, D Hoyle, E Voelkl, T Zega
- 522 *Focused Interest Group on Microanalytical Standards (FIGMAS): An Update*; OK Neill, A vonderHandt, JM Allaz
- 524 *Rare Earth Orthophosphate Reference Materials From Na₂CO₃-MoO₃ Flux: New Synthetic Procedures and Trace Element Determinations*; JW Singer, DJ Cherniak
- 526 *Microprobe Analysis of Pu-Ga Standards*; AD Wall, JP Romero, D Schwartz

Advances in Scanning Electron Microscopy: Transmission Modes and Channeling Effects

- 528 *Low Accelerating Voltage Scanning Transmitted Electron Microscope: Imaging, Diffraction, X-ray Microanalysis, and Electron Energy-Loss Spectroscopy at the Nanoscale*; H Demers, N Brodusch, R Gauvin
- 530 *On-axis Transmission Kikuchi Diffraction for Orientation Mapping of Nanocrystalline Materials in the SEM*; E Brodu, E Bouzy, J-J Fundenberger
- 532 *The Influence of Microscope and Specimen Parameters on the Spatial Resolution of Transmission Kikuchi Diffraction*; GC Sneddon, PW Trimby, JM Cairney

- 534 *Crystallographic Orientation Image Mapping with Multiple Detector Configurations at 30 – 300 kV*; JD Sugar, JT McKeown, DC Bufford, JR Michael
- 536 *Three-Dimensional Analysis of Cracks by Focused Ion Beam and Transmission Kikuchi Diffraction*; M Abbasi, H-U Guim, I Park, R Ayer, Y Ro
- 538 *Investigating Stress-Assisted Grain Growth in Nanocrystalline Materials Using in-situ Transmission Kikuchi Diffraction*; P Trimby, G Sneddon, V Bhatia, JM Cairney
- 540 *Dynamical Simulations of Transmission Kikuchi Diffraction (TKD) Patterns*; E Pascal, S Singh, B Hourahine, C Trager-Cowan, Graef, M De Graef
- 542 *Characterization of Porous, TiO₂ Nanoparticle Films Using On-Axis TKD in SEM – a New Nano-Analysis Tool for a Large-Scale Application*; N Wollschläger, L Palasse, I Häusler, E Ortel, K Dirscherl, V-D Hodoroaba
- 544 *Applications of Multivariate Statistical Methods to Analysis of Electron Backscatter Diffraction and Transmission Kikuchi Diffraction Datasets*; AJ Wilkinson, Y Zayachuk, DM Collins, R Korla
- 546 *Comparison of Dislocation Mapping Using Electron Channeling Contrast Imaging and Cross-Correlation Electron Backscattered Diffraction*; BE Dunlap, TJ Rubbles, DT Fullwood, MA Crimp
- 548 *Collection of selected area electron channeling patterns (SACP) on an FEI Helios NanoLab Scanning Electron Microscope*; RD Kerns, S Balachandran, AH Hunter, MA Crimp
- 550 *Automated Acquisition and Analysis of Selected Area Electron Channeling Patterns in an FEG-SEM*; J Tessmer, S Singh, Y Picard, M DeGraef
- 552 *Crystallographic Orientation Maps Obtained from Ion and Backscattered Electron Channeling Contrast*; C Lafond, T Douillard, S Cazottes, S Dubail, C Langlois
- 554 *Expanding capabilities of low-kV STEM imaging and transmission electron diffraction in FIB/SEM systems*; T Vystavěl, L Tůma, P Stejskal, M Unčovský, J Skalický, R Young
- 556 *Challenges Associated with Transmission Experiments in the SEM*; JR Michael
- 558 *Analytical STEM-in-SEM: Towards Rigorous Quantitative Imaging*; J Holm
- 560 *Advancing Correlative STEM Analysis Methods for FE-SEM*; DC Bell, M Shibata, N Erdman
- 562 *Automated Serial Section Large-field Transmission-Mode Scanning Electron Microscopy (tSEM) for Volume Analysis of Hippocampus Ultrastructure*; JM Mendenhall, M Kuwajima, KM Harris
- 564 *Improved Image Quality in SEM Imaging of Thin Tissue Sections.*; W Zuidema, JP Hoogenboom, P Kruit
- 566 *Electron Channelling Contrast Imaging (ECCI): An Amazing Tool for Observations of Crystal Lattice Defects in Bulk Samples*; S Zaefferer
- 568 *Applications of Electron Channeling Contrast Imaging (ECCI) in Failure Analysis of In-Situ Synchrotron X-Ray Diffraction Deformation Experiments*; SS Kaboli, PP Burnley

- 570 *Non-destructive Imaging of Extended Defects in III-nitride Thin film Structures Using Electron Channelling Contrast Imaging*; N-K Gunasekar, M Nouf-Allahiani, D Thomson, E Pascal, B Hourahine, C Trager-Cowan
- 572 *Focused Ion Beam (FIB) based Tomography of Dislocations using Electron Channeling Contrast Imaging (ECCI)*; S Balachandran, Z Radha, D Colbry, MA Crimp
- 574 *Investigating Defect Contrast in Ge_xSi_{1-x}/Si Epitaxial Structures Using Electron Channeling Contrast Imaging*; J Tessmer, M DeGraef, Y Picard
- 576 *High-Contrast Visualization of Anti-Phase Domains and Screw Dislocations in 3C-SiC*; T Borsa, R Brow, H Robinson, B Van Zeghbroeck
- 578 *Rapid Nanometer Mapping of Nickel-Steel Friction Stir Weld Joint*; GW Lee, G Abreu-Faria, J Rodríguez, J Orsborn, AJ Ramirez
- 580 *Effects of Ultrasonic Welding on Nanocrystalline Ag-W Investigated with 30kV Transmission Kikuchi Diffraction (tKD) and 300kV STEM SE Imaging*; DN Leonard, AA Ward, MR French, SR Cross, ZC Cordero
- 582 *Effect of Ni Addition on Microstructure and Hardness of A356 Alloy after Hot Plastic Deformation*; HM Medrano-Prieto, CG Garay-Reyes, I Estrada-Guel, CG Nava-Dino, MC Maldonado-Orozco, R Martínez-Sánchez
- 584 *Synthesis and characterization of Mg obtained by mechanical alloying and doped with Al_2O_3 and Y_2O_3* ; Fernando C Marquez, EA Juárez Arellano, J Reyes Gasga
- 586 *10kfps Transmission Imaging in a 196 Beam SEM*; W Zuidema, S Rahangdale, P Keijzer, AH Wolters, BN Giepmans, JP Hoogenboom, P Kruit
- 588 *Measurement of vortex beam phase by electron holography*; K Harada, K Niitsu, K Shimada, YA Ono, D Shindo
- 590 *Development of a Fountain detector for spectroscopy of secondary electrons in SEM*; T Agemura, H Iwai, T Sekiguchi
- 592 *Non-Diffractive Electron Bessel Beams for Scanning Electron Microscopy in Transmission Mode Using Direct Phase Masks*; S Hettler, M Dries
- 594 *Applications of Forward Modeling to Refinement of Grain Orientations*; S Singh, A Leff, M Taheri, Graef, M De Graef
- 596 *EBSD – a Powerful Tool for the Analysis of Magnetic Materials*; D Hohns, T Grubesa, D Schuller, T Bernthaler, D Goll, G Schneider
- 598 *2015 NIST Workshop on Analytical Transmission Scanning Electron Microscopy*; RR Keller
- 600 *On Mass-Thickness Contrast in Annular Dark-Field STEM-in-SEM Images*; R White, J Holm
- 602 *Revised Algorithm for Image Sharpness Measurement in Scanning Electron Microscopy based on Derivative Method in ISO/TS 24597 document*; S Kim, BC Park, I-S Oh, JS Kim

Anniversary Session: Instrumentation of Atom Probe: 50 Years and Counting

- 604 *A Personal Retrospective on the Origin of the Time-of-Flight Atom Probe*; DF Barofsky
- 608 *My Life with Erwin: The Beginning of an Atom-Probe Legacy*; JA Panitz
- 610 *Field Emission Microscopy to Study the Catalytic Reactivity of Binary Alloys at the Nanoscale.*; C Barroo, L Jacobs, N Gilis, SV Lambrechts, S Owczarek, Y De Decker, T Visartde Bocarmé
- 612 *Enabling Atom Probe Analyses of New Materials Classes with Vacuum-Cryo-Transfer Capabilities*; SS Gerstl, S Tacke, Y-S Chen, J Wagner, R Wepf
- 614 *The Pulsed-Laser Atom Probe: A Review of Its Development and Initial Applications*; GL Kellogg
- 616 *Evolution of Atom Probe Data Collection Toward Optimized and Fully Automated Acquisition*; TJ Prosa, DA Reinhard, HG Cyr, Saint I Martin, KP Rice, Y Chen, DJ Larson
- 618 *On the Multiple Event Detection in Atom Probe Tomography*; Z Peng, B Gault, MW Ashton, SB Sinnott, P-P Choi, Y Li, D Raabe
- 620 *Simplifying Observation of Hydrogen Trapping in Atom Probe Tomography*; Y-S Chen, D Haley, PA Bagot, MP Moody
- 622 *Applications, Technical Challenges, and Recent Implementation of a UHV/Cryogenic Specimen Transfer System for Atom Probe Tomography*; RM Ulfing, TF Kelly, TJ Prosa, J Shepard, B Gault, L Stephenson, Gunten, D von U Maier
- 624 *Interlaboratory Study: Laser-assisted Atom Probe Tomography (APT) of a Phosphorous-Doped Silicon Specimen*; AJ Akey, DC Bell
- 626 *Nanoscale Chiral Recognition Using Field Ion and Field Emission Microscopy.*; N Gilis, J Prakash, C Barroo, T Visartde Bocarmé
- 628 *Laser-Induced Reversion of δ' precipitates in an Al-Li Alloy*; M Khushaim, R Gemma, T Al-Kassab

Reconstruction, Simulations, and Data Analysis in Atom Probe Tomography

- 632 *Correlating Irradiation-Induced Solute Clustering with Changes of Hardness in Low and High Flux Reactor Pressure Vessel Steels*; JM Hyde, KB Wilford
- 634 *Exploring Artifact Signals in Atom Probe Mass Spectra*; F Meisenkothen, EB Steel
- 636 *Field evaporation behavior of ternary compound semiconductor $In_xAl_{1-x}N$* ; B Mazumder, S Broderick, J Peralta, H Foronda, JS Speck, K Rajan
- 638 *Recent Reconstruction Developments in IVAS*; BP Geiser, F Vurpillot, Y Chen, KP Rice, S Wright, DA Reinhard, G Sobering, RM Ulfing

- 640 *Reconstructing APT datasets: Challenging the limits of the possible*; F Vurpillot, D Zanuttini, S Parviainen, B Mazumder, N Rolland, JS Speck, C Hatzoglou
- 642 *High Fidelity Reconstruction of Experimental Field Ion Microscopy Data by Atomic Relaxation Simulations*; S Katnagallu, A Nematollahi, M Dagan, M Moody, B Grabowski, B Gault, D Raabe, J Neugebauer
- 644 *Atomistic Simulations of Surface Effects Under High Electric Fields*; S Parviainen, M Dagan, S Katnagallu, B Gault, M Moody, F Vurpillot
- 646 *Coupling Molecular Dynamics and Finite Element Simulations to Investigate the Nearest Neighbor Dependence of Field Evaporation*; T Withrow, C Oberdorfer, E Marquis, W Windl
- 648 *Atomic Level Studies of Step Dynamics in Homogeneous Crystal Growth*; MA Koppa, DH Dunlap, PR Schwoebel
- 650 *First-principles calculation of field evaporation and surface diffusion on BCC Fe (001)*; T Ohnuma
- 652 *Zooming in on field evaporation behavior: A Time Depending Density Functional Theory Study*; K Kaluskar, J Peralta, C Loyola, S Broderick, K Rajan
- 654 *Correlative TEM and Atom Probe Tomography – A Case Study on Structural Materials for Fusion Reactors*; S Kraemer, P Wells, C Oberdorfer, RG Odette
- 656 *A Methodology for investigation of Grain-Boundary Diffusion and Segregation*; Z Peng, T Meiners, Y Lu, B Gault, C Liebscher, D Raabe
- 658 *Tracking Structural Modifications from In-Situ Atom Probe Gas-Solid Reactions through Computational Homology*; S Broderick, T Zhang, K Rajan
- 660 *Visualizing and Quantifying Spinodal Decomposition in a Duplex Stainless Steel*; S Mburu, RP Kolli, DE Perea, J Liu, SC Schwarm, S Ankem
- 662 *Automated Crystallographic Identification of Atom Probe's Ion Desorption Map*; Y Chen, KP Rice, TJ Prosa, DA Reinhard, BP Geiser, MM Nowell, SI Wright
- 664 *An Open-Access Atom Probe Tomography Mass Spectrum Database*; DR Diercks, SS Gerstl, BP Gorman

Applications of Atom Probe Tomography

- 666 *Application of Atom Probe Tomography to Nitride Semiconductors*; RA Oliver, F Tang, S Bennett, TL Martin, PA Bagot, GD Smith, MP Moody
- 668 *Correlated Transmission Electron Microscopy and Atom Probe Tomography study of Boron distribution in BGeN*; B Bonef, R Cramer, F Wu, JS Speck
- 670 *Exploration of Doped Semiconductors at the Atomic Scale*; A Rodil, C Krammel, R Plantenga, S Koelling, P Koenraad

- 672 *Correlative transmission EBSD-APT analysis of grain boundaries in Cu(In,Ga)Se₂ and Cu₂ZnSnSe₄ based thin-film solar cells*; T Schwarz, G Stechmann, B Gault, O Cojocar-Mirédin, P-P Choi, A Redinger, S Siebentritt, D Raabe
- 674 *Nanoscale Chemical Imaging of Coking Mechanisms in a Zeolite ZSM-5 Crystal by Atom Probe Tomography*; JD Poplawsky, JE Schmidt, B Maxumder, W Guo, D Fu, O Attila, Winter, M de F Meirer
- 676 *Atom probe tomography of human tooth enamel and the accurate identification of magnesium and carbon in the mass spectrum.*; Fontaine, La A J Cairney
- 678 *Distinguishing Meteoritic Nanodiamonds from Amorphous Carbon Using Atom-probe Tomography*; JB Lewis, D Isheim, C Floss, D Seidman
- 680 *Atomic Elemental Tomography of Heavy Element Biomaterials*; X Wang, RM Schofield, MH Nesson, A Devaraj
- 682 *Metallic nanoshell for three-dimensional chemical mapping of low conductive materials with pulsed-voltage atom probe tomography*; V Adineh, R Marceau, J Fu
- 684 *Nanoscale Chemical Variations at Boundaries in a BaCe_{0.8}Y_{0.2}O_{3-δ} – Ce_{0.8}Y_{0.2}O_{3-δ} Dual Phase Hydrogen Separation Membrane*; G Burton, D Diercks, B Gorman
- 686 *3DAP/TEM Study of Precipitation Hardened Magnesium Alloys*; T Sasaju, T Ohkubo, K Hono
- 688 *Atom Probe Tomography and analytical Scanning Transmission Electron Microscopy of Rapid Solidification Microstructures in Al-Cu Alloy Thin Films*; JM Wieszorek, KW Zweiacker, C Liu, I Martin, T Prosa, DJ Larson
- 690 *On the Dose Rate Dependence of Cr Clustering in Ion-Irradiated Fe-18Cr Alloys*; E Anderson, R Odette, N Almirall, S Tumey, E Marquis
- 692 *Recent Progress of Correlative Transmission Electron Microscopy and Atom Probe Tomography for Materials Characterization*; W Guo
- 694 *In-process Precipitation During Laser Additive Manufacturing Investigated by Atom Probe Tomography*; P Kürnsteiner, MB Wilms, A Weisheit, P Barriobero-Vila, EA Jäggle, D Raabe
- 696 *Atom Probe Tomography Studies of the Initiation of Localized Corrosion in Aluminum Alloy 2024*; R Parvizi, RK Marceau, AE Hughes, P Cizek, AM Glenn, MY Tan, M Forsyth
- 698 *Degradation mechanism of molds for precision glass molding*; Z Peng, M Rohwerder, M Friedrichs, P-P Choi, B Gault, T Meiners, H Kreilkamp, F Klocke
- 700 *Atom Probe Characterization of Oxide Layers Formed on Polycrystalline Nickel Based Superalloys*; MT Lapington, DJ Crudden, RC Reed, MP Moody, PA Bagot
- 702 *Microstructures and Properties of As-Cast AlCrFeMnV, AlCrFeTiV, and AlCrMnTiV High Entropy Alloys*; KE Knipling, PU Narayana, LT Nguyen

- 704 *Linking Experimental Solute Segregation Specificity in Nanocrystalline Alloys to Computational Predictions*; X Zhou, GB Thompson
- 706 *Improved Atom Probe Methodology for Studying Carbon Redistribution in Low-Carbon High-Ms Lath Martensitic Steels*; L Morsdorf, B Gault, D Ponge, CC Tasan, D Raabe
- 708 *Nanoscale Investigation of Belgian Chocolate by Atom Probe Tomography*; C Barroo, AJ Akey, DC Bell
- 710 *Field Evaporation Characteristics in Hafnium Carbides*; F Vogel, S Ngai, C Smith, GB Thompson
- 712 *Improving Local Electrode Performance by Tesla Coil Electric Discharges*; D Isheim, A Akey, SS Gerstl
- 714 *Sensitivity Analysis of Laser Effect on Mg-Gd-Er Alloy*; R Hu, X Zheng, W Du, G Sha
- 716 *Atom probe tomography quantification of alloy fluctuations in (Al,In,Ga)N*; B Bonaf, M Laurent, S Keller, UK Mishra
- 718 *Identifying Nanometer-scale Clustering in InAlAsSb Random Alloys Using Atom Probe Tomography*; NA Kotulak, K Knipling, LC Hirst, S Tomasulo, J Abell, M Gonzalez, MK Yakes, JR Meyer
- 720 *Atom Probe Tomography of Reduced Phases in Apollo 16 Regolith Sample 61501,22*; P Gopon, M Spicuzza, TF Kelly, DA Reinhard, TJ Prosa, DJ Larson, J Fournelle
- 722 *An Atom Probe Tomography Study of Ni-Cr-Al-Ti High Temperature Oxidation*; TL Barth, EA Marquis
- 724 *The Supersaturation and Transient Volume Measurement for Nucleation, Growth, Coarsening in a Concentrated Ni-Based Superalloy*; S-I Baik
- 726 *Nanoscale Phase Separation in $Al_{0.5}CoCrFeNi(Cu)$ High Entropy Alloys as Studied by Atom Probe Tomography*; KE Knipling, JL Tharpe, PK Liaw
- 728 *Influence of Ni, Mo and Mn Content on the G-Phase Precipitation and Spinodal Decomposition of Aged Duplex Stainless Steels*; R Badyka, C Pareige, S SAILLET, C Domain
- 730 *Investigation of Novel Phase Transformation Mechanisms in Titanium Alloys Using Atom Probe and Aberration-Corrected Scanning Transmission Electron Microscope*; Y Zheng, T Alam, R Banerjee, HL Fraser

Nanomechanical Characterization of Materials using Microscopy and Microanalysis Techniques

- 732 *In-situ TEM Study of Mechanical Size Effects in TiC Strengthened Steels*; S Taniguchi, R Soler, C Kirchlechner, C Liebscher, A Taniyama, G Dehm
- 734 *In-situ Elastic Strain Mapping via EBSD of Micro-Sized Specimens*; MJ McLean, WA Osborn
- 736 *In situ Strain Mapping of Planar Slip in 304 Stainless Steel*; TC Pekin, C Gammer, J Ciston, C Ophus, AM Minor

- 738 *In situ TEM Fracture Testing for Shallow Ion Irradiated Layers*; JP Wharry, KH Yano
- 740 *Investigation of Grain Growth and Deformation in Nanocrystalline Metals Through In-situ TEM Mechanical Testing and Crystallographic Orientation Mapping*; CM Barr, DC Bufford, K Hattar
- 742 *Development of Quantitative In Situ TEM Nanomechanical Testing for Polymers*; NR Velez, FI Allen, MA Jones, GF Meyers, AM Minor
- 744 *Nanoindentation on Graphene Encapsulated Single Cells*; J Li, C Zheng, B Liu, Y Kim, J Li, W Yan, J Fu
- 746 *In situ Mechanical Testing of Contacts Between Nanoscale Bodies: Measuring the Load-dependence of Contact Area.*; SB Vishnubhotla, R Chen, SR Khanal, X Hu, A Martini, TD Jacobs
- 748 *Imaging the Structural Evolution in Nanocrystalline Metals During Mechanical Deformation*; C Kuebel, A Kobler, A Kashiwar, H Hahn
- 750 *Micro-Mechanical In Situ Measurements in Thin Film Systems Regarding the Determination of Residual Stress, Fracture Properties and Interface Toughness*; R Konetschnik, D Kozic, HP Gänser, D Kiener, R Brunner
- 752 *STEM Characterization of the Deformation Substructure of a NiCoCr Equiatomic Solid Solution Alloy*; J Miao, CE Slone, TM Smith, C Niu, H Bei, M Ghazisaeidi, GM Pharr, MJ Mills
- 754 *The Role of Bcc Mg/Nb Interfaces in Nanocomposite Deformation Observed via In-Situ Mechanical Testing in TEM*; Y Chen, N Li, S Yadav, X Liu, JK Baldwin, R Hoagland, J Wang, N Mara
- 756 *Microstructural and nanomechanical characterization of in-situ He implanted and irradiated fcc materials*; P Hosemann, D Kaoumi, C Zheng, D Frazer
- 758 *Effect of Build Orientation on the Mechanical Properties and Fracture Behavior of ABS Produced by Fused Deposition Modeling*; F Akasheh, A Rochester, H Aglan
- 760 *Characterization of Dislocations in Single-Crystalline Ag₃Sn Intermetallic Alloys*; H Yu, Y Sun, S-W Lee, PC Canfield, M Aindow
- 762 *In-situ Deformation of Various Micro/Nanoscaled Samples in the Transmission Electron Microscope: Experimental Results and Pitfalls*; R Sarkar, C Ebner, J Rajagopalan, C Rentenberger
- 764 *Coupling Quantitative Dislocation Analysis with In Situ Loading Techniques: New Insight into Deformation Mechanisms*; ML Taheri, G Vetterick, AC Leff, M Marshall, JK Baldwin, A Misra, K Hattar
- 766 *Characterization of Dislocation Plasticity in Rhenium using In-Situ TEM Deformation*; JE Sabisch, AM Minor
- 768 *In Situ TEM Investigation of the Deformation Mechanisms and Microstructural Changes in Ultrafine-grained Non-textured Aluminum Film Using Automated Crystal Orientation Mapping*; E Izadi, P Peralta, J Rajagopalan
- 770 *Understanding Heterogeneous Deformation in Polycrystalline Al 6061 by in situ SEM Deformation and HREBSD Characterization*; J Yoo, J Carroll, J Emery, J Kacher

- 772 *An Analysis of Nanoindentation in a NiCoAlFeMo High Entropy Alloy Produced by Sintering;* CD Gómez-Esparza, CA Rodríguez-González, I Estrada-Guel, R Martínez-Sánchez
- 774 *Effect of Ti and W Additions on the Microstructural Behavior of a Nanocrystalline CoCrFeMoNi High Entropy Alloy;* CD Gómez-Esparza, H Camacho-Montes, I Estrada-Guel, R Martínez-Sánchez, CA Rodríguez-González
- 776 *Mechanical Behavior on Microstructure of B₄C Particles Reinforced 2024 Aluminum Matrix Composite Obtained by Mechanical Milling;* C Carreño-Gallardo, I Estrada-Guel, M Herrera-Ramírez, R Martínez-Sánchez, C López-Meléndez
- 778 *Microstructure and superconductivity of Bi/Ni bilayers Prepared by Pulsed Laser Deposition;* L Liu, Y Xing, D Franceschini, G Solórzano
- 780 *Correlated EBSD and High Speed Nanoindentation Mapping;* E Hintsala, J Risan, R Dietrich, R Nay
- 782 *In Situ Study of High-Temperature Mechanical Properties of Carbon Nanotube Scaffolds;* S Bhowmick, CS Tiwary, S Asif, PM Ajayan
- 784 *TEM Study of Polycrystalline Co-Ni-Ga for Applications of Shape Memory Alloys;* M Sánchez-Carrillo, JP Flores-de-los-Ríos, HJ Morales-Rodríguez, J Ramos-Cano, A Santos-Beltrán, V Gallegos-Orozco
- 786 *Study of Nanostructured NiCrMo base alloy Applied via LVOF thermal Spray;* VG Gallegos-Orozco, A Santos-Beltran, M Santos, H Morales-Rodriguez, I Ronquillo-Ornelas, R Carbajal-Sanchez, C Modesto, V Orozco
- 788 *Microstructural Characterization of Inconel 718 for Aeronautical Use;* A Martinez, MT Santoyo, O Vazquez, JM Herrera
- 790 *Influence of Salt Fluxes on Recycled Al Nanocomposites Reinforced with TiO₂ Nanoparticles Produced in Liquid State;* A Santos-Beltran, V Gallegos-Orozco, H Morales-Rodriguez, M Sanchez-Carrillo, I Estrada-Guel, C Modesto-Acosta
- 792 *Improved Understanding of Material Behavior using Correlative In-situ Techniques;* MJ Cordill, J Kreith, M Winhold, M Leitner, CH Schwalb
- 794 *Comparative Study between Vickers and Knoop Micro-hardness of Ultra High Temperature Ceramics;* N Seetala, A Simpson, C Provo, L Matson, H Lee
- 796 *In Situ Study of Mechanical Testing and Fracture Process of Glassy Polystyrene Grafted Nanoparticle Assembly: Impact of Film Thickness and Strain Rate;* M-S Hsiao, Y Jiao, R Wheeler, J Lefebvre, S Bhowmick, RA Vaia, LF Drummy
- 798 *Technique for In-situ Meso-Scale Uniaxial Mechanical Testing in the SEM;* C Spellman, V Verma, A Arzoumanidis, Z Zanzinger
- 800 *Low-cost functionalized pseudoboehmite/aluminum substrates for the analysis of nanoparticles by SEM;* MM Martinez-Garcia, PE Cardoso-Avila, N Gomez-Ortiz, JL Pichardo-Molina

Pushing the Limits of Cryo-TEM: Development and Applications

- 802 *Detection of Isolated Metal Ions on Ferritin by Single-Particle Cryo-STEM Reconstruction*; N Elad, G Bellapadrona, L Houben, I Sagi, M Elbaum
- 804 *Dose-Efficient Cryo-STEM Imaging of Whole Cells Using the Electron Microscope Pixel Array Detector*; KA Spoth, KX Nguyen, DA Muller, LF Kourkoutis
- 806 *Cryo-STEM Tomography with Inpainting*; A Stevens, ND Browning
- 808 *Electron Beam Sources using InGaN Semiconductor Photocathodes for Single-shot Imaging Electron Microscope*; T Nishitani, A Narita, S-I Kitamura, T Tomita, T Meguro, H Iijima, S Fuchi, M Tabucchi
- 810 *New Strategies for Improving CryoEM Single Particle Analysis in EMAN2.2*; SJ Ludtke, T Durmaz, M Chen, JM Bell
- 812 *Towards High Resolution in Cryo-Electron Tomography Subtomogram Analysis*; S Pfeffer, M Khoshouei, R Danev, F Förster
- 814 *Going Deeper in Cryo Electron Tomography with Neural Networks*; M Chen, W Dai, SY Sun, MF Schmid, W Chiu, SJ Ludtke
- 816 *Phase Contrast Single Particle Analysis at Atomic Resolutions.*; M Khoshouei, R Danev, M Radjainia, W Baumeister
- 818 *Efficient Cryo-EM: Measuring Effects of Particle Orientation in Electron Microscopy*; K Naydenova, CJ Russo
- 820 *Streptavidin Monolayer-Crystal Affinity Grids: A Step Toward Controlling What Happens During Cryo-EM Sample Preparation*; RM Glaeser, B-G Han, JH Cate
- 822 *Ion Channel in Lipid Nanodisc by Single Particle Cryo-EM - Pushing the Technology Limit*; D Asarnow, E Palovcak, Y Gao, D Julius, Y Cheng
- 824 *Lessons Learned from using a Cs-Corrected, Energy-Filtered, Phase-Plate TEM for Single-Particle CryoEM*; A Cheng, E Eng, W Rice, L Kim, M Alink, CS Potter, B Carragher
- 826 *Development of High Resolution Transmission Electron Microscopes for Analysis of Biomolecular Structure*; S Motoki, T Kaneko, H Iijima, Y Shimizu, I Ishikawa, Y Ohkura
- 828 *Electrostatic Zach Phase Plates for Transmission Electron Microscopy: Status and Future Investigations*; M Obermair, S Hettler, M Dries, D Gerthsen
- 830 *Contamination and Charging of Amorphous Thin Films Suitable as Phase Plates for Phase-Contrast Transmission Electron Microscopy*; S Hettler, P Hermann, M Dries, M Obermair, D Gerthsen, M Malac
- 832 *Improving Detectors for Cryo-Electron Microscopy*; PE Mooney
- 834 *On-the-Fly Image Quality Evaluation for Single-Particle Analysis Cryo-Electron Microscopy*; L Yu, E Franken, A Voigt, F Grollios, P Tiemeijer, S Reyntjens

- 836 *Accurate Cryo-EM Characterizations of Polypeptoid Vesicles*; X Jiang, J Sun, RN Zuckermann, NP Balsara, KH Downing
- 838 *The Future of Direct Electron Detection in Cryo-TEM*; G Van Duinen, L Yu, E Franken, M Kuijper, H Roeven, B Janssen
- 840 *Relating Sampling Anisotropy to Resolution Anisotropy in Cryo-EM Maps*; PR Baldwin, YZ Tan, ET Eng, CS Potter, B Carragher
- 842 *Hole-Free Phase Plate Energy Filtering Imaging of Graphene: Toward Quantitative Hole-Free Phase Plate Imaging in a TEM*; M Malac, E Kano, M Hayashida, M Kawasaki, S Motoki, RF Egerton, I Ishikawa, Y Okura
- 844 *Cryo-FIB Lift-out Sample Preparation Using a Novel Cryo-gripper Tool*; AJ Smith, T Laugks, S Kleindiek, S Albert, MP Johnson, WH Wood, BD Engel, W Baumeister
- 846 *Design of a High Capacity Puck Storage System for Cryo-EM grids in a Facility Setting*; A Estevez, C Arthur, A Rohou, C Ciferri
- 848 *Self-Blotting Nanowire Grids for Cryo-EM Sample Preparation*; H Wei, Z Zhang, V Dandey, A Raczkowski, B Carragher, CS Potter
- 850 *Studying the effects of interfacial coupling in $La_{0.5}Sr_{0.5}CoO_{3-\delta}$ thin films on $SrTiO_3$ using in-situ cooling experiments*; X Rui, J Walter, C Leighton, RF Klie
- 852 *Distinguish Coexistence of Nanoemulsion and Liposome in Propofol by Cryogenic Transmission Electron Microscopy (cryo-TEM)*; Y Wu, P Petrochenko, JH Myung, S Manna, B Koo, S Choi, D Kozak, J Zheng

In situ and operando Characterization of Material Processes in Liquids and Gases

- 854 *Control of Radiation Chemistry during Liquid Cell TEM to Synthesize Transition Metal and Bimetallic Nanoparticles*; TJ Woehl
- 856 *Time lapse liquid phase scanning transmission electron microscopy of nanoparticles*; Jonge, de N A Verch, J Hermansdörfer, Jong, KP de J Zečević
- 858 *Probing Dynamic Phase Transformations of Hydrated Iron Oxide Nanoparticles with in situ Scanning Transmission Electron Microscopy*; R Hufschmid, KM Krishnan, ND Browning
- 860 *Capturing Dynamics in Liquids with High-Speed CMOS Cameras – Opportunities and Challenges*; SW Chee, A Datta, U Anand, D Loh, U Mirsaidov
- 862 *Stroboscopic High-Duty-Cycle GHz Time-Resolved Microscope: Toward Hardware Implementation and Commissioning*; J Qiu, SS Baturin, Y Li, C Jing, A Kanareykin, SV Baryshev, BW Reed, D Masiel
- 864 *Electron Beam Effects on Liquid Specimens in (S)TEM*; N Jiang
- 866 *Dynamic Nanobubbles in Graphene Liquid Cell under Electron Beam Irradiation*; L Wang, L Liu, A Moshin, H Sheng, J Wen, D Miller

- 868 *Stability of Silicon Dioxide in Liquid Phase TEM*; MJ Meijerink, Jong, KP De J Zečević
- 870 *Ionic liquid by Hitachi enables in-situ imaging of potable water in IV-HRTEM*; M Gajdardziska-Josifovska, DP Robertson, JP Kilcrease
- 872 *Using STEM to Probe the in-situ Dynamics of Multimetallic Nanoparticles Grown in Polymer Nanoreactors*; JS Du, P-C Chen, VP Dravid, CA Mirkin
- 874 *Understanding Reaction Mechanisms in Electrochemistry and Corrosion: Liquid-Cell S/TEM*; K Jungjohann, S Goriparti, C Chisholm, B Mook, K Harrison, A Leenheer, K Zavadil
- 876 *Investigating Local Corrosion Processes in Real and Diffraction Space by in situ TEM Liquid Cell Experiments*; J Key, S Zhu, CM Rouleau, RR Unocic, Y Xie, J Kacher
- 878 *Driving Liquid Chemistry with in situ STEM in Monolayer Window Encapsulated Liquid Cells*; JR Jokisaari, A Mukherjee, X Hu, R Klie
- 880 *SEM and Auger Electron Spectroscopy of Liquid Water through Graphene Membrane*; H Guo, A Yulaev, E Strelcov, A Kolmakov
- 882 *In Situ Imaging and Spectroscopy of Particles in Liquid*; X-Y Yu, B Arey
- 884 *Visualization of Electrochemical Reaction Dynamics in Liquids Using TEM*; W Zheng, Z Zeng, H Zheng
- 886 *Multi-Modal Characterization of New Battery Technologies by Operando ec-STEM*; BL Mehdi, J Chen, A Stevens, C Park, L Kovarik, AV Liyu, W Henderson, J-G Zhang
- 888 *Using Scanning Transmission X-ray Microscopy to Reveal the Origin of Lithium Compositional Spatiodynamics in Battery Materials*; J Lim, Y Li, DH Alsem, H So, SC Lee, P Bai, DA Cogswell, X Liu
- 890 *Visualization of peptide-peptide interactions in FET biosensors with liquid-cell TEM*; L Xing, M-S Hsiao, A Islam, N Bedford, R Martineau, Y Ngo, S Kim, L Drummy
- 892 *Operando and multimodal studies of speciation and activity of Pt catalysts during the hydrogenation of ethylene*; E Stach, S Zhou, Y Li, D Liu, Y-M Liu, J Liu, D Zakharov, Q Wu
- 894 *In-situ Characterization of Catalytic Reactions Promoted by Localized Surface Plasmon Resonance Energy*; C Wang, W-CD Yang, D Sil, A Agrawal, R Sharma
- 896 *In situ TEM Observation of MultiLayer Graphene Formation from CO on Cobalt Nanoparticles at Atmospheric Pressure*; PJ Kooyman, GM Bremmer, E Zacharaki, AO Sjästad, V Navarro, JW Frenken
- 898 *Atomic scale environmental transmission electron microscopy study of the surface mobility of ceria nanocubes*; M Bugnet, SH Overbury, Z Wu, FC Aires, T Epicier
- 900 *Room Temperature CO Dissociation on Selective Edges of Gold Nanoparticles*; W-CD Yang, C Wang, R Sharma
- 902 *Spatio-temporally resolved in situ transmission electron microscopy of the dynamics of nanostructured materials*; TW Hansen, P Liu, J Madsen, P Schlexer, B Sebök, J Schiøtz, JB Wagner

- 904 *Visualizing Redox Chemistry in Oxide Surfaces at Atomic-Resolution*; M Ek, QM Ramasse, L Arnarson, PG Moses, C Kisielowski, JR Jinschek, S Helveg
- 906 *Surface Dynamics Associated with Redox Processes on TiO₂ Nanoparticles*; Q Liu, S Chang, P Crozier
- 908 *Model “Alloy” Specimens for MEMS-Based Closed-Cell Gas-Reactions*; LF Allard, III, HM Meyer DK Hensley, WC Bigelow, KA Unocic
- 910 *In Situ Field Emission of Carbon Nanotubes in Oxygen Using Environmental TEM and the Influence of the Imaging Electron Beam*; AL Koh, E Gidcumb, O Zhou, R Sinclair
- 912 *In-situ Observation of Shape Transformation and Surface Oxidation of Pd Nanocrystals*; A Yoon, P-H Lu, Z-W Shan, J-M Zuo
- 914 *In situ Imaging and Spectroscopy of the Carbon Deposition Mechanism on Ni/CeO₂ Solid Oxide Fuel Cell Anode Catalyst*; EL Lawrence, PA Crozier
- 916 *The Effect of Gas on Image Quality and Resolution in In situ Scanning Transmission Electron Microscopy*; Y Zhu, ND Browning
- 918 *Evaluation of Environmental Imaging for 200kV Field Emission Cs-corrected Analytical Scanning and Transmission Electron Microscope for Multi-User Facilities*; H Inada, T Yotsuji, H Muto, H Matsumoto, M Konno
- 920 *Constructing a Predictive Model of Copper Oxidation from Experiment and Theory*; CM Andolina, MT Curnan, Q Zhu, WA Saidi, JC Yang
- 922 *Multi-scale red-ox dynamics of active metal catalysts revealed by a combination of in situ scanning and transmission electron microscopy*; R Farra, J Cao, A Rinaldi, E Willinger, X Huang, M Greiner, R Schloegl, MG Willinger
- 924 *In situ S/TEM Observation of Hydrogen Bubbles Formation and Evolution in Aluminium Nanoparticles*; Y Liu, T Zhu
- 926 *Atomic-scale Investigation on the Structure Evolution of the MnCr₂O₄ Nano-octahedron in a Stainless Steel in Corrosion Environment by in situ ex-environment TEM Observations*; Y Zhou, B Zhang, S Zheng, X Ma
- 928 *New approaches to in-situ heating in FIB/SEM systems*; L Novák, M Wu, P Wandrol, M Kolíbal, T Vystavěl
- 930 *Modified Transport-of-Intensity Approach for Mapping In-situ Magnetic Induction*; C Phatak, V Brajuskovic, F Barrows, A Petford-Long
- 932 *In situ Analytical Microscopy of Asphaltene Aggregation and Growth*; NJ Zaluzec, A Janssen, MA Kulzick, MG Burke
- 934 *Study of Alkali Halide Solid Solutions by Scanning Electron Microscopy and X-ray Diffraction*; R Rodriguez-Mijangos, O Hernández-Negrete, RC Carrillo-Torres, FJ Carrillo-Pesqueira, ME Alvarez-Ramos, J Hernández-Paredes
- 936 *In Situ TEM Observation of Water Splitting*; JA Rodriguez Manzo, NJ Salmon, DH Alsem

- 938 *Electrochemical Measurements during In Situ Liquid-Electrochemical TEM Experiments*; E Fahrenkrug, DH Alsem, NJ Salmon, S Maldonado
- 940 *Water Vapor in Closed-Cell In Situ Gas Reactions: Initial Experiments*; KA Unocic, AK Datye, WC Bigelow, LF Allard
- 942 *Manipulation and Immobilization of Nanostructures for In-situ STEM*; AW Robertson, BL Mehdi, L Kovarik, ND Browning
- 944 *In situ S/TEM Reduction Reaction of Calcined Cu/BEA-zeolite Catalyst*; KA Unocic, DA Ruddy, TR Krause, S Habas
- 946 *The Effects of Impurities on Crystal Growth Rate in an Isothermal Continuous-Flow Reactor using a Photomicroscopic Method*; L-D Shiau
- 948 *In-situ observation of Rh-CaTiO₃ catalysts during reduction and oxidation treatments by transmission electron microscopy*; S Dai, S Zhang, M Katz, G Graham, X Pan
- 950 *Temperature Measurement in a TEM using Electron Diffraction of Amorphous Films*; M Hayashida, K Cui, M Malac
- 952 *Formation of Swiss-cheese-like Nanostructure of α -Fe₂O₃ by Reduction*; W Zhu, J Winterstein, R Sharma, G Zhou
- 954 *In situ Study of Dynamics of CuAu Alloy Nanoparticles on Oxide Supports*; W Gao, M Colombo, S Dai, S Zhang, G Graham, X Pan
- 956 *In-situ TEM Study on Size-dependent Thermal Stability of Nickel Filled Silica Nano-Opals*; P Moradifar, Y Liu, J Russell, T Mallouk, J Badding, N Alem
- 958 *Addressing In-Situ Challenges Using Integrated Hardware and Software*; BK Miller, S Mick
- 960 *Atomic-scale Relaxation Dynamics in the Supercooled Liquid State of a Metallic Glass Nanowire by Electron Correlation Microscopy*; P Zhang, Z Liu, J Schroers, PM Voyles
- 962 *Three dimensional analyses of degradation in PEMFCs*; T Daio, I Narita, K Suganuma
- 964 *The Stability of Sapphire in the Presence of Water: an Environmental TEM Study*; J Carpena-Núñez, D Zakharov, AE Islam, G Sargent, EA Stach, B Maruyama
- 966 *Atomic-Resolution Characterization of Surface Structures and Metal-Support Interfaces on Nanostructured Pt/CeO₂ Catalysts Performing CO Oxidation*; J Vincent, PA Crozier
- 968 *Understanding Redox Effects on Supported Bimetallic Particles*; CE Klierer

Biological Soft X-ray Tomography

- 970 *The National Center for X-ray Tomography: Status Update*; G McDermott, R Boudreau, J-H Chen, A Ekman, Gros, MA Le TE Plautz, CA Larabell

- 972 *Cryo Soft X-ray Tomography and Other Techniques at Diamond Light Source*; MC Darrow, M Harkiolaki, MC Spink, I Luengo, M Basham, EM Duke
- 974 *Correlation of Soft X-ray Tomography with Fluorescence Microscopy in Biological study*; L-J Lai, Z-J Lin, C-C Hsieh, Y-J Su, D-J Wang, S-Y Chiang, G-C Yin
- 976 *The dual-Axes for Soft X-Ray cryo-tomography reveals ultrastructural alterations of the host cell during Hepatitis C infection by increasing the isotropic axial resolution*; AJ Perez-Berna, R Valcarcel, A Sorrentino, MJ Rodriguez, FJ Chichon, JL Carrascosa, P Gastaminza, E Pereiro
- 978 *PSF Corrected Reconstruction in Soft X-ray Tomography (SXT)*; AA Ekman, TE Plautz, J-H Chen, G McDermott, MA LeGros, C Larabell
- 980 *High resolution soft X-ray tomography of large samples by focal series projections*; J Otón, E Pereiro, JJ Conesa, FJ Chichón, JL Carrascosa, JM Carazo
- 982 *Development of a Commercial Laboratory Scale Soft X-ray Microscope*; T McEnroe, F O'Reilly, P Sheridan, J Howard, R Byrne, A O'Connor, D Rogers, C Rogers
- 984 *Progress Toward Automatic Segmentation of Soft X-ray Tomograms Using Convolutional Neural Networks*; TE Plautz, R Boudreau, J-H Chen, AA Ekman, MA LeGros, G McDermott, CA Larabell
- 986 *Soft X-Ray Tomography: Filling the Gap Between Light and Electrons for Imaging Hydrated Biological Cells*; LM Collinson, M-C Domart, R Carzaniga, M Razi, P Guttman, G Schneider, E Pereiro, S Tooze
- 988 *Chromatin Reorganization during Viral Infection*; V Aho, M Myllys, CA Larabell, M Vihinen-Ranta
- 990 *Multimodal imaging and soft x-ray nanotomography to optimize algal-based lipid feedstocks*; C Smallwood, W Chrisler, J-H Chen, E Patello, R Boudreau, Gros, M Le JE Evans
- 992 *Near-Edge Absorption Soft X-ray Nanotomography of Cells Incubated with Nanoparticles*; JJ Conesa, J Oton, E Pereiro, FJ Chichon, JL Carrascosa
- 994 *Sorting Out the JUNQ: the Spatial Nature of Protein Quality Control*; EM Sontag, J-H Chen, G McDermott, D Gestaut, C Larabell, J Frydman
- 996 *Quantitative 3D analysis of structural organization of normal and tumor cells*; CA Larabell, Gros, MA Le

Anniversary Session: Celebrating 50 Years of Microanalysis

- 998 *Historical and Current Importance of Electron Probe Microanalysis in Space Sciences, A Retro- and Forward-looking Perspective*; BL Jolliff, PK Carpenter
- 1000 *Seven Decades of Trans-Atlantic Cooperation in the Development of EPMA*; J Fournelle
- 1002 *There and Back Again: An Unfinished Tale - XEDS in the AEM*; NJ Zaluzec

- 1004 *Focused Ion Beams for Imaging, Analysis, and Fabrication – Where Did They Come From and Where are They Going?*; JA Notte
- 1006 *Micro X-ray Fluorescence: A personal perspective of 30 years*; GJ Havrilla
- 1008 *Determination of Major, Minor, and Trace Elements in Jadeite using Scanning micro-X-ray Fluorescence*; EP Vicenzi, T Lam
- 1010 *Five Dimensional X-ray Imaging with the Color X-ray Camera*; J Davis, J Schmidt, M Huth, R Hartmann, H Soltau, L Strüder
- 1012 *Considerations for the Acquisition of Very Large Area EDS Spectral Image Mosaics*; SM Seddio, PK Carpenter
- 1014 *Progress in X-ray Mapping in Electron Microscopes toward Single-Atom Analysis*; M Watanabe
- 1016 *Historical Development of the CAMECA EPMA*; C Henderson, A-S Robbes, MP Moret, D Larson, K Baxter
- 1018 *History of JEOL Microbeam Analysis: High Accuracy Analyses for Scientific and Industrial Work from the Centimeter to Nanometer Scale*; H Takahashi, H Yamada, S Notoya, M Takakura, T Murano, V Robertson, P McSwiggen
- 1020 *EDAX – More Than 50 Years of Influence On Microanalysis*; PP Camus, T Nylese
- 1022 *50 Years of Microanalysis: A Little History of Who's Who, A Perspective from Bruker*; T Juzwak
- 1024 *The Magic That Turns A Tiny Cloud Of Electrons Into An X-Ray Spectrum*; RB Mott
- 1026 *SEM/EDS Trace Analysis: Limits Imposed by Fluorescence of the Detector*; DE Newbury, NW Ritchie, M Mengason, K Scott
- 1028 *Advances in atomic-resolution and molecular-detection EELS*; OL Krivanek, N Dellby, TC Lovejoy, RF Egerton, P Rez
- 1030 *Quantitative Aspects of 3D Chemical Tomography in the Scanning Transmission Electron Microscope*; AA Herzing
- 1032 *The Many Connections Between Atom Probe and Electron Microscopy*; TF Kelly
- 1034 *Advances in (and a brief history of) cathodoluminescence microscopy*; DJ Stowe, M Bertilson, JA Hunt
- 1036 *Optimisation of Soft X-Ray Spectroscopy at Room and Liquid Nitrogen Temperatures*; CM MacRae, NC Wilson, A Torpy
- 1038 *Integration of Quantitative Compositional Mapping and Image Processing Routines: A Powerful Approach to Petrologic Investigations*; TM Hahn, PK Carpenter, BL Jolliff
- 1040 *Analysis of Multi-Signal Hyperspectral Datasets Collected by EPMA*; NC Wilson, CM MacRae, A Torpy
- 1042 *Materials Analysis Using Secondary Ion Mass Spectrometry: Challenges and Opportunities*; AV Walker

- 1044 *High Spatial Resolution Spectroscopy in a FE-SEM: X-ray Microanalysis and Electron Energy-Loss Spectroscopy*; H Demers, N Brodusch, R Gauvin
- 1046 *The f-ratio Quantification Method for X-ray Microanalysis with a Field Emission SEM Applied to Multi-Elements Specimen*; C Teng, H Demers, N Brodusch, R Gauvin
- 1048 *Incorporation of an Amptek Silicon Drift Detector into a Wavelength Dispersive Spectrometer (WDS) Replacing the Gas Flow Proportional Counter*; R Wuhrer, K Moran
- 1050 *Characterizing the Effectiveness of Atomic Layer Deposited Coatings for the Prevention of Glass Disease*; ME Hiebert, RJ Phaneuf, E Vicenzi
- 1052 *Testing a New Electron Microprobe and Developing New Analytical Protocols*; JM Allaz
- 1054 *Characterization of Complex Industrial Specimens by Hyperspectral EPMA Mapping*; A Torpy, NC Wilson, CM MacRae
- 1056 *EPMA and Quantitative EDS of Rare Earth Elements in Geochronological Reference Materials*; HA Lowers, NW Ritchie, DT Adams
- 1058 *Quantitative Electron Probe Microanalysis Of Fe At Low Accelerating Voltage Using the L α and L β X-ray Lines*; AG Moy, JH Fournelle
- 1060 *Carbon Bonding Determination with XES using a TES Microcalorimeter Detector*; GJ Havrilla, K McIntosh, M Croce, M Rabin, F Vila, R Huber, D Podlesak, M Carpenter
- 1062 *Advantage of Specimen Heating in FE-EPMA for Performing Quantitative Trace Carbon Analysis in Steel Materials*; Y Tanaka, T Yamashita, M Nagoshi
- 1064 *A New Detection Metric for EDS Detectors*; PP Camus
- 1066 *Very Large Area Phase Mapping of a Petrographic Thick Section using Multivariate Statistical Analysis of EDS Spectral Images.*; SM Seddio, PK Carpenter
- 1068 *New Developments in Compositional Stage Mapping by EPMA and micro-XRF*; P Carpenter, T Hahn
- 1070 *Implementing High Performance Workstation Virtualization for Data Processing in a Multi-User Microscopy Facility.*; DE Huber, JM Sosa, J Riedel, CD Ellerbrock, DM McComb
- 1072 *EPMA Characterisation of Quartz and Quartz-Cement from a Triassic Sandstone*; CM MacRae, A Torpy, C Delle Piane, NC Wilson
- 1074 *Phenom Desktop SEM for Gunshot Residue and Cathodoluminescence Imaging and Analysis*; K Mason, R Wuhrer
- 1076 *Characterisation of Acid Resistant Concrete Exposed to Sulphuric Acid Using SEM, EDS and X-Ray Mapping*; S Salek, R Wuhrer, G Adam, B Samali
- 1078 *Composition and Crystal Orientation Mapping of nano-scale multi-phase Rapid Solidification Microstructures in hypo-eutectic Al-Cu Alloy Thin Films*; JM Wiezorek, C Liu, S Farjami, KW Zweiacker, JT McKeown, GH Campbell

- 1080 *How to Set Up Your STEM for EELS at Very High Energy Losses*; I MacLaren, AJ Craven, C Black, S McFadzean, H Sawada
- 1082 *Portable Electron Microscopy and Microanalysis in Extreme Environments*; CS Own, MF Murfitt, LS Own, J Cushing, J Martinez, K Thomas-Keprta, DR Pettit
- 1084 *Near Shadowless EDS Tomography for Sliced Sample Realized by X-ray Collection with One Large Sized SDD Detector*; Y Aoyama, I Ohnishi, E Okunishi, N Endo, T Sasaki, Y Iwasawa, Y Kondo
- 1086 *Understanding EDXS Analysis of Nanostructures in TEM*; H Li, P Banerjee, K Flores
- 1088 *Elemental Analyses of Heat Resistant Steels by High-Energy Resolution EDS Analyzer Based on Superconducting-Tunnel-Junction Array*; G Fujii, M Ukibe, S Shiki, M Ohkubo
- 1090 *The “Great VPSEM Gotcha”: Great VPSEM Imaging Does Not Imply Great VPSEM X-ray Microanalysis! Degraded Spatial Resolution Is Always Imposed by Gas Scattering*; DE Newbury, NW Ritchie
- 1092 *Standardization of the MSA/MAS/AMAS Hyper-Dimensional File Format*; A Torpy, M Kundmann, NC Wilson, CM MacRae, NJ Zaluzec
- 1094 *EDS-Based Phase Analysis of Alkali Activated Slag*; NA Alharbi, RK Hailstone, B Varela
- 1096 *SEM study of Corrosion Deposits of Ni-Mn-Ga Fe Doped Shape Memory Alloys*; M Sánchez-Carrillo, HJ Morales-Rodríguez, JP Flores-de-los-Ríos, E Huape-Padilla, A Santos-Beltrán, V Gallegos-Orozco
- 1098 *Analytical Spatial Resolution in EPMA: What is it and How can it be Estimated?;* AG Moy, JH Fournelle

Biological Science Symposia

Gina Sosinsky Memorial Symposium: Imaging of Cellular Communications

- 1100 *Gina Sosinsky - Excellence in Science, Scholarship, and Humanity*; E Bullitt, T Ruiz
- 1102 *Unraveling the molecular details of the cell-ECM interface: 3D structures of membrane-embedded Integrin complexes*; X-P Xu, KL Anderson, MF Swift, N Volkmann, D Hanein
- 1104 *Structure of the *C. elegans* innexin-6 Gap Junction Channel*; A Oshima, K Tani, Y Fujiyoshi
- 1106 *Single molecule and single cell analysis of HER2 receptors in breast cancer cells using liquid phase scanning transmission electron microscopy*; Jonge, de N DB Peckys, S Wiemann
- 1108 *Probing the Molecular Basis for the Lateral Flexibility of Tight Junction Strands*; ES Krystofiak, J Zhao, Morcillo, A Ballesteros, CM Van Itallie, R Cui, JM Anderson, C Fenollar Ferrer, B Kachar
- 1110 *STORM and TEM Identify the Cardiac Ephapse: An Intercalated Disk Nanodomain with Previously Unanticipated Functions in Cardiac Conduction*; R Veeraraghavan, GS Hoeker, AA Laviada, X Wan, I Deschenes, J Smyth, J Gorelik, R Gourdie

- 1112 *Galactose Induces Formation of Chains of the Retinal Adhesion Protein, Retinoschisin*; B Heymann, C Vijayarathy, R Huang, A Dearborn, PA Sieving, AC Steven
- 1114 *Cryo-Fixed Stained Microtubules Can Be Imaged With High Electron Doses For Accessing the Full Resolving Power Of an Electron Microscope*; A Fera, L(Dye
- 1116 *Human Vision, Cosmic Forces and the 21st Century Scientist*; MA Goldstein
- 1118 *The Alignment and Classification of 3D Reconstructions of Rod-Like Molecules Obtained by Electron Tomography*; CJ Brooks, T Ruiz, M Radermacher

Microstructure Characterization of Food Systems

- 1120 *Applications of X-ray Micro Computed Tomography Technology in Food Research*; AD Lape, Jeor, V St. J Johnson, P Smith
- 1122 *Food Structure, Its Formation and Breakdown*; PJ Lillford
- 1124 *Understanding The Effect of Processing on The Structure of Plant Cell Walls as a Mean to Design Novel Clean Label Ingredients*; J Dong, K Moelants, T Lipkie, A Steinbach, J Mazoyer
- 1126 *The Effect of Bran Reduction on Protein Secondary Structure in Intermediate Wheatgrass (*Thinopyrum intermedium*) Dough*; C Gajadeera, A Marti, BP Ismail
- 1128 *Understanding pH-Induced Softening of Feta Cheese During Storage at the Ultrastructural Level – A Structure-Function Case Study*; AH Vollmer, NN Youssef, JA Powell, X Qi, DJ McMahon
- 1130 *Bimodal force spectroscopy as a technique to determine the Young's moduli of protein fibrils and nanoparticles*; OG Jones
- 1132 *Raman Microspectroscopy and Its Role in Solving Today's Food Industry Challenges*; S Zbylut
- 1134 *What went wrong? Forensics & food microstructural characterization*; Jeor, St. VL
- 1136 *Imaging and Characterization of Metallic Antioxidants in Plant Based Food Using Energy Dispersive Spectroscopy*; TL Nylese
- 1138 *Biochar from Alpaca Manure, The Basics*; DR Sutton, OM Vierrether, KE Anderson, CA Wisner

Imaging the Biology of Cells and Tissues: Just Do It Right

- 1140 *Characterizing an Ionic Liquid as a Biological Fixative in Fluorescence Microscopy*; LA Trinh, F Cutrale, SE Fraser, JP Kilcrease, E Rosa-Molinar
- 1142 *Label-free Imaging of Stem Cell Adhesion and Dynamic Tracking of Boundary Evolution Using Photonic Crystal Enhanced Microscopy (PCEM)*; Y Zhuo, JS Choi, T Marin, H Yu, BA Harley, BT Cunningham
- 1144 *High-Speed / Long-Time, High-Resolution / Large-Fields in vivo imaging by 4K / 8K CMOS sensors Without Trade-Off Factors*; S Nishimura

- 1146 *Gold Nanoparticle Technology to Address Variability in EM Labeling*; RD Powell, VN Joshi, FR Furuya, W Liu, JW Dubendorff, JF Hainfeld, E Rosa-Molinar
- 1148 *FRIL is for the Tenacious: Maintaining Rigor and Reproducibility*; JE Rash, T Yasumura, KG Vanderpool, N Martinez-Rivera, E Rosa-Molinar, JI Nagy
- 1150 *Comparison of 3-D Cellular Imaging Techniques using Scanned Electron Probes*; RD Leapman, EL McBride, A Rao, G Zhang, Q He, MD Guay, ID Pokrovskaya, B Storrie
- 1152 *Biofilm Structure of Geobacter sulfurreducens by Helium Ion Microscopy*; A Belianinov, MC Halsted, MJ Burch, K Songkil, ST Retterer
- 1154 *Statistical design of experiments to ensure “rigor and reproducibility” in imaging sciences.*; VN Joshi, RD Powell, E Rosa-Molinar
- 1156 *Nanoscale Observation of Intact Biological Specimens in Water with High-contrast Imaging by Scanning Electron Assisted Dielectric-impedance Microscopy*; T Ogura, T Okada
- 1158 *Morphological and Production Changes in Planktonic and Biofilm Cells Monitored Using SEM and Raman Spectroscopy*; K Hrubanova, V Krzyzanek, O Samek, R Skoupy, M Šiler, J Ježek, S Obruča, P Zemanek
- 1160 *Large-Area Ultrastructural Analysis on Alteration of Synaptic Vesicles in the 835MHz Radiofrequency-exposed Cerebral Cortex of Mice Brain Using Limitless Panorama and 3D Electron Tomography*; H-J Kim, JH Kim, D-H Yu, AR Je, S Choi, H-S Kweon, HR Kim, YH Huh
- 1162 *Advantages of Using a Variable Pressure Serial Block Face Scanning Electron Microscope for 3D Volume Analyses.*; CS López, C Bouchet-Marquis, M Williams
- 1164 *Developing a Training Module in Rigor and Reproducibility in Imaging Sciences*; AM Medina-Lopez, H Shinogle-Decker, N Martinez-Rivera, E Rosa-Molinar

3D and Intravital Imaging in Development and Beyond

- 1166 *Smart Microscopy for Multi-Scale Developmental Biology in Real-Time*; J Huiskens
- 1168 *Multi-scale time-lapse intravital imaging of soft tissues to map single cell behavior*; JM Pastoriza, Y Wang, MS Sosa, J Aguirre-Ghiso, JS Condeelis, MH Oktay, D Entenberg
- 1170 *Combining Novel Probes and High Resolution Imaging to Dissect Mitochondrial Function in Living Systems*; KA Pena, M Larsen, M Calderon, M Tsang, SC Watkins, MP Bruchez, Croix, CM St
- 1172 *Advanced 3D and live imaging reveals phenotypic consequences of disruptions in mechanical and genetic mechanisms underlying embryonic cardiovascular development.*; ME Dickinson
- 1174 *Conotruncal Heart Defects: Altered Tissue Morphology and Hemodynamics*; RS Jones, L Junor, MR Hutson, ML Kirby, RL Goodwin
- 1176 *Imaging Live Uterine Tissue Modulation Using Confocal Microscopy*; SMB Obayomi, S Peck, DP Baluch

- 1178 *Some novel uses for three-dimensional data from SPM and stereo SEM*; PB Fraundorf, D Osborn, M Lipp
- 1180 *New Approaches for high lateral resolution Array Tomography analysis*; Y Yamaguchi, M Maeda, Y Kataoka, Y Moriya, C Nakayama, T Haruta, M Suga, N Erdman
- 1182 *4D Quantitative Image Analysis of Cancer Cell Invasion in a Brain Microenvironment Using ImageJ Software*; J Gamble, R Tanguay, JA Greenwood

Pharmaceuticals and Medical Science

- 1184 *Revealing the Iron Oxides Mineral Core in Ferritin due to the Variations in the H and L Subunits*; S Narayanan, E Firlar, S Shafiee, K He, R Shahbazian-Yassar, T Shokuhfar
- 1186 *Structure of the insulin receptor in complex with insulin using single particle cryoEM analysis*; G Scapin, V Dandey, Z Zhang, W Prosis
- 1188 *Visualizing the Protein Corona: A qualitative and quantitative approach towards the nano-bio-interface*; I Lieberwirth
- 1190 *Conformational Changes in HIV-1 Env Trimer Induced by a Single CD4 as Revealed by Cryo-EM*; P Acharya, Q Liu, X Ma, M Lu, VP Dandey, ET Eng, WJ Rice, C Wigge
- 1192 *The Microstructure of Pharmaceutical Materials Revealed by Scanning Electron Diffraction*; DN Johnstone, PA Midgley
- 1194 *Multi-linear Regression Model to Predict the Electron Stability of Poorly Soluble Active Pharmaceutical Ingredients*; M S'ari, A Brown, N Hondow, R Brydson, H Blade, L Hughes, S Cosgrove
- 1196 *Real-time Imaging of Protein Therapeutics Using Liquid Cell EM*; LM DiMemmo, AC Varano, J Haulenbeek, MJ Dukes, SP Piccoli, DF Kelly
- 1198 *Obtaining 3 Å Resolution Structures of Biomedical Targets at 200 keV*; MA Herzik, M Wu, ME Matyskiela, PP Chamberlain, GC Lander
- 1200 *Digital Radiography/Computed Tomography of Medical Devices*; JM Troedel
- 1202 *4D Laboratory X-ray microscopy for the in-situ investigation of drug release in a push-pull osmotic pump tablet*; H Bale, W Harris, A Merkle
- 1204 *Solving Contaminant and Unexpected Material Problems in Drugs and Medical Devices Using Microscopy Methods – An Overview*; DL Joslin
- 1206 *Determining the Number of Components for Multivariate Curve Resolution: Case Study Using Raman Mapping of Pharmaceutical Tablets*; C Fauteux-Lefebvre, Lavoie, F B. M-J Colbert, J-M Guay, R Gosselin
- 1208 *Electron Microscopy and Spectroscopy of Citrate Induced Calcium Oxalate Crystal Structure and Hydration State Changes, and Implications for Kidney Stones*; DJ Banner, E Firlar, JK Finlay, R Shahbazian-Yassar, T Shokuhfar

- 1210 *Rotavirus Double and Triple Layered Viral Particles: Correlative Characterization Using Electron Microscopy, Disc centrifuge and Capillary Electrophoresis.*; A Miseur, P Blain, A Coppens, C Chapelle, C Hens, G Delpierre, M Deschuyteneer
- 1212 *Methylene Blue Loaded PLGA Nanoparticles: Combined Emulsion, Drug Release Analysis and Photodynamic Activity*; C Gutierrez-Valenzuela, R Rodríguez-Córdova, Y Hernández-Giottonini, P Guerrero-Germán, A Lucero-Acuña
- 1214 *Alginate Microcapsule Technology and Impacts on Cell Therapy Development*; M Belhaj, V Menon, B Rohrer, J Potts
- 1216 *Cryogenic Transmission Electron Microscopy (Cryo-TEM) Reveals Morphological Changes of Liposomal Doxorubicin during In Vitro Release*; Y Wu, P Petrochenko, FC Szoka, S Manna, B Koo, N Zheng, W Jiang, J Zheng
- 1218 *Quantification and Identification of Visible and Subvisible Particulates from Elastomeric Components Contributing to the Total Particle Count of Pharmaceutical Products*; E McPherson, C Bingham, D Carter, W Toomey, M Scofield, R Pulvirenti

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

- 1220 *3D reconstruction of Zucchini- and Tobacco Yellow Mosaic Virus induced ultrastructural changes in plants*; B Zechmann, G Zellnig
- 1222 *Cryo-electron Tomography Analysis of Infectious Extracellular Vesicles from a Non-enveloped RNA Virus*; JE Yang, ED Rossignol, E Bullitt
- 1224 *Primary Envelopment of the Herpes Simplex 1 Virion*; WW Newcomb, J Fontana, DC Winkler, JB Heymann, N Cheng, AC Steven
- 1226 *Flexible Fitting and Refinement of Atomic Structures Using the Coarse-Grained DDFF Force Field Tailored to 5-10Å Resolution Cryo-TEM Maps*; J Kovacs, VE Galkin, W Wriggers
- 1228 *The Near-to-Native-State Architecture of Measles Virus Assembly Sites and Isolated Measles Virus Particles*; ER Wright, JD Strauss, Z Ke, CM Hampton, F Leon, M Brindley, RK Plemper
- 1230 *Staphylococcus aureus Pathogenicity Islands: Hijackers on the Bacteriophage Assembly Pathway.*; T Dokland, JL Kizziah, AD Dearborn, KA Manning, EA Wall, L Klenow, LK Parker, GE Christie
- 1232 *Deformation of the S. aureus Cell Envelope due to Surface Adhesion*; J Gu, T Chou, M Libera
- 1234 *Exploring Cellular Morphology of Thermoplasma acidophilum by Cryo-Electron Tomography with Volta Phase Plate*; Y Fukuda, F Beck, I Nagy, R Danev, W Baumeister
- 1236 *The Use of Cryotomography to Study the Complex Morphological Remodeling of Membranes in Bacteria*; E Tocheva

- 1238 *Structural Analysis of the Helicobacter pylori pore forming toxin, VacA*; MD Ohi, TL Cover, NJ Foegeding, TM Pyburn
- 1240 *Capturing Near Atomic Resolution Snapshots of the Ribosome Assembly Process Using Direct Electron Detectors*; J Ortega, A Razi
- 1242 *Spatial Organization of the Ccq1-Tpz1-Poz1 Telomere Complex*; HW Scott, J-K Kim, C Yu, L Huang, F Qiao, D Taylor
- 1244 *Structural Studies that Define Regulatory Interactions within the Mitochondrial Fission Machinery*; RW Clinton, CA Francy, JA Mears
- 1246 *Evolution and Fate of the Residual Body of Toxoplasma gondii revealed by FIB-SEM series*; M Attias, KR Miranda, Souza, W De Souza
- 1248 *Revealing the Native Molecular Architecture of the Nuclear Periphery using Cryo- Focused Ion Beam Milling, Light Microscopy and Electron Tomography* ; E Villa, R Watanabe, R Buschauer, V Lam, K Khanna, J Singla, F Alber
- 1250 *Cryo-FIB Milling Reveals Complex Vesicular Architecture in Photosynthetic Bacteria*; JM Noble, J Lubieniecki, JM Plitzko, H Engelhardt, W Baumeister, LF Kourkoutis
- 1252 *Amorphous Solid Phase Deposition of Ions and Phosphate within Eukaryotic Mitochondrial Matrices – Imaging and Characterization by CryoSTEM Tomography and Energy-Dispersive X-ray Spectroscopy*; SG Wolf, Y Mutsafi, T Ilani, M Elbaum, D Fass
- 1254 *In Situ Liquid Cell Electron Microscopy: An Evolving Tool for Biomedical and Life Science Applications*; MJ Dukes, C Varano, DF Kelly
- 1256 *Single Particle CryoEM of the Anthrax Toxin Initial Engagement Complex*; AJ Machen, N Akkaladevi, TA White, M Fisher
- 1258 *Applications of Bubblegram Imaging*; W Wu, N Cheng, J Fortana, AC Steven
- 1260 *3D Structural Analysis and Classification of EmaA, a Collagen Binding Adhesin*; CJ Brooks, KP Mintz, M Radermacher, T Ruiz
- 1262 *Structure and Function of the Staphylococcus aureus Bacteriophage 80 α Baseplate*; JL Kizziah, AD Dearborn, KA Manning, T Dokland
- 1264 *Structure Analysis of a Sugar-moiety Chimera of EmaA, a Collagen Adhesin of a Gram-negative Bacterial Pathogen*; GG Tang-Siegel, CJ Brooks, M Radermacher, KP Mintz, T Ruiz
- 1266 *Plasma Cleaning Improves the Image Quality of Serial Block-face Scanning Electron Microscopy (SBFSEM) Volumetric Data Sets*; B Armbruster, C Booth, S Searle, M Cable, R Vane
- 1268 *Electron microscopy and tomography on endocytosis of macrophages*; I Ratnayake, P Ahrenkiel, N Thiex, A Hoppe

Bridging the Gap: Technologies and Methods for Correlative Light and Charged Particle Microscopy of Biological Systems

- 1270 CLEM, $1 + 1 = 3$; P Verkade
- 1272 *Integrated Microscopy: highly accurate light-electron image correlation anywhere on a sample*; M Haring, N Liv, CA Zonneville, A Narvaez, L Voortman, P Kruit, J Hoogenboom
- 1274 *Minimal Resin Embedding of Multicellular Specimens for Targeted FIB-SEM Imaging*; A Steyer, N Schieber, P Machado, S Markert, C Stigloher, Y Schwab
- 1276 *The HPM Live μ – From Live Cell Imaging to High Pressure Freezing in Less than 2 Seconds for Correlative Microscopy Approaches*; X Heiligenstein, M Belle, F Eyraud, G Raposo, J Salamero, J Heiligenstein
- 1278 *A Correlative Cryo-Fluorescence and CryoSEM Approach for Visualizing Nanomaterials in Glioblastoma Tissue*; A DiCorato, T O'Halloran, D Joester
- 1280 *Correlative Light and Electron Imaging of Cell-Cell Interactions within the Islet of Langerhans*; DW Piston, J Hughes, A Ustione
- 1282 *Correlative Fluorescence and Electron Microscopy in 3D*; J Franks, C Wallace, M Shibata, M Suga, N Erdman, S Watkins
- 1284 *Development of Two Different Types of Correlative Light and Electron Microscope for Real Time Imaging and Quick Loading of Sample*; I-Y Park, M Bae, Y Haam
- 1286 *Cell interactions in Wound Biofilm and in vitro Biofilm Revealed by Electron Microscopy*; B Deng, S Ghatak, S Steiner, P Chatak, JW Peck, DW McComb, CK Sen
- 1288 *The Lateral Habenula Has Vesicles That Accumulate Either GABA or Glutamate*; S Zhang, DH Root, DJ Barker, M Morales
- 1290 *Luminescent Ruthenium Complex Labels for Correlative Microscopy*; VN Joshi, N Pipalia, E Rosa-Molinar, M Auer
- 1292 *Effect of Tip Morphology of Vertically Aligned Alumina Nanowire Arrays on Ovalbumin Uptake of Dendritic Cells*; SC Aier, K Meduri, M Newman, R Ekeya, P Crawford, D Austin, L Lampert, JF Conley
- 1294 *Structures of Green Culms and Charcoal of Bambusa multiplex*; M Kawasaki, V Yordsri, C Thanachayanont, C Junin, S Asahina, T Oikawa, A Saiki, M Shiojiri
- 1296 *High Throughput Correlation of Dendritic Spines: 2-photon in vivo live imaging to SEM Utilizing the Automated Tape-Collecting Ultramicrotome and Array Tomography*; CI Thomas, K-S Lee, S Peter, D Fitzpatrick, N Kamasawa
- 1298 *The Atmospheric Scanning Electron Microscope (ASEM) observes the axonal compartmentalization and microtubule formation in neurons*; T Kinoshita, C Sato, S Nishihara
- 1300 *Multi-color Electron Microscopy by element-guided identification of cells, organelles and molecules*; M Scotuzzi, J Kuipers, D Wensveen, Boer, P de N Pirozzi, K Hagen, B Giepmans, J Hoogenboom

1302 *Using new 3D CLEM imaging technique to investigate the effects of substrate mechanics on cellular uptake of nanoparticle.*; Y-C Chuang, W-Y Yen, L Zhang, W Bahou, M Simon, M Rafailovich, C-C Chang

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

- 1304 *Graphene Enclosure Facilitates Single-Molecule Analysis of ErbB2 Receptors in Intact, Hydrated Eukaryotic Cells by Electron Microscopy*; IN Dahmke, A Verch, R Weatherup, S Hofmann, Jonge, N de
- 1306 *Therapeutic Engineered Hydrogels Postpone Capsule Formation at the Host-Implant Interface*; KA Harmon, BA Lane, JF Eberth, MJ Yost, HI Friedman, RL Goodwin
- 1308 *Correlative Light, Electron, and Ion Microscopy for the Study of Urinary Tract Infection Pathogenesis*; JA Fitzpatrick, MS Joens, VP O'Brien, SJ Hultgren
- 1310 *Monitoring the Exocytosis and Full Fusion of Insulin Granules in Pancreatic Islet Cells via Graphene Liquid Cell-Transmission Electron Microscopy*; E Firlar, S Shafiee, M Ouy, Y Xing, D Lee, A Chan, S Afelik, R Shahbazian-Yassar
- 1312 *Identification and Characterization of Reconstituted Synuclein-alpha, Amyloid-beta and Tau Fibrils by Immunogold Negative Staining Electron Microscopy*; M Reichelt, TW Bainbridge, R Corpuz, SH Lee, JA Ernst, O Foreman, M Sagolla, JK Atwal
- 1314 *3D Virtual Histology and its Potential Contributions to Science*; KC Cheng
- 1316 *Effect of Gamma Irradiation On Autophagic Flux in Glioblastoma Cells That Express LC3B-eGFP-mCHERRY*; LS Yasui, V Bui, A Latgnotha
- 1318 *Super-resolution Imaging of the Kidney Glomerulus in Health and Disease Conditions*; HY Suleiman, R Roth, JH Miner, AS Shaw
- 1320 *Magnesium-Supported Continuous Growth of Rodents' Incisors*; V Srot, B Bussmann, J Deuschle, B Pokorny, M Watanabe, PA van Aken
- 1322 *Phantoms Models to Characterize Influenza Hemagglutinin-based Vaccines*; DM McCraw, AK Harris
- 1324 *The Role of Electron Microscopy in Pediatric Pathology*; EP Wartchow
- 1326 *Mobile Image Analysis for Microscopic Images of Seeds*; K Gao, M Warmund, T White, R Angelovici, F Bunyak
- 1328 *Centriole Mediated Neurogenesis of OSN in Fish*; SK De, SK Sarkar
- 1330 *Molecular Consequences of Cardiac Valve Development as a Result of Altered Hemodynamics*; V Menon, L Junor, JF Eberth, SM Ford, MT McPheeters, MW Jenkins, M Belhaj, JD Potts
- 1332 *MacCallum's Triangle – Is It Rheumatic? Is It Traumatic? Or Is It Both?*; S Siew
- 1334 *Zika Virus, a Newly Emergent Flavivirus*; CS Goldsmith, DB Rabeneck, RB Martines, J Bhatnagar, D Rollin, SR Zaki

- 1336 *Correlative Confocal and Environmental Scanning Electron Microscopy for Investigating the Fungal Invasion of Plant Surfaces in Their Native State*; AJ Bowling, HE Pence, T Slanec, LL Granke
- 1338 *Glutamine Addiction: An Achilles Heel for MYC-Overexpressing Breast Cancer*; E Jiang, A Waldron
- 1340 *Nanomaterial-based receptor conjugates for capture and rapid detection of Salmonella Enteritidis*; K Cousin, B Tiimob, D Baah, C Fermin, T Samuel, W Abdela
- 1342 *In vivo formation of Ce-phosphate Nanoparticles following Intratracheal Instillation of CeCl₃: Subcellular sites, Nanostructures, Precipitation Mechanisms and Nanoparticle 3D-Alignment*; UM Graham, C Wang, AK Dozier, JE Fernback, L Drummy, K Mahalingam, RM Molina, NV Konduru
- 1344 *Calcium co-Localization with in vivo Cerium Phosphate Nanoparticle Formation after Intratracheal Instillation Dosing with CeCl₃ or CeO₂ NPs*; UM Graham, JE Fernback, C Wang, AK Dozier, L Drummy, K Mahalingam, RM Molina, N Konduru
- 1346 *Micro-morphological Characterization of In-Vivo Diatoms Using ESEM*; E Tihlaříková, V Neděla, M Fránková
- 1348 *The Process of Setting Up an Electron Microscopy Laboratory for Clinical Services.*; RA Radabaugh, JA King
- 1350 *Nanoparticles for Detection, Diagnostics, and Targeting using Hyperspectral Imaging*; D Baah, B Tiimob, K Cousin, W Abdela, T Samuel, C Fermin
- 1352 *The effect of fullerene soot on the mechanical properties of chitosan*; O Velázquez Meraz, A Tejada Ochoa, JE Ledezma Sillas, C Carreño Gallardo, FC Robles Hernández, JM Herrera Ramírez
- 1354 *Using Negative Staining TEM to Study Structure/Function Relationships of Cystic Fibrosis Host-Adapted Opportunistic Pathogen Pseudomonas aeruginosa*; DL Chance, TP Mawhinney
- 1356 *Three-dimensional Visualization of Ion Nanodomains in Subcellular Compartments*; W Girard-Dias, Souza, W De K Miranda
- 1358 *Large Area, High-resolution Multilayered Imaging Approach Using Block-face SEM: Identification of Neurodegeneration in Mouse Model of 22q11 Deletions Syndrome*; CA Brantner, P Mistry, L Matsiyevskiy, C Bryan, D Meechan, TM Maynard, A Popratiloff
- 1360 *The Tolerance of Chromium (VI) by Delftia acidovorans*; H Zuo, H Dong
- 1362 *Characterizing the Intracellular Trafficking of Helicobacter pylori VacA*; NJ Foegeding, T Cover, M Ohi

Methodologies, Technologies and Analysis of Biological Specimens

- 1364 *One Simple and Reproducible Sample Prep Protocol Used to Compare the Surface Topography (SEM) of the Mouse and Newt RPE and the Bruch's Membrane*; PT Lam, C Gutierrez, ML Duley, RE Edelman, ML Robinson
- 1366 *Sample Optimization for In Situ Lamella Preparation for Cryo Electron Tomography*; JM Mitchels, J Novacek, M Peterek
- 1368 *A Freeze Drying Sample Preparation Method for Correlative Light and Scanning/Transmission Electron Microscopy*; K Uryu, N Soplop, D Acehan, CM Rice, MT Catanese, A Hoshino, D Lyden

- 1370 *Freeze Drying Method with Gaseous Nitrogen for Biological Application of Helium Ion Microcopy*; K Uryu, CM Rice, MT Catanese, G Santulli, H Totary-Jain, C Huynh, B Goetze
- 1372 *Quantifying Pancreatic Islet Architecture with Confocal Fluorescence Microscopy: Endocrine Cell Type Distribution Effects on Hormone Secretion*; CM Richman, DW Piston
- 1374 *Morphological studies of penetration pathways via stratum corneum and hair follicles using nano-sized iron oxide*; K-J Choi, B-K Park, S-H Lee, Q Wang, S-H Lee
- 1376 *Nucleus Classification in Colon Cancer H&E Images using Deep Learning*; A Hamad, F Bunyak, I Ersoy
- 1378 *3D Printed Optics*; H Osman
- 1380 *Graphic User Interface for Reliable and Repeatable Quantification of Neuron Morphology and Microstructural Analysis*; J La, B Mason, T Donaldson, C Yelleswarapu
- 1382 *Absolute Configuration, Optical Activity and Raman Microscopy of L and D-Glutamic Acid*; LY Fox-Urbe, Y Soberanes, V Guzman-Luna, G Saab-Rincon, J Hernández-Paredes, RR Sotelo-Mundo
- 1384 *Surface Characterization of Porous Nanomaterials in Environmental Applications by Scanning Electron Microscopy*; G-W Lee, JH Kwon, S-C Jang, K Myung, YS Huh
- 1386 *Analysis of Polymer-Biomacromolecule Composites in the Solid State via Energy Dispersive Spectroscopy-Scanning Electron Microscopy*; PW Lee, N Avishai, JK Pokorski
- 1388 *Carbon Nanostructures Synthesized by Chemical Reaction Using Rongalite and Polyethyleneimine as Complex Agents.*; J Gonzalez, RC Carrillo-Torres, ME Alvarez-Ramos, SJ Castillo
- 1390 *Biomimetic Synthesis of Ceramic Composites*; P Moghimian, V Srot, SJ Facey, PA van Aken
- 1392 *Quantitative analyzing the spatial organization of the organelles in cancer cell using Soft X-Ray Tomography*; J-H Chen, R Boudreau, A Ekman, G McDermott, M LeGros, C Larabell

Tutorials

Physical Sciences Tutorial: Large Scale Data Acquisition and Analysis for Materials Imaging and Spectroscopy

- 1394 *Tutorial: Processing of Atomic Resolution Images and Multispectral Data*; S Jesse, A Belianninov

Physical Sciences Tutorial: Entrepreneurship in the Microscopy Community

- 1396 *Entrepreneurship in Microscopy: Lessons from a Journey*; TF Kelly

Biological Sciences Tutorial: CryoEM with Phase Plates

- 1398 *Biological Sciences Tutorial: CryoEM with Phase Plates*; R Danev

Biological Sciences Tutorial: Practical Strategies for Cryo-CLEM Experiments

1400 *Practical Strategies for cryo-CLEM Experiments*; CM Hampton

Biological Sciences Tutorial: Freeze Fracture, Deep-Etch & 3D Anaglyphs

1402 *Biological Sciences Tutorial: Freeze-fracture, Deep-etch and 3D Anaglyphs*; R Roth

Physical Science Symposia

Characterization of Semiconductor Materials and Devices

- 1404 *Characterization of Semiconductor Materials Using Electron Holography*; L Zhou, Z Gan, M-G Han, DJ Smith, MR McCartney
- 1406 *Observation and Analysis of an Electrically Active Layer at the Core-Shell Interface of a GaN Nanowire by Advanced Electron Microscopy*; S Yazdi, T Kasama, JB Wagner, R Ciechonski, RE Dunin-Borkowski, E Ringe
- 1408 *Advanced Characterization of Emerging Semiconductor Devices Using Low Energy, Broad Ion Beam Argon Milling*; P Nowakowski, J Sagar, ML Ray, PE Fischione
- 1410 *Investigating Ionic Transport Anisotropy in Oxygen Deficient Lanthanum Cobaltites via STEM and First Principles Theory*; AY Birenbaum, L Qiao, M Biegalski, V Cooper, A Borisevich
- 1412 *Differential Phase Contrast Imaging with Reduced Dynamical Diffraction Effect*; A Nakamura, Y Kohno, H Sasaki, N Shibata
- 1414 *The Measurement of Strain, Chemistry and Electric Fields by STEM-based Techniques*; J-L Rouviere, B Haas, E Robin, D Cooper, N Bernier, M Williamson
- 1416 *Methodology to Improve Strain Measurement in III-V Semiconductors Materials*; M Vatanparast, PE Vullum, M Nord, TW Reenaas, R Holmestad
- 1418 *Phase and Atomic Displacement Profiles within Crystals Measured and Simulated using the Self-interference of Split HOLZ Lines*; M Norouzpour, R Herring
- 1420 *How to Avoid Artifacts in Nanobeam Diffraction Strain Measurements*; B Fu, M Gribelyuk, FH Baumann, Y-Y Wang
- 1422 *Strain Measurement of 3D Structured Nanodevices by EBSD*; WA Osborn, LH Friedman, M Vaudin
- 1424 *Electrostatic potential mapping by secondary-electron voltage-contrast and electron-beam-induced-current in TEM*; M-G Han, JA Garlow, Y Zhu
- 1426 *EBIC-Enabled NanoManipulators – Investigating Dislocations in mc-Solar Cells*; P Hamer, M Hiscock, J Lindsay, D Tweddle, T Martin, P Wilshaw
- 1428 *STEM EBIC Mapping of the Metal-Insulator Transition in Thin-film NbO₂*; WA Hubbard, T Joshi, M Mecklenburg, B Zutter, P Borisov, D Lederman, BC Regan

- 1430 *Imaging of Electric Fields at the GaN/Ni Interface Using Electron Beam Induced Current in a Scanning Transmission Electron Microscope*; Z Warecki, V Oleshko, A Armstrong, K Collins, AA Talin, J Cumings
- 1432 *In Situ Nanoprobng Tools for Fault Localization and Defect Characterization*; AJ Smith, A Rummel, M Kemmler, K Schock, S Kleindiek
- 1434 *Epitaxial Growth of ZnO Monolayer on Graphene: The Thinnest Metal Oxide Semiconductor*; H-K Hong, J Lee, NY Kim, S Son, JH Kim, R Erni, Z Lee
- 1436 *Strain Coupling During Lithiation of a Fe₃O₄/SrTiO₃ Epitaxial Thin Film*; S Hwang, Q Meng, P-F Chen, K Kisslinger, Y Zhu, EA Stach, Y-H Chu, D Su
- 1438 *Directly Identifying Phase Segregation in 2D Quaternary Alloys*; J Hachtel, S Susarla, V Kochat, C Tiwary, P Ajayan, JC Idrobo
- 1440 *Cross-sectional STEM Imaging and Spectroscopy of Devices with Embedded 2D Materials*; RJ Wu, D Reifsnnyder Hickey, A Mkhoyan
- 1442 *Dielectric breakdown along c-axis boundaries in magnetoelectric Cr₂O₃ for spintronic devices*; C Sun, Z Song, A Rath, M Street, W Echtenkamp, J Feng, C Binek, D Morgan
- 1444 *Structure and Chemistry of Oxide Surface Reconstructions in III-Nitrides Observed using STEM EELS*; JH Dycus, KJ Mirrielees, ED Grimley, R Dhall, R Kirste, S Mita, Z Sitar, R Collazo
- 1446 *Field Emission from Zinc Oxide Nanobelt*; A Asthana, YK Yap, RS Yassar
- 1448 *High Spatial Resolution Energy Dispersive X-ray Spectroscopy and Atom Probe Tomography Study of Indium Segregation in N-polar InGaN Quantum Wells*; M Catalano, B Bonef, C Lund, UK Mishra, S Keller, MJ Kim
- 1450 *Detailed In Situ Observations of Electromigration in Aluminum Wires*; M Mecklenburg, B Zutter, WA Hubbard, S Aloni, BC Regan
- 1452 *In Situ Biasing of Conductive Bridge Resistive Memory Devices Observed in a Transmission Electron Microscope*; R Berthier, C Nail, C Carabasse, G Molas, D Cooper
- 1454 *Point and Extended Defects in Ultra Wide Band Gap β -Ga₂O₃ Interfaces*; JM Johnson, S Krishnamoorthy, S Rajan, J Hwang
- 1456 *Advances in Elemental Electron Tomography for the State-of-the-art Semiconductor Devices and Circuits Characterization and Failure Analysis*; B Fu, M Gribelyuk, FH Baumann, C Fang, W Zhao, E Chen, I Brooks
- 1458 *Automated STEM/EDS Metrology Characterization of 3D NAND Devices*; Z Zhong, J Roller, O Bidiuk, J Blackwood, M Verheijen, O Ugurlu, J Donald
- 1460 *Toward Automated S/TEM Metrology of Advanced CMOS Devices: Journey to Obtain a Precise and Accurate Measurement*; W Weng, H Tan, A Katnani
- 1462 *Quantitative Electron Energy Loss Spectroscopy (EELS) Analysis of Flowable CVD Oxide for Shallow Trench Isolation of finFET Integration*; J Li, J Bruley, R Conti, M Belyansky, S Metha, J Strane, L Tai, L Jiang

- 1464 *Manganese Segregation Behavior in Damascene Metal Lines*; G Lian, M Ali, S Boettcher
- 1466 *Accretion Detection via Scanning Acoustic Microscopy in Microelectronic Components - Considering Symmetry Breaking Effects*; E Grünwald, R Hammer, J Rosc, B Sartory, R Brunner
- 1468 *Unraveling the Crystal Structure of All-Inorganic Halide Perovskites using CBED and Electron Ptychography*; Reis, dos R H Yang, C Ophus, T Shalapska, G Bizarri, D Perrodin, P Ercius, J Ciston
- 1470 *Nanometer-scale resolved cathodoluminescence imaging: New insights into GaAs/AlGaAs core-shell nanowire lasers*; M Müller, P Veit, B Loitsch, J Winnerl, S Matich, F Bertram, G Koblmüller, JJ Finley
- 1472 *Heterovalent ZnTe/GaSb and ZnSe/GaAs grown by Molecular Beam Epitaxy*; BD Tracy, M Lassise, Y-H Zhang, DJ Smith
- 1474 *On The Effects of Column Occupancy and Static Atomic Disorder on the Analysis of Chemical Ordering in $Ga(P_{(1-x)}Bi_x)$ Compounds*; A Beyer, L Nattermann, K Volz
- 1476 *TEM characterization of GaSb grown on single crystal offcut Silicon (001)*; H Porter, M Steer, A Craven, D McGrouther, I Thayne, I MacLaren
- 1478 *Structural and Chemical Assessment of InAs/AlGaAs Quantum Dot Structures for Enlarged Bandgap Intermediate Band Solar Cells*; M Catalano, A Taurino, M Lomascolo, A Creti, V Tasco, A Passaseo, MJ Kim
- 1480 *HAADF-STEM Study of MBE-Grown Dirac Semimetal Cd_3As_2* ; S Rezaie, H Kim, T Schumann, M Goyal, S Stemmer
- 1482 *Thickness-Dependent Defect Evolution in $GaAs_{0.92}Sb_{0.08}/GaAs$ Heterostructures*; A Gangopadhyay, A Maros, N Faleev, D Smith
- 1484 *Phase Identification of III-N Thin Films Grown by Molecular Beam Epitaxy and Migration Enhanced Epitaxy using Precession Electron Diffraction*; E Ortega, YL Casallas-Moreno, M López-López, A Ponce
- 1486 *Nanoscale Structure-Property Relationship in Amorphous Hydrogenated Boron Carbide for Low-k Dielectric Applications*; S Im, MM Paquette, M Belhadj-Larbi, P Rulis, R Sakidja, J Hwang
- 1488 *HAADF STEM and PL Characterization of Monolayer-Thick GaN/(Al,Ga)N Quantum Wells for Deep UV Optoelectronics Applications*; AA Toropov, E Evropeytsev, VN Jmerik, DV Nechaev, SV Ivanov, S Rouvimov
- 1490 *An Application of High-Resolution Dual-Lens Dark-Field Electron Holography in Strain Analysis for Nanometer Semiconductor Device in Wafer-foundries*; WW Zhao, Y-Y Wang, B Fu
- 1492 *Electron tomography study on nanoscale HfO_x/AlO_y -based resistive switching device*; J Zhang, P Ercius, P Zhang, J Luo, K Kim, M Zhang, RS Williams
- 1494 *Image Simulation and Analysis to Predict the Sensitivity Performance of a Multi-Electron Beam Critical Dimension Metrology Tool*; M Mukhtar, B Thiel

- 1496 *Structural Switch of AlN Sputtered Thin Films from (101) to (002) Orientation, Driven by the Growth Kinetics*; A Taurino, MA Signore, M Catalano, MJ Kim
- 1498 *Finding unstrained 10-nm lattice defects in silicon, given 10¹¹ per cubic centimeter*; J Roberts, D Osborn, P Fraundorf
- 1500 *Direct Observation of Oxygen Movement in Graphene Oxide-Based Resistive Switching Memory*; S Kim, JC Kim, HY Jeong
- 1502 *Novel FIB-less Fabrication of Electrical Devices for in-situ Biasing*; R Dhall, JH Dycus, M Cabral, E Grimley, W Xu, J Damiano, JM LeBeau
- 1504 *Photoemission electron microscopy as a new tool to study the electronic properties of 2D crystals and inhomogeneous semiconductors*; T Ohta, M Berg, K Keyshar, JM Kephart, TE Beechem, R Vajtai, P Ajayan, AD Mohite
- 1506 *Temperature-dependent signals in STEM Electron Beam-Induced Current (EBIC) Imaging*; WA Hubbard, ER White, M Mecklenburg, BC Regan
- 1508 *High Contrast SEM Observation of Semiconductor Dopant profile using TripleBeam® System*; Y Aizawa, T Sato, T Sunaoshi, H Matsumoto, T Agemura, S Torikawa, I Nakatani, M Kiyohara
- 1510 *2D Junction Profiling on Semiconductor Device Reliability Fail*; Y-Y Wang, J Nxumalo, A Katnani, D Ioannou, J Brown, K Bandy, M Macdonald, J Bruley
- 1512 *Radial Interference Contrast in in-situ SEM Observation of Metal Oxide Semiconductor Film Crystallization*; K Shigeto, T Kizu, K Tsukagoshi, T Nabatame
- 1514 *Analysis of amorphous-to-crystalline germanium stack with Cs-corrected analytical STEM*; DH Anjum, KH Lee, G Zhou, Q Zhang, N Wei, GM Xia, CS Tan, X Zhang
- 1516 *Growth of ZnO thin films synthesized by chemical routes for optoelectronic applications*; R Sánchez-Zeferino, ME Álvarez-Ramos, RC Carrillo-Torres, S Munguia-Rodríguez, JA Gonzalez, G Saavedra-Rodríguez
- 1518 *Assessing Hexagonal Boron Nitride Crystal Quality by Defect Sensitive Etching*; T Hoffman, Y Zhao, S Liu, N Khan, M Twigg, N Bassim, J Edgar
- 1520 *Exploring the structural and electronic properties of nanowires at their mechanical limits*; B Ozdol, C Gammer, L Zeng, S Bhowmick, T Nordqvist, P Krogstrup, AM Minor, U Dahmen
- 1522 *Mapping Anti-phase Domains by Polarity Sensitive Orientation Imaging Using Electron Backscatter Diffraction*; N-K Gunasekar, S Vespucci, A Vilalta-Clemente, H Jussila, A Winkelmann, G Nolze, N Subramaniyam, AJ Wilkinson
- 1524 *Transmission Electron Microscopy of Vertically Stacked ErAs-InAs Semimetal - Quantum Dot Nanocomposite Heterostructures Grown on GaAs(001) Substrates*; K Mahalingam, YZ Zhang, KG Eyink, J Peoples, B Urwin, L Grazulis, M Hill
- 1526 *Correlation of Etch Pits and Dislocations in As-grown and Thermal-Cycle-Annealed HgCdTe(211) Films*; M Vaghayenagar, RN Jacobs, JD Benson, AJ Stoltz, LA Almeida, DJ Smith

TEM/STEM/EELS/SNOM of Ultralow Energy Excitations

- 1528 *Optical Spectroscopy at High Spatial Resolution with Fast Electrons*; LH Tizei, S Meuret, N Bonnet, F Treussart, B Daudin, B Gayral, R Bourrellier, A Tararan
- 1530 *Mapping “broken” dark modes using cathodoluminescence in a scanning electron microscope.*; AC Liu, DE Gomez, T Coenen
- 1532 *Near-Field Mid-Infrared Plasmonics in Complex Nanostructures with Monochromated Electron Energy Loss Spectroscopy*; J Hachtel, R Davidson, R Haglund, S Pantelides, B Lawrie, JC Idrobo
- 1534 *Interaction between Relativistic Electrons and Mesoscopic Plasmonic Tapers*; S Guo, N Talebi, W Sigle, C Lienau, A Campos, M Kociak, M Esmann, SF Becker
- 1536 *Understanding Imaging and Energy-loss Spectra Due to Phonon Excitation*; LJ Allen, HG Brown, BD Forbes, NR Lugg, SD Findlay
- 1538 *Localized signals in vibrational STEM-EELS*; C Dwyer, T Aoki, P Rez, L-YS Chang, TC Lovejoy, OL Krivanek
- 1540 *Investigating molecule-plasmon interactions in chemically-functionalized metal nanoparticles using monochromated EELS*; P Abellan, PZ El-Khoury, FS Hage, J Cottom, AG Joly, WP Hess, R Brydson, QM Ramasse
- 1542 *Chemical Nano-Imaging with Tip-Enhanced Vibrational Spectroscopy*; EA Muller, MB Raschke
- 1544 *Exploring Vibrational and Valence Loss Spectra from Oxide Nanoparticles*; PA Crozier, Q Liu, K Venkatraman, DM Haiber, WJ Bowman, K March, P Rez
- 1546 *Detecting Sub Bandgap Energies in CIGS with Electron Energy-Loss Spectroscopy*; J Deitz, P Paul, A Arehart, S Karki, S Marsillac, T Grassman, D McComb
- 1548 *Local Mapping of Bandgap Electronic State in $\text{Pr}_x\text{Ce}_{1-x}\text{O}_{2.8}$: Elucidating Enhancement and Mechanism of Grain Boundary Electrical Conductivity*; WJ Bowman, E Sediva, T Aoki, JL Rupp, PA Crozier
- 1550 *Understanding Guided Light Modes in Oxide Nanoparticles with Monochromated EELS*; Q Liu, SC Quillin, DJ Masiello, PA Crozier
- 1552 *Ultra-High Energy Resolution EELS*; T Lovejoy, N Bacon, A Bleloch, N Dellby, M Hoffman, O Krivanek
- 1554 *STEM-EELS Evaluation of the Dependence of Localized Surface Plasmon Linewidth on the Size of Au Nanoparticles*; J Wei, J Xu, X Bai, J Liu
- 1556 *Predicting the Electronic Structure of CeO_2 Grain Boundaries for Comparison with Atomic Resolution EELS*; T Boland, P Rez, P Crozier
- 1558 *EELS Investigation of Al_2O_3 at 30 keV and below; First Results of Alumina’s Structural Sensitivity to a Low-Energy Electron Beam*; T Sunaoshi, M Shirai, S Okada, K Kaji, E Voelkl
- 1560 *Energy Filtered STEM Imaging at 30kV and Below – A New Window into the Nano-World?*; T Sunaoshi, M Shirai, S Okada, K Kaji, E Voelkl

- 1562 *Probing Interfacial and Surface Effects with Vibrational Electron Energy Loss Spectroscopy*; K Venkatraman, Q Liu, K March, P Rez, P Crozier
- 1564 *Ultra-high Resolution of Electron Energy Loss Spectroscopy by a Monochromated Titan TEM: Towards Challenging Nanomaterials Characterization*; S Lopatin, B Cheng, W-T Liu, M-L Tsai, J-H He, A Chuvilin
- 1566 *Monochromated EELS and Optical Spectroscopy of Layered Carbon Nitrides*; DM Haiber, PA Crozier

Advanced Microscopy and Microanalysis of Complex Oxides

- 1568 *Imaging Point Defects in Complex Oxides Using Quantitative STEM*; H Kim, J Zhang, S Stemmer
- 1570 *Influence of Substrate Temperature and Dopant Distribution at Two-Dimensionally Doped Superconducting La_2CuO_4 Interfaces*; YE Suyolcu, Y Wang, F Baiutti, G Gregori, G Cristiani, W Sigle, J Maier, G Logvenov
- 1572 *Bayesian Statistical Model for Imaging of Single La Vacancies in LaMnO_3* ; J Feng, A Kvit, C Zhang, D Morgan, P Voyles
- 1574 *Utilizing Atom Probe Tomography for 3-D Quantification of Point Defects*; BP Gorman, G Burton, DR Diercks
- 1576 *Dissecting Electronic Structure of a New Line Defect in NdTiO_3 by EELS*; KA Mkhoyan
- 1578 *Probing Disorder in MBE-grown Oxide Films Using Quantitative STEM*; H Kim, S Raghavan, O Shoron, S Stemmer
- 1580 *Oxide Epitaxy with Large Symmetry Mismatch: Bronze-phase VO_2 on SrTiO_3* ; H Sims, X Gao, S Lee, JA Nichols, TL Meyer, TZ Ward, ST Pantelides, MF Chisholm
- 1582 *Compositional Ordering and Polar Nano-Regions: Physical Effects of Sn Alloying in SrTiO_3 Thin Films*; ED Grimley, T Wang, B Jalan, JM LeBeau
- 1584 *Identification and quantification of boron dopant sites in antiferromagnetic Cr_2O_3 films by electron energy loss spectroscopy*; C Sun, M Street, R Jacobs, C Binek, D Morgan, P Voyles
- 1586 *Interfacial Coupling and Polarization of Perovskite ABO_3 Heterostructures*; Y Zhu
- 1588 *ELNES spectrum unmixing and mapping for oxide/oxide interfaces.*; S Lu, K Kormondy, T Ngo, E Ortmann, T Aoki, A Posadas, J Ekerdt, A Demkov
- 1590 *Identifying Novel Polar Distortion Modes in Engineered Magnetic Oxide Superlattices*; S GHosh, A Choquette, S May, M Oxley, A Lupini, S Pantelides, A Borisevich
- 1592 *High Resolution Studies of Oxide Multiferroic Interfaces in the Aberration-Corrected STEM*; J Grandal, JI Beltran, G Sanchez-Santolino, F Gallego, J Tornos, M Cabero, C Leon, F Mompean
- 1594 *Interface and Surface Local Atomic Structures of Lithium Ion Battery Oxides*; Y Ikuhara

- 1596 *Utilizing High-temperature Atomic-resolution STEM and EELS to Determine Reconstructed Surface Structure of Complex Oxide*; W Xu, PC Bowes, ED Grimley, DL Irving, JM LeBeau
- 1598 *Aberration-corrected STEM imaging and EELS mapping of BaTiO₃/SrTiO₃ interfacial defects*; H Wu, S Lu, P Ponath, T Aoki, JG Ekerdt, AA Demkov, MR McCartney, DJ Smith
- 1600 *Combined EELS and XAS Analysis of the Relationship between Depth Dependence and Valence in LSMO Thin Films*; J Fitch, R Trappen, C-Y Huang, J Zhou, G Cabrera, S Dong, S Kumari, MB Holcomb
- 1602 *Probing Electronic Structure of BaSnO₃ by EELS Analysis and ab-initio Calculations*; H Yun, M Topsakal, A Prakash, C Leighton, B Jalan, R Wentzcovitch, KA Mkhoyan, JS Jeong
- 1604 *Interaction between Ferroelectric Polarization and Defects in BiFeO₃ Thin Films*; L Li, L Xie, Y Zhang, X Cheng, Z Hong, C Adamo, C Heikes, D Schlom
- 1606 *Understanding the Effect of Doping and Epitaxial Strain on the Ferroelectric Polarization of Layered Perovskite Thin Films*; M Campanini, M Trassin, C Ederer, R Erni, MD Rossell
- 1608 *Transmission electron microscopy and first-principles study on highly strained BiFeO₃ grown on LaAlO₃*; I-T Bae, A Kovács, HJ Zhao, J Íñiguez, S Yasui, T Ichinose, H Naganuma
- 1610 *STEM-EELS investigation of charge and strain distributions in perovskite oxide thin films*; A Gloter, X Li, G Tieri, M Marinova, D Preziosi, V Garcia, S Fusil, A Barthelemy
- 1612 *Measuring the cation and oxygen atomic column displacement at picometer precision*; Y Wang, L Jones, B Berkels, W Sigle, P van Aken
- 1614 *Atomic Mapping of Domain Configurations in Ferroelectric Thin Films*; X Ma
- 1616 *Correlating Local Chemistry and Local Cation Displacements in the Relaxor Ferroelectric PMN*; MJ Cabral, S Zhang, JT Chi, BJ Reich, EC Dickey, JM LeBeau
- 1618 *Atomic-Scale Investigations of Domain Walls in Polycrystalline BiFeO₃*; G Drazic, A Bencan, D Damjanovic, T Rojac
- 1620 *Multimodal chemical and functional imaging of nanoscale transformations in ferroelectric thin films*; AV Ievlev, CC Brown, P Maksymovych, SV Kalinin, OS Ovchinnikova
- 1622 *In-situ Observation of Cu Filaments Evolution in SiO₂ layer*; Z Zhang, F Yuan, C Liu, F Zhou, HM Yau, W Lu, X Qiu, H-SP Wong
- 1624 *Partial ferroelastic domain mediated ferroelectric domain switching*; Y Zhang, L Li, Y Chu, X Pan
- 1626 *In-situ transmission electron microscopy study of oxygen vacancy ordering and dislocation annihilation in undoped and Sm-doped CeO₂ ceramics during redox processes*; Y Ding, Y Chen, KC Pradel, M Liu, ZL Wang
- 1628 *In-situ STEM-EELS observation of ferroelectric switching of BaTiO₃ film on GaAs*; L Hong, D Huber, R Contreras-Guerrero, R Droopad, RF Klie

- 1630 *Emergent Phase Coherence of Stripe Order in Manganites Revealed with Cryogenic Scanning Transmission Electron Microscopy*; Baggari, El I BH Savitzky, R Hovden, AS Admasu, J Kim, S-W Cheong, LF Kourkoutis
- 1632 *Intricate physics of coherent electron beam/oxide materials interaction revealed by 4D inline holography—electron ptychography*; H Xin, X Zhong, J Lin, Z Liao, J Zhu, X Huang
- 1634 *Measuring Orbital Angular Momentum (OAM) and Torque Transfer from Polarization Vortices with the Electron Microscopy Pixel Array Detector*; KX Nguyen, Y Jiang, MC Cao, P Purohit, AK Yadav, J Junquera, MW Tate, R Ramesh
- 1636 *Measuring Ferroelectric Order Parameters at Domain Walls and Vortices in Hexagonal Manganites with Atomic Resolution STEM*; ME Holtz, K Shapovalov, J Mundy, CS Chang, D Meier, A Cano, DA Muller
- 1638 *Quantifying Local Structure of Complex Oxides Using Accurate and Precise Scanning Transmission Electron Microscopy*; JM LeBeau, M Cabral, JH Dycus, ED Grimley, S Zhang, EC Dickey
- 1640 *Nanoscale Compositional Analysis of a Thermally Processed Entropy-Stabilized Oxide via Correlative TEM and APT*; DR Diercks, G Brennecka, BP Gorman, CM Rost, J-P Maria
- 1642 *Correlative Raman Spectroscopy and Focused Ion Beam for Targeted Microstructural Analysis of Titania Polymorphs*; J Mangum, LH Chan, L Garten, B Gorman
- 1644 *Solid State Transition from γ to α - Al_2O_3 Induced by SPEX Mechanical Milling*; FD Cortes Vega, P Martinez Torres, S Borjas Garcia, J Zarate Medina
- 1646 *Molybdenum Oxide Structures synthesized by Microwave Technique and its Phase Transformation by Thermal Treatment*; CE Ornelas, F Paraguay-Delgado, J Lara-Romero
- 1648 *Microstructure Patterns by Switching Spectroscopy Piezo-response Force Microscopy of Lead Free Perovskite-type Polycrystalline Thin Films.*; GM Herrera-Pérez, O Solis-Canto, J Holguin-Momaca, S Olive-Mendez, E Guerrero-Lestarjette, G Tapia-Padilla, A Reyes-Rojas, LE Fuentes-Cobas
- 1650 *Microstructural and Mechanical Behavior in the Al_{2024} Alloy Modified With Addition of CeO_2* ; JD Franco-Madrid, CG Garay-Reyes, I Estrada-Guel, CG Nava-Dino, MC Maldonado-Orozco, R Martinez-Sánchez
- 1652 *Correlating Surface Roughness and Binder Erosion to Tint Retention of Coatings*; PY Eastman, M Koback, J Gu, MB Clark, J Ngunjiri, J Reffner, C Valente
- 1654 *Honeycomb Networks of Metal Oxides From Self-Assembling PS-PMMA Block Copolymers*; F Barrows, P Nealey, T Segal-Peretz, L Stan, J Elam, A Mane, E Porath, A Petford-Long
- 1656 *Microstructure and Electrical Conductivity of $(\text{Y}, \text{Sr})\text{CoO}_{3-\delta}$ Thin Films Tuned by the Film-Growth Temperature*; H Jing, G Hu, S-B Mi, L Lu, M Liu, S Cheng, S Cheng, C-L Jia
- 1658 *Epitaxial Growth and Atomic-Scale Investigation of Dielectric $\text{Ca}_{1.46}\text{Nb}_{1.11}\text{Ti}_{1.38}\text{O}_7$ Thin Films*; X-W Jin, Y-H Chen, L Lu, S-B Mi, H Wang, C-L Jia
- 1660 *Statistical measurement of polar displacements in complex oxides*; L Miao, D Mukherjee, GA Stone, N Alem

- 1662 *Influence of Bulk Polarization and Surface Polarity on Surface Reconstructions and Related Local Properties of Multiferroic BiFeO₃ Film*; L Jin, P Xu, Y Zeng, L Lu, J Barthel, T Schulthess, RE Dunin-Borkowski, H Wang
- 1664 *The Interactions of Ferroelectric Domain Walls and Crystallographic Defects in the PbTiO₃ Films*; X Ma
- 1666 *Atomic Level Structural Modulations at the Negatively Charged Domain Walls in BiFeO₃ Films*; X Ma
- 1668 *Zr-doped Al₂O₃ Grain Boundary and Interfacial Microstructure*; Z Liu
- 1670 *Direct Polarity Determination of Ferroelectric Ca_{0.28}Ba_{0.72}Nb₂O₆ Single Crystal by Combined Defocused Convergent Beam Electron Diffraction and Simulation*; X He, L Gu
- 1672 *Simultaneous Structural and Electrical Analysis of Vanadium Dioxide Using In Situ TEM*; H Ghassemi, B Jacobs, H Asayesh-Ardakani, W Yao, L Giannuzzi, R Shahbazian-Yassar
- 1674 *Study of Ytria-Tantala Binary Using Scanning Transmission Electron Microscopy*; D Park, CA Macauley, A Fernandez, C Levi
- 1676 *Supper lattice structure transformation based on nonstoichiometric bismuth oxychloride*; S WU, J Sun, S Yang
- 1678 *Multimodal Imaging of Cation Disorder and Oxygen Deficiency-Mediated Phase Separation in Double Perovskite Oxides*; SR Spurgeon, PV Sushko, A Devaraj, Y Du, T Droubay, SA Chambers
- 1680 *In Situ Observation of Phase Separation in High-Temperature Superconductor La_{2-x}Sr_xCuO₄*; JS Jeong, W Wu, G Yu, M Greven, KA Mkhoyan
- 1682 *Modulating the Redox Equilibrium of Silver Using Electron Beams*; H Sheng, J Wen, L Wang, DJ Miller, H Zheng, S Jia, F Cao, H Liu
- 1684 *Formation of Single-atom-thick Copper Oxide Monolayers*; K Yin, Y-Y Zhang, Y Zhou, L Sun, MF Chisholm, ST Pantelides, W Zhou
- 1686 *Structural and Electronic Properties of Ti Doped ZnO: XRD, TEM, EELS and Ab-initio Simulations*; R Medlín, J Minár, P Šutta, W Khan, O Šipr, P Novák, M Netrvalová
- 1688 *Characterization of the Molecular Crystal L-Alaninium Oxalate by Raman Microscopy, Optical Microscopy and X-ray Powder Diffraction*; FJ Carrillo-Pesqueira, RC Carrillo-Torres, O Hernández-Negrete, ME Alvarez-Ramos, J Hernández-Paredes

Advanced Microscopy and Microanalysis of Low-Dimensional Structures and Devices

- 1690 *Quantitative STEM: Comparative Studies of Composition and Optical Properties of Semiconductor Quantum Structures*; A Rosenauer, FF Krause, K Müller-Caspary, E Goldmann, F Jahnke, M Paul, M Jetter, P Michler
- 1692 *Correlative Transmission Electron Microscopy of Highly Perfect Fe₃O₄ Nanocubes*; A Kovács, P Diehle, T Maeda, J Caron, J Muro-Cruces, AG Roca, J Arbiol, J Nogués

- 1694 *Observing Nanoscale Orbital Angular Momentum in Plasmon Vortices with Cathodoluminescence*; J Hachtel, SY Cho, R Davidson, M Chisholm, JC Idrobo, R Haglund, S Pantelides, B Lawrie
- 1696 *Cathodoluminescence Mapping of Defect Regions in Cadmium Sulfide Nanowires*; O Cretu, C Zhang, D Golberg
- 1698 *Using Advanced STEM Techniques to Unravel Key Issues in the Development of Next-Generation Nanostructures for Energy Storage*; JG Lozano, E Liberti, K Luo, GT Martinez, MJ Roberts, AI Kirkland, PD Nellist, PG Bruce
- 1700 *A novel Pd₂Se₃ two-dimensional phase driven by interlayer fusion in layered PdSe₂*; J Lin, S Zuluaga, P Yu, Z Liu, ST Pantelides, K Suenaga
- 1702 *Exchange of Re and Mo atoms in MoS₂ driven by Scanning Transmission Electron Microscopy*; S Yang, W Sun, Y Zhang, Y Gong, MF Chisholm, ST Pantelides, W Zhou
- 1704 *Atomic Defects and Edge Structure in Single-layer Ti₃C₂T_x MXene*; X Sang, D Yilmaz, Y Xie, M Alhabeab, B Anasori, X Li, K Xiao, PR Kent
- 1706 *Movement and Imaging of Single-Atom Dopants in Silicon*; BM Hudak, J Song, PC Snijders, AR Lupini
- 1708 *Correlating the Structure and Composition of 2D Materials with Their Catalytic Activity*; M Bar-Sadan, OE Meiron, V Kuraganti, L Houben
- 1710 *Nanoscale Strain Tomography by Scanning Precession Electron Diffraction*; DN Johnstone, AT van Helvoort, PA Midgley
- 1712 *Picometer-Precision Strain Mapping of Two-Dimensional Heterostructures using an Electron Microscope Pixel Array Detector (EMPAD)*; Y Han, S Xie, K Nguyen, M Cao, MW Tate, P Purohit, SM Gruner, J Park
- 1714 *Understanding 2D Crystal Vertical Heterostructures at the Atomic Scale Using Advanced Scanning Transmission Electron Microscopy*; S Haigh, AP Rooney, TJ Slater, E Prestat, E Khestanova, R Dryfe, M Velicky, RV Gorbachev
- 1716 *Real-time in-situ Investigation of III-V Nanowire Growth using Custom-designed Hybrid Chemical Vapor Deposition-TEM*; K Thelander, LR Wallenberg, AR Persson, M Tornberg, D Jacobsson, C Hetherington, J Gustafsson, S Dogel
- 1718 *Size-dependent stability of iron oxide evaluated through in-situ heating experiments*; Bonifacio C Fittz, H Majidi, K van Benthem
- 1720 *Multi-Modal Processing of Graphene Towards Precisely Controlled Fabrication of a Nanoelectronic Device Using the Helium Ion Microscope and the TOF SIMS*; S Kim, AV Ievlev, IV Vlasiouk, MJ Burch, X Sang, C Brown, RR Unocic, A Belianinov
- 1722 *Graphitization and Growth of free-standing Nanocrystalline Graphene using In Situ Transmission Electron Microscopy*; CNS Kumar, VS Chakravadhanula, A Riaz, S Dehm, D Wang, X Mu, R Krupke, C Kuebel
- 1724 *Nanoscale Thermometry for 2D Materials*; X Hu, P Yasaei, JR Jokissari, S Ögüt, A Salehi, RF Klie

- 1726 *Probing Strain-Induced Phenomena in Low Dimensionality Multiferroic Oxides*; C Magén, R Guzmán, S Farokhipoor, L Maurel, E Langenberg, J Iñiguez, S Venkatesan, AR Lupini
- 1728 *Atomic Scale Structure and Defects in 2D GaSe Films and Van der Waals Interface*; JM Johnson, CH Lee, S Krishnamoorthy, S Rajan, J Hwang
- 1730 *Ge Nanowires: Sn Catalysts and Ge/Ge_{1-x}Sn_x Core-Shell Structures*; AF Marshall, G Chan, AC Meng, M Braun, PC McIntyre
- 1732 *Structural and Magnetic Characterization of B20 Skyrmion Thin Films and Heterostructures Using Aberration-Corrected Lorentz TEM and Differential Phase Contrast STEM*; BD Esser, AS Ahmed, RK Kawakami, DW McComb
- 1734 *Lorentz TEM Image Simulations of Dzyaloshinskii Domain Walls Under an In-Plane Magnetic Field*; MP Li, Graef, M De V Sokalski
- 1736 *Electron-Beam-Induced Deposition of Carbon Nanorod via Spot Mode as Highly Stable and Sensitive AFM Probe Tip*; W Qian, C Nguyen, D Liu, JA Turner
- 1738 *Breaking Friedel's Law in Polar Two Dimensional Materials*; P Deb, Y Han, S Xie, ME Holtz, J Park, DA Muller
- 1740 *Characterizing Multi-layer Pristine Graphene, Its Contaminants, and Their Origin Using Transmission Electron Microscopy*; TH Brintlinger, ND Bassim, J Winterstein, A Ng, MS Lodge, M Ishigami, K Whitener, PE Sheehan
- 1742 *SEM and TEM Study of a Ceramic Membrane/Laser Induced Graphene Composite*; MB Bayati, H Peng, H Deng, J Lin, TA White, Cortalezzi, MF de
- 1744 *Electron Diffraction of Germanane*; A Hanks, BD Esser, S Jiang, JE Goldberger, DW McComb
- 1746 *Growth dynamics, stacking sequence and interlayer coupling in few-layer graphene revealed by in situ SEM*; Z-J Wang, G Eres, F Ding, R Schloegl, MG Willinger
- 1748 *RISE - Raman SEM Imaging of Single Layer and Twisted Bilayer Graphene*; U Schmidt, H Zimmermann, S Freitag, T Dieing
- 1750 *Revealing the Bonding of Nitrogen Impurities in Monolayer Graphene*; C Su, J Li, J Kong
- 1752 *Hidden Defects and Unexpected Properties of Graphene — How Advanced TEM Contributes to Materials Development*; B Butz, C Dolle, F Niekiet, A Mittelberger, E Spiecker, K Weber, B Meyer, D Waldmann
- 1754 *Local Layer Stacking and Structural Disorder in Graphene Oxide Studied via Scanning Electron Diffraction.*; AS Eggeman, RK Leary, DN Johnstone, PA Midgley
- 1756 *Visualizing the Spatial Distribution of Ripples in Graphene with Low-Energy Electron Diffractive Imaging*; I-S Hwang, W-H Hsu, W-T Chang, C-Y Lin, T Latychevskaia

- 1758 *Ambient Dependent formation of Zn_2SiO_4 and SiO_2 from Core-shell $ZnO@SiO_2$* ; S Tripathi, A Roy, N Ravishankar
- 1760 *Probing Two-dimensional $(Bi,Sb)_2Te_3/h$ -BN Heterostructures Using Complementary S/TEM and Simulation Techniques*; D Reifsnnyder Hickey, JS Lee, RJ Wu, N Samarth, KA Mkhoyan
- 1762 *Atomic study of Hybrid Spintronic Heterostructures: $Co_2FeAl_{0.5}Si_{0.5}/Ge(111)$* ; Z Nedelkoski, D Kepaptsoglou, B Kuerbanjiang, QM Ramasse, A Ghasemi, C Love, S Cavill, K Hamaya
- 1764 *In Situ Heating Study of $2H-MoTe_2$ to Mo_6Te_6 NW Phase Transition*; Q Wang, H Zhu, C Zhang, R Addou, K Cho, RM Wallace, MJ Kim
- 1766 *Quantification of Electron Beam Heating Effect in TEM*; H Guo, P Zhou, D Natelson, J Lou
- 1768 *Structural and compositional analysis of core/shell QDs by Transmission Electron Microscopy techniques*; N Fernández-Delgado, M Herrera, J Pizarro, PL Galindo, PJ Rodríguez-Cantó, R Abargues, JP Martínez-Pastor, SI Molina
- 1770 *Electron Probe Microanalysis of Electrospun Nd_2O_3 Nanofibers Doped with Ce/Zn*; SS Johnson, RO Broomfield, GY Woodland, JG Breitzer, DE Autrey, S Han, Z Luo
- 1772 *Identification of Tin Whisker Growth on Tin Plated Copper Substrate*; A Knight, H Aglan, D Burdick
- 1774 *Microscopic Analysis of Tin Whisker Growth on Tin Plated Copper Microchip Leads.*; A Rochester, D Burdick, H Aglan
- 1776 *Interfacial Strain Mapping and Chemical Analysis of Strained-Interface Heterostructures by Nanodiffraction and Electron Energy-Loss Spectroscopy*; WJ Bowman, S Schweiger, R Pfenninger, E Izadi, A Darbal, JL Rupp, PA Crozier

Imaging and Spectroscopy of Beam Sensitive Materials

- 1778 *TEM Investigations of Peptoid Structures*; KH Downing, X Jiang, RN Zuckermann, NP Balsara
- 1780 *Determining Nanoscale Molecular Ordering in Semiconducting Polymers*; GA Calderon Ortiz, M Zhu, J Hwang
- 1782 *Nanobeam Scanning Diffraction for Orientation Mapping of Polymers*; KC Bustillo, O Panova, XC Chen, CJ Takacs, J Ciston, C Ophus, N Balsara, AM Minor
- 1784 *4d Imaging of Polymer Electrolyte Membrane Fuel Cell Cathodes by Scanning X-Ray Microscopy*; J Wu, A Hitchcock, M Lerotic, D Shapiro, V Berejnov, D Susac, J Stumper
- 1786 *Three Dimensional Microstructure Characterization of Polypropylene Blends*; J-C Lin, Y Huang, J Harris, W Brandon, MA Jones
- 1788 *Automated image acquisition and analysis of beam sensitive samples*; E Stach, DN Zakharov, Y Lin, S Yoo, G Resch

- 1790 *Way to Reduce Electron Dose in Pseudo Atomic Column Elemental Maps by 2D STEM Moiré Method*; Y Kondo, K-I Fukunaga, E Okunishi, N Endo
- 1792 *Electron beam-induced object excitations at atomic resolution - minimization and exploitation*; C Kisielowski, HA Calderon, S Helveg, P Specht
- 1794 *Reducing Electron Beam Damage with Multipass Transmission Electron Microscopy*; C Ophus, T Juffman, SA Koppell, BB Klopfer, R Glaeser, MA Kasevich
- 1796 *Application of Electron Counting to Electron Energy-loss Spectroscopy and Implications for Low-Dose Characterization*; JL Hart, AC Lang, AC Leff, P Longo, C Trevor, R Twesten, ML Taheri
- 1798 *Recent Advances on Imaging Porous Frameworks by Electron Microscopy Methods*; AA Mayoral, II Diaz, JE Readman
- 1800 *Structure Determination of Molecular Sieve Nanoparticles with Electron Microscopy and Powder X-Ray Diffraction*; X Zhang, JA Thakkar, J Zha
- 1802 *Characterization of MEL defects in 2 – Dimensional MFI nanosheets*; P Kumar, H Zhang, N Rangnekar, M Tsapatsis, A Mkhoyan
- 1804 *Low-Dose and In-Painting Methods for (Near) Atomic Resolution STEM Imaging of Metal Organic Frameworks (MOFs)*; BL Mehdi, AJ Stevens, P Moeck, A Dohnalkova, A Vjunov, JL Fulton, DM Camaioni, OK Farha
- 1806 *Direct Detection Image Detector and Electron Counting – A New Tool for High-resolution Imaging of Metal-Organic Frameworks*; M Pan
- 1808 *Revealing the Structure of Graphitic Carbon Nitride through Low-Dose TEM using a Direct Electron Detector*; DM Haiber, PA Crozier
- 1810 *Determining Optical Absorption Coefficients in Beam Sensitive Materials Using Monochromated Electron Energy-Loss Spectroscopy*; JA Alexander, FJ Scheltens, LF Drummy, MF Durstock, FS Hage, QM Ramasse, DW McComb
- 1812 *Damage by induced electric field in beam-sensitive materials*; N Jiang
- 1814 *Characterization of Fluorescence-tagged Polymeric Particles using Confocal Laser Scanning Microscopy and Three Dimensional Structured Illumination Microscopy*; X Wang, M Wei
- 1816 *Polymer imaging in SEM – charge, damage and coating free.*; P Wandrol, M Slouf
- 1818 *The Structure and Electronic States of Self-Assembled C₆₀ Crystals*; T Ramprasad, J Howe, TJ Gnanaprakasa, A Hanawa, J Jiminez, K Muralidaran, TJ Zega
- 1820 *Investigation of the Nature of Capping Layer Materials for FIB-SEM Preparation: Implications for the Study of Carbonaceous Material in Extraterrestrial Samples*; P Haenecour, TJ Zega, JY Howe, P Wallace, C Floss, T Yada

- 1822 *Characterization of BiVO₄ Powders and Thin Films by Electron Microscopy and Electron Energy Loss Spectroscopy*; HA Calderon, FM Toma, JK Cooper, ID Sharp, P Ercius, Mayorga, OE Cigarroa-E Neri
- 1824 *Convenient Optics for High Dispersion Small Angle Electron Diffraction with Highly Coherent Low Dose Illumination*; M Kawasaki, M Shiojiri, K Nishio
- 1826 *Transmission Electron Microscope Observation of Charge Distribution on Insulating Thin Films by Hydro-carbon Deposition*; K Harada, K Shimada, K Niitsu, T Katsuta, T Ohno, D Shindo
- 1828 *Accelerating Voltage and Probe Current Dependence of Electron Beam Drilling Rates for Silicon Crystal*; N Endo, Y Kondo
- 1830 *Expanding the Depth of Field for Imaging with Low keV Electrons: High Resolution Surface Observations of Nanostructured LaB₆ Using Low keV Secondary and Backscattered Electrons.*; T Sunaoshi, S Okada, K Kaji, E Voelkl, R Ramachandran, T Salguero
- 1832 *Non-invasive Morphological and Elemental Analysis of Ivory Plate for Artworks Authentication Using ESEM and EDS*; E Tihlaříková, V Neděla, J Hradilová, D Hradil
- 1834 *Microgel Swelling Studied by cryo-SEM*; J Liang, F Teng, T Chou, M Libera
- 1836 *Scientific Analysis of NPAR Processing of EBSD Results for Beam-Sensitive Materials*; PP Camus, SI Wright, MM Nowell, Kloe, R de Kloe
- 1838 *SEM/EDS Analysis of Cell Phone Cover Glass Facilitated by the Use of a Silicon Drift Detector*; J Konopka
- 1840 *Treading lightly – Achieving spectroscopy and elemental maps of beam sensitive specimens in the SEM*; SR Burgess, J Holland, JT Sagar
- 1842 *Damage-less chemical state analysis by using soft X-ray emission spectroscopy in low voltage SEM*; Y Sakuda, M Ishizaki, T Togashi, S Asahina, M Takakura, H Takahashi, M Kurihara
- 1844 *Imaging Hydrated Nanostructured Zeolite X using Single-Electron-Detection Camera*; S Chen, S Don, SL Chang
- 1846 *Low Dose Characterization of Diamondoid Carbon Nanothreads by Transmission Electron Microscopy*; S Juhl, X Li, J Badding, N Alem
- 1848 *Exposing Advanced Building Strategies of Strongly Iron-Enriched Incisors*; V Srot, B Busmann, J Deuschle, B Pokorny, M Watanabe, PA van Aken

Nanoparticles: Synthesis, Characterization, and Applications

- 1850 *Nanoparticles in The ETEM: From Gas-Surface Interactions of Single Objects to Collective Behavior of Nanocatalysts*; T Epicier
- 1852 *Aberration-Corrected STEM Study of Shape Controlled Metallic Core-Shell Nanoparticles for Catalytic Applications*; J Wang, N Lu, Y Xia, MJ Kim

- 1854 *Electron Microscopy Investigations of Precious Metal Catalysts: Towards Controlled Synthesis of Ultra-Small Nanoparticles*; Q He, T Davies, C Dixon, S Althahban, L Lu, S Freakley, L Abis, N Agarwal
- 1856 *Pt₁/CeO₂-ZnO Nanowire Single-Atom Catalysts for Water-Gas Shift Reaction*; J Xu, Y Song, J Liu
- 1858 *Dynamic investigation of metal-support interactions in heterodimer nanoparticles by in situ Transmission Electron Microscopy*; V Ortalan, CW Han, J Greeley, C Wang, F Ribeiro, C Milligan, T Choksi, P Majumdar
- 1860 *Structural Transformations of Au and Au-Cu Nanoparticles during Liquid-Phase Synthesis and Redox Reactions in Gaseous Environment*; D Alloyeau, N Ahmad, H Prunier, A Chmielewski, J Nelayah, G Wang, C Ricolleau
- 1862 *From Atoms To Functional Nanomaterials; Structural Modifications As Observed Using Aberration-Corrected STEM*; SI Sanchez, LF Allard, MT Schaal, SA Bradley, GJ Gajda
- 1864 *Studies of the Hierarchical Structure in UCT Manganese Oxides*; B Deljoo, T Jafari, SL Suib, M Aindow
- 1866 *Combustion Synthesis of Ni-SiO₂ Nanoscale Materials*; KV Manukyan, S Rouvimov, AS Mukasyan
- 1868 *Development of Two-Dimensional Polycrystalline Co₃O₄ Hierarchical Structures and Pt₁/2D-Co₃O₄ Single-atom Catalysts*; Y Cai, Y Guo, J Liu
- 1870 *In-situ, Ex-situ, and 3-D Imaging of Nanomaterials in the STEM*; I Arslan
- 1872 *Organic Surface Modification and Analysis of Titania Nanoparticles for Self-Assembly in Multiple Layers*; S Rades, P Borghetti, E Ortel, T Wirth, S García, E Gómez, M Blanco, G Alberto
- 1874 *Understanding the Self-Assembly of a Janus-type POM-POSS Co-Cluster from low-dose cryo STEM*; C Kuebel, C Ma, H Wu, M-B Hu, H-K Liu, W Wang
- 1876 *Wet-chemical Synthesis of Electrochromic WO₃ and W_xMo_{1-x}O₃ Nanomaterials with Phase and Morphology Control*; S Tripathi, K Ghosh, A Roy, AK Singh, N Ravishankar
- 1878 *Gold Nanoparticle Photoaffinity Labels for Electron Microscopy.*; VN Joshi, M England, D Mitra, FR Furuya, L Kuznetsova, R Ismail, JF Hainfeld, RD Powell
- 1880 *From High-precision Imaging to High-performance Computing: Leveraging ADF-STEM Atom-counting and DFT for Catalyst Nano-metrology*; L Jones, J Aarons, A Varambhia, K MacArthur, D Ozkaya, M Sarwar, C-K Skylaris, P Nellist
- 1882 *High-throughput Quantitative STEM Mass Measurement in Statistically Robust Populations of Supported Metal Nanoparticles*; SD House, Y Chen, R Jin, JC Yang
- 1884 *Epitaxial Quantum Dot Superlattices: From Synthesis to Characterization to Electronic Structure*; BH Savitzky, R Hovden, K Whitham, T Hanrath, LF Kourkoutis
- 1886 *Atomic Electron Tomography: Probing 3D Structure and Material Properties at the Single-Atom Level*; Y Yang, C-C Chen, MC Scott, C Ophus, R Xu, Jr., A Pryor L Wu, F Sun

- 1888 *Quantitative STEM of Catalyst Nanoparticles using ADF Imaging with Simultaneous EDS and EELS Spectroscopy*; AM Varambhia, L Jones, D Ozkaya, S Lozano-Perez, P Nellist
- 1890 *Contributions of Support Effect to Impregnated Cobalt CeO₂ and SiO₂ Catalysts*; Z Liu, R Wang
- 1892 *Investigation of Nanoparticle Reactions with Laser Heating by In situ TEM*; T Isik, S Kundu, IE Gunduz, V Ortalan
- 1894 *Tungsten and Bismuth Nanoparticles for X-ray Computed Tomography.*; VN Joshi
- 1896 *Electrospray as a Sample Preparation Tool for Electron Microscopic Investigations: Toward Quantitative Evaluation of Nanoparticles*; J Mielke, P Dohányosová, P Müller, S López, V-D Hodoroaba
- 1898 *The Stability of High Metal-Loading Pt₁/Fe₂O₃ Single-Atom Catalyst under Different Gas Environment*; S Duan, R Wang, J Liu
- 1900 *On the Morphologies and Photocatalytic Properties of TiO₂ Nanoparticles Synthesized by Pulsed-Laser Decomposition of Titanium Tetraisopropoxide*; M Mozael, Z Dong, BH Kear, JF Al-Sharab, SD Tse
- 1902 *Photo-mediated Seedless Synthesis of Silver Nanoparticles Using CW-Laser and Sunlight Irradiation*; F Félix-Domínguez, RC Carrillo-Torres, JÁ González, J Hernández-Paredes, R Sánchez-Zeferino, ME Álvarez-Ramos
- 1904 *Elemental Distribution Analysis of Core/Shell Nanocrystals with STEM/EDX*; JT Held, K Hunter, UR Kortshagen, KA Mkhoyan
- 1906 *Sample Preparation and Analysis of Aggregated ‘Single Atom Alloy’ Nanoparticles by Atom Probe Tomography*; C Barroo, AJ Akey, J Shan, M Flytzani-Stephanopoulos, DC Bell
- 1908 *Analysis of Fluorine Traces in TiO₂ Nanoplatelets by SEM-EDX, AES and TOF-SIMS*; S Rades, E Ortel, T Wirth, M Holzweber, F Pellegrino, G Martra, V-D Hodoroaba
- 1910 *Detection of CdS nanoparticles and implications for cadmium yellow paint degradation in Edvard Munch’s The Scream (c. 1910, Munch Museum)*; BD Levin, KX Nguyen, M Holtz, MB Wiggins, MG Thomas, ES Tveit, JL Mass, R Opila
- 1912 *Microstructure of Cu-Ni Matrix Nanocomposites Reinforced with Al₂O₃ Nanoparticles*; MI Ramos, NM Suguihiro, E Brocchi, G Solorzano
- 1914 *Growth Regimes of Hydrothermally Synthesized Potassium Tantalate Nanoparticles*; T Ly, LD Marks
- 1916 *Effect of Synthesis Temperature on the Formation GAC supported Pd and Au NPs*; K Meduri, C Stauffer, T Lindner, G O’Brien Johnson, PG Tratnyek, J Jiao
- 1918 *Ultrathin Au-alloy nanowires: Synthesis and Stability*; D Chatterjee, R Narayanan
- 1920 *Morphological and Structural Analysis of Magnetic Support Produced from Magnetite (Fe₃O₄) Nanoparticles and Recycled Polyamide*; LG Santos, JC Spadotto, DF Valezi, M Fontana, CLB Guedes, IG Solórzano, Mauro, E Di

- 1922 *Influence of Microstructure on the Magnetic Properties of Goethite (α -FeOOH)*; DF Valezi, JC Spadotto, LG Santos, JPT Baú, CE Carneiro, DA Zaia, Costa, ACS da IG Solórzano
- 1924 *Structural Characterization of Monodisperse SiO₂ Spherical Nanoparticles Grown by Controlled Method to Develop Optical Phantoms*; E Ortiz-Rascón, RC Carrillo-Torres, I López-Miranda, FJ Carrillo-Pesqueira, J Medina-Monares, RP Duarte-Zamorano, ME Álvarez-Ramos
- 1926 *Characterization of Metal Matrix Composites Reinforced with Carbon Nanotubes by High Resolution Transmission Electron Microscopy*; Merino, Isaza CA Sillas, JE Ledezma Ramírez, JM Herrera Meza, JM Meza
- 1928 *Synthesis and Characterization of Carbon Nanotubes Via Spray Pyrolysis Method*; E Uriza-Vega, M Herrera-Ramírez, C López-Meléndez, I Estrada-Guel, E Martínez-Franco, R Martínez-Sánchez, C Carreño-Gallardo
- 1930 *Effect of Multiwall Carbon Nanotubes (MWCNs) Reinforcement on the Mechanical Behavior of Synthesis 7075 Aluminum Alloy Composites by Mechanical Milling*; E Uriza-Vega, I Estrada-Guel, M Herrera-Ramírez, E Martínez-Franco, C López-Meléndez, R Martínez-Sánchez, C Carreño-Gallardo
- 1932 *Electron-Beam Induced Activation of Catalyst Supports for CNT Growth*; J Carpena-Núñez, B Davis, AE Islam, G Sargent, N Murphy, T Back, M Matthew, B Maruyama
- 1934 *Carbón Nanostructures Synthetized Using Rongalite and Polyethyleneimine as Complex Agents*; JA González, RC Carillo, E Alvarez, JS Castillo
- 1936 *Monitoring the degradation of lubricating oil by means of surface plasmon*; JA Heredia-Cancino, F Félix-Domínguez, R Carrillo-Torres, ME Álvarez-Ramos
- 1938 *Preparation and microscopic characterization of biobased nanoparticles from natural waste materials*; VK Rangari, S Jeelani
- 1940 *Biocompatible, Biodegradable Radio-opaque Polymer Nanoparticles.*; VN Joshi, H Smilowitz
- 1942 *Effect of functionalization and size of CNTs in the production of nanocomposites*; S Simões, PJ Ferreira, F Viana, MAL Reis, MF Vieira
- 1944 *Characterization of Cu-30Mo Alloys Synthesized by Mechanical Alloying*; O Hernández, A Medina, S Borjas, L Bejar, JL Bernal, J Vega
- 1946 *Microstructural changes in aluminum mechanically milled sintered by conventional method and induction*; JM Mendoza-Duarte, FC Robles-Hernandez, C Carreño-Gallardo, I Estrada-Guel, R Martínez-Sánchez
- 1948 *Structure and Function of Nano-sized InSb Precipitate Embedded in an Al Alloy*; Y Zhang, X Gao, NV Medhekar, L Bourgeois
- 1950 *Aluminum Sintering in Air Atmosphere Using High Frequency Induction Heating*; JM Mendoza-Duarte, FC Robles-Hernandez, I Estrada-Guel, R Martínez-Sánchez
- 1952 *Photo-Induced Solution Deposition of Silver Nanoparticles on a Tb³⁺ Doped SiO₂-GeO₂-Na₂O Glass.*; F Félix-Domínguez, JA González-Olmos, RA Íñiguez-Palomares, J Alvarado-Rivera, RC Carrillo-Torres, E Álvarez

- 1954 *Synthesis of Neodymium Hydroxide Nanoparticles with CTAB at Low Temperature*; P Martínez-Torres, SE Borjas-García, N Gómez-Ortíz, N Dasgupta-Schubert, JL Pichardo-Molina, DR García-Zavala
- 1956 *Synthesis of Mesoporous Zirconia by Using Alkoxide Precursor and Triethanolamine as hydrolysis Stabilizer*; SE Borjas García, PG Martínez Torres, N Gómez Ortíz, N Dasgupta-Schubert, G Viramontes Gamboa, JL Bernal Ponce, A Medina Flores, JL Pichardo Molina
- 1958 *Synthesis and characterizations of amorphous manganese oxide particles and platelets for the application of rechargeable lithium batteries*; JF Al-Sharab, Y Yang
- 1960 *Ordering of Nanoparticles along Concentric Nanoings Observed in Al-Cu-Fe Alloy*; H Hampikian, B Kothe, C Li, M Caputo

Advanced Characterization of Energy-Related Materials

- 1962 *Advancing In situ Analytical Electron Microscopy for Probing Dynamic Nano-Scale Solid State Electrochemistry*; YS Meng
- 1964 *In situ Nanoscale Imaging and Spectroscopy of Energy Storage Materials*; RR Unocic, RL Sacci, X Sang, KA Unocic, GM Veith, NJ Dudley, KL More
- 1966 *Liquid-Cell TEM Observations of Sn Lithiation reactions: A Temperature Case Study*; S Goriparti, Z Warecki, KL Harrison, AJ Leenheer, J Cumings, KL Jungjohann
- 1968 *Real time observation of initial conversion reaction of Co_3O_4 nanoparticles using graphene liquid cell electron microscopy*; JH Chang, JY Cheong, SJ Kim, J-W Jung, C Kim, HK Seo, JW Shin, JM Yuk
- 1970 *Imaging Electrochemical Processes in Li Batteries by Operando STEM*; ND Browning, L Mehdi, A Stevens, W Xu, WA Henderson, J-G Zhang, K Mueller, H Mehta
- 1972 *MoS_2 - S_8 Composite Cathodes for Long Cycle Life High Performance Li-S Batteries Studied by FESEM and High-Resolution AEM*; VP Oleshko, PT Dirlam, AG Simmonds, TS Kleine, CL Soles, J Pyun
- 1974 *Towards Understanding Ionic Transport Mechanisms of Sodium in Graphitic Materials by In Situ TEM*; K He
- 1976 *Operando Injection of Oxygen Ions to Organometal Halide Perovskite ($\text{CH}_3\text{NH}_3\text{PbI}_3$) under In-Situ Electrical Biasing STEM-EELS*; HJ Jung, D Kim, S Kim, B Shin, VP Dravid
- 1978 *Complementary Methodical Approach for the Analysis of a Perovskite Solar Cell Layered System*; S Rades, F Oswald, S Narbey, J Radnik, V-D Hodoroaba
- 1980 *Liquid Cell TEM Observation of Platinum Based Alloy Nanoparticle Growth*; L Zheng, W-I Liang, K Bustillo, H Zheng
- 1982 *In Situ Optical Microscopy of the Electrochemical Intercalation of Lithium into Single Crystal Graphite*; JJ Lodico, M Woodall, HL Chan, WA Hubbard, BC Regan
- 1984 *EELS Probing of lithium based 2-D battery compounds processed by Liquid Phase Exfoliation*; J Coelho, E Mcguire, C Downing, P Casey, S Park, C McGuinness, V Nicolosi

- 1986 *Early Growth Stages of Directly Synthesized Large-Area Zeolite Nanosheets*; P Kumar, M-Y Jeon, M Tsapatsis, A Mkhoyan
- 1988 *In Situ Observation of Structural Change in Single-Crystalline LiFePO₄ Nanoflakes during Electrochemical Cycling*; S Kim, VP Dravid, K He
- 1990 *In situ TEM study of the hydrogen effect on the interface between Al and its oxide at room and elevated temperature*; D Xie, M Li, Z Shan
- 1992 *Measuring the Phase Transformation Kinetics Under Non-Equilibrium Conditions from Time Resolved High Resolution TEM Images*; R Sharma, Z Hussiani, PAA Lin, B Natarajan
- 1994 *In situ TEM observations of Oxygen Surface Dynamics in CeO₂ Cubes*; EL Lawrence, SL Chang, PA Crozier
- 1996 *In Situ Observation of Cooling in a Bismuth Telluride and Bismuth-Antimony Telluride Nanoscale Heterojunction*; M Mecklenburg, WA Hubbard, B Vareskic, B Zutter, S Aloni, BC Regan
- 1998 *Integrating Novel Microscopy into Battery Research: From Atomic Resolution to In Situ and Functional Imaging*; M Chi, C Ma, A Lupini, K More, C Nan, J Sakamoto, N Dudney
- 2000 *Atomic-Scale Characterization of Electrode Materials in Lithium/Sodium-ion Batteries by STEM*; L Gu
- 2002 *New Full-Range Electron Tomography Procedure for Accurate Quantification of Surfaces, Curvature, and Porosity in Energy-Related Nanomaterials*; E Padgett, R Hovden, Silva, JA Da T Hanrath, DA Muller
- 2004 *Revealing the Nanoscale Structure and Chemistry of Intact Solid-Liquid Interfaces in Electrochemical Energy Storage Devices by Cryo-FIB Lift-Out and Cryo-STEM*; MJ Zachman, Z Tu, LA Archer, LF Kourkoutis
- 2006 *Identifying and engineering the stacking sequence in CVD grown few-layer MoS₂ via aberration-corrected STEM*; A Yan, W Chen, C Ophus, J Ciston, CH Merino, A Zettl
- 2008 *In-Situ TEM Study of Phase Evolution in Individual Battery Materials*; K Karki, H Zhang, Y Huang, MS Whittingham, EA Stach, G Zhou
- 2010 *Pre-irradiation Characterization of Radiation Resistant Nanocrystalline and Ultrafine-grained Austenitic Steels*; H Wen, R Carnahan, A Hoffman, I Robin, M Wilding
- 2012 *Systematic Transmission Electron Microscopy study investigating Lithium and Magnesium Intercalation in Vanadium Oxide polymorphs*; A Mukherjee, HD Yoo, G Nolis, J Andrews, S Banerjee, J Cabana, RF Klie
- 2014 *The Intermediate State of the Layered \rightarrow Spinel Phase Transformation in LiNi_{0.80}Co_{0.15}Al_{0.05}O₂ Cathode*; H Zhang
- 2016 *S/TEM Study of Fading Mechanism of Lithium Transition Metal Oxide Cathode for Lithium Ion Battery*; C Wang, P Yan, J Zheng, J-G Zhang
- 2018 *Tuning the outward to inward swelling in lithiated silicon nanotubes via surface oxide coating*; J Wang, H Luo, Y Liu, Z Zhang, SX Mao, C Wang, T Zhu

- 2020 *Comparison of Spinel and Monoclinic Crystal Structures of γ - Al_2O_3 for Simulation of Electron Energy Loss Spectra*; HO Ayoola, CS Bonifacio, Q Zhu, D Su, JJ Kas, JJ Rehr, E Stach, WA Saidi
- 2022 *Visualization of Phase Evolution of Ternary Spinel Transition Metal Oxides (CuFe_2O_4) during Lithiation*; EA Stach, ES Takeuchi, AC Marschilok, KJ Takeuchi, CA Cama, J Li
- 2024 *On the Detection Limits of Li K X-rays Using Windowless Energy Dispersive Spectrometer (EDS)*; P Hovington, V Timoshevskii, S Bessette, S Burgess, P Statham, H Demers, R Gauvin, K Zaghib
- 2026 *3D Characterization of Silicon Based Electrode Material for Advanced Lithium-Ion Storage Technologies*; T Vorauer, J Rosc, PH Jouneau, P Bayle-Guillemaud, B Fuchsbichler, S Koller, R Brunner
- 2028 *Designing Catalysts for Meeting the DOE 150 °C Challenge for Exhaust Emissions*; C Carrillo, H Xiong, AT DeLaRiva, D Kunwar, EJ Peterson, SR Challa, G Qi, M Wiebenga
- 2030 *Computationally Assisted STEM and EXAFS Characterization of Tunable Rh/Au and Rh/Ag Bimetallic Nanoparticle Catalysts*; SD House, CS Bonifacio, J Timoshenko, P Kunal, H Wan, Z Duan, H Li, JC Yang
- 2032 *3D Imaging of Nanoalloy Catalysts at Atomic Resolution*; J Zhou, Y Yang, Z Zhao, C Ophus, P Ercius, Y Huang, J Miao
- 2034 *Unveiling the Atomistic Processes of the Accelerated Decomposition of 8.5 mol% Y_2O_3 -stabilized ZrO_2 by Environmental TEM*; B Butz, AL Koh, R Sinclair
- 2036 *TEM Characterization of Heterojunctions for Photocatalytic Application: ZrO_2 - TiO_2 and CuO/ZrO_2 - TiO_2* ; D Guerrero-Areque, R Gomez, HA Calderon
- 2038 *Nucleation of Metal Nanoparticles on Amorphous Substrate: Insights into Orientation Preference and Heterogeneous Catalysis*; D Chatterjee, A Regunath, K K, R Ahmad, AK Singh, R Narayanan
- 2040 *Quantitative 3D Information of Supported Pd/CMK-3 Catalysts at The Nanoscale*; W Wang, D Wang, C Kuebel, A Villa
- 2042 *Multi-Dimensional Multi-Functional Catalytic Architecture: A Selectively Functionalized Three-Dimensional Hierarchically Ordered Macro/Mesoporous Network for Cascade Reactions Analyzed by Electron Tomography*; RK Leary, C Parlett, J Barnard, FD Peña, M Isaacs, S Beaumont, K Wilson, A Lee
- 2044 *Quantification of Material Property Changes During Electrode Degradation in Polymer Electrolyte Fuel Cells Using X-ray Computed Tomography*; RT White, S Eberhardt, M Najm, M Dutta, FP Orfino, E Kjeang
- 2046 *Crystallization Processes of Amorphous GeSn Thin Films by Heat Treatment and Electron Beam Irradiation*; T Kimura, M Ishimaru, M Okugawa, R Nakamura, H Yasuda
- 2048 *Real-time Observation of Sintering Process of Carbon Supported Platinum Nanoparticles in Oxygen and Water through Environment TEM*; L Luo, Y Shao, C Wang
- 2050 *In-situ Electron Diffraction Studies of Sodium Electrochemistry in MoS_2* ; J Wu, Q Li, Z Yao, S Mitra, S Hao, TS Sahu, Y Li, C Wolverton

- 2052 *The effect of electron beam dosage in the decomposition behavior of electrolytes encapsulated inside the graphene sheets based on in situ TEM observation*; JY Cheong, JH Chang, JM Yuk, JY Lee, I-D Kim
- 2054 *In Situ TEM Observation on the agglomeration of nanoparticles in the interface of SnO₂*; JY Cheong, JH Chang, SJ Kim, C Kim, HK Seo, JW Shin, JM Yuk, JY Lee
- 2056 *Electron Microscopy Study of ALD Protective Coating on the FeOF Electrode*; C-F Lin, S-C Liou, M Noked, W-A Chiou, GW Rubloff
- 2058 *PtBi Alloy Nanoparticles on Reduced Graphitic Oxide Support for Electrocatalysis*; S Tripathi, N Ravishankar
- 2060 *Combining in-situ SEM with high sensitivity analytical TEM for understanding the degradation of metallic interconnects in SOFC*; S Poitel, Z-J Wang, M Willinger, J van Herle, C Hébert
- 2062 *A Comparative TEM Study of Soot Particles Derived from used Diesel and Gasoline Engine Oils*; A Janssen, L Felisari, MA Kulzick, G Burke
- 2064 *The Influence of pH Control of the Reaction Solution in the Growth of ZnO Films by CBD Technique for Solar Cell Applications*; F Vásquez-M, A Garcia-Barrientos, JL Bernal, R Ambrosio, R Balderas, R Ramírez-Bon
- 2066 *Understanding Hollow Metal Oxide Nanomaterial Formation with in situ Transmission Electron Microscopy*; L Yu, R Han, X Sang, J Liu, A Patel, K Page, BS Guiton
- 2068 *Electron Microscopy of Heterostructure for Solar Energy Recovery: ZnO Nanowires and Co₃O₄ Nanoparticles.*; O Cigarroa-Mayorga, JE Neri, C Kisielowski, HA Calderon
- 2070 *Asymmetric Phase Transition Pathways during Li/Na Migration in 2D Materials*; S Chen, P Gao
- 2072 *Microstructural Evolution and Oxidation Behavior of T91/T92 Steel upon Long-Term Steam Test*; K Shin, H Ma, Y He
- 2074 *Investigating the Electrochemical Reversibility of Transition Metal Oxide Conversion Materials Through STEM-EELS*; FC Castro, VP Dravid
- 2076 *Highly Nonconductive Li-Ion Battery Components Successfully Imaged at Very Low Accelerating Voltages*; S Freitag, C Berger, J Gelb, C Weissenberger, T Bernthaler
- 2078 *Microstructure and Chemical Composition Analysis of Additive Manufactured Ni-Mn-Ga Parts Sintered in Different Conditions*; M Caputo, CV Solomon
- 2080 *Breaking the time barrier in Kelvin probe force microscopy: Fast free force reconstruction using the G-Mode Platform*; L Collins, SV Kalinin, S Jesse
- 2082 *ToF-SIMS investigations of tip-surface chemical interactions in atomic force microscopy on a combined AFM/ToF-SIMS platform*; CC Brown, AV Ievlev, P Maksymovych, SV Kalinin, OS Ovchinnikova
- 2084 *Ion Beam Induced Current Measurements of Solar Cells with Helium Ion Microscopy*; A Belianinov, S Kim, C Buechley, MJ Burch, OS Ovchinnikova, S Jesse

- 2086 *Cathodoluminescence Measurements of CdTe in Transmission Electron Microscope*; W-CD Yang, Y Yoon, BH Gaury, PM Haney, N Zhitenev, R Sharma
- 2088 *Development of Quantitative Techniques with Time-of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS) for Li Characterization in High Energy Batteries.*; S Bessette, P Hovington, C Kim, R Gauvin, H Demers, K Zaghib
- 2090 *Electron Tomography of PEM Fuel Cell Catalyst Coarsening on Alternate Carbon Supports*; BT Sneed, DA Cullen, KS Reeves, KL More
- 2092 *Direct Observation of Hafnia Structural Phase Transformations*; BM Hudak, SW Depner, GR Waetzig, S Banerjee, BS Guiton
- 2094 *Annealing Effects on TiO₂ Photocatalytic Degradation of Methylene Blue*; R Catabay, S Fowler, A Leng, J Jiao
- 2096 *TEM Analysis of CsPbBr₃ Nanocrystals: Challenges and Perspectives.*; M Brennan, M Kuno, S Rouvimov
- 2098 *Monochromated Electron Energy-Loss Spectroscopy of Lead-Free Halide Perovskite Semiconductors*; JA Alexander, ET McClure, PM Woodward, DW McComb
- 2100 *Structural Change of a Cu/ZnO Catalyst under Methanol Observed by ETEM*; H Chi, C Bonifacio, C Andolina, E Stach, G Veser, J Yang
- 2102 *A 4D Framework for Probing Structure-Property Relationships in Lithium Ion Batteries*; J Gelb, D Finegan, M McNeil, D Brett, PR Shearing
- 2104 *Calculation of the Electric Field Based on Average Momentum Transfer using Pixelated Electron Detector in STEM*; W Gao, C Addiego, X Pan
- 2106 *Nanoscale Imaging of Subsurface Oxygen Formation on Rhodium Catalysts.*; SV Lambeets, C Barroo, S Owczarek, E Genty, N Gilis, T Visartde Bocarmé
- 2108 *Microstructure and Crystallographic Determination of Nanoporous Catalysts*; C Barroo, T Egle, AJ Akey, DC Bell, J Biener
- 2110 *Corrosion Analysis of Electrical Connectors using SEM*; J Ford, H Aglan, A Ludwick

Geological Sample Characterization using Various Imaging Modalities

- 2112 *New Technique for Imaging Geologic Materials via Integrated Correlative Light and Electron Microscopy (iCLEM)*; PC Hackley, BJ Valentine, L Voortmann, DV Slingeland, J Hatcherian
- 2114 *High Throughput Shale Rock Imaging Using Multi-Beam Scanning Electron Microscopy*; AL Eberle, T Garbowski, S Bhattiprolu, K Crosby, D Zeidler
- 2116 *Multi-modal SEM Imaging for Shale Reservoir Characterization*; L Hathon, KB Hooghan, M Myers, M Dixon

- 2118 *Raman microspectroscopy and Raman imaging of fluid inclusions as method of phase identification.*; S Mamedov
- 2120 *Application of Multiple Imaging Tools for Organic Material Characterization in Shale Reservoirs*; Z Liu, L Hathon, M Myers
- 2122 *Application of Low-Voltage FESEM and TEM to the Study of Mineral and Organic-Matter Components in Unconventional Gas Shales, With a Focus on Organic Pores Structure*; PL smith, T Zhang
- 2124 *Cross-Modal Characterization for Quantifying Fracturing Fluid Effects on Organic-Rich Source Rocks*; W Li, B Lai, F Liang
- 2126 *An Integrated Workflow to Predict Macro-scale Transport Properties in Gas Shales by Coupling Molecular Dynamics Simulation with Lattice Boltzmann Method*; Y Ning, S He, G Qin
- 2128 *Microstructural Analysis of the Transformation of Organic Matter During Artificial Thermal Maturation of the Upper Cretaceous Boquillas (Eagle Ford) Formation, Texas, USA*; K Hooghan, WK Camp, W Knowles, TE Ruble
- 2130 *Organic Matter Characterization in Shales: A Systematic Empirical Protocol*; KN Hooghan, L Hathon, M Myers, ML Dixon
- 2132 *The Application of Auger Spectroscopy in Planetary Science: Elemental Analysis of Presolar Silicate Grains.*; C Floss
- 2134 *Identification of Rare Polytypes of Presolar SiC with Coordinated TEM, Raman Spectroscopy and NanoSIMS Measurements*; RM Stroud, N Liu, A Steele, CM Alexander, LR Nittler
- 2136 *Coordinated X-ray, ion, and electron microanalysis approach towards understanding the earliest-formed solids in the solar system*; P Mane, S Wallace, M Bose, K Domanik, T Zega, M Wadhwa
- 2138 *Transmission Electron Microscopy Studies of Carbonaceous Chondrites which Experienced Experimentally Simulated Space Weathering Effects*; MS Thompson, LP Keller, R Christoffersen, MJ Loeffler, RV Morris, TG Graff, Z Rahman
- 2140 *Alteration of Helium-Filled Bubbles and Space Weathered Material During Heating in the TEM*; KD Burgess, RM Stroud
- 2142 *Curiosity Rover Mars Hand Lens Imager (MAHLI) Views of the Sediments and Sedimentary Rocks of Gale Crater, Mars*; KS Edgett, RA Yingst, ME Minitti, MR Kennedy, GM Krezoski, DM Fey, Mouélic, S Le SK Rowland
- 2144 *Using Combined TEM, Raman, XRD, and VNIR techniques to Investigate Secondary Phase Formation and Textural Relationships in Brine + Jarosite Experiments*; KM Miller, CM Phillips-Lander, GW Strout, JL Bishop, AS Elwood Madden, Madden, ME Elwood Madden
- 2146 *Quantitative Relief Models of Rock Surfaces on Mars at Sub-millimeter Scales from Mars Curiosity Rover Mars Hand Lens Imager (MAHLI) Observations: Geologic Implications*; JB Garvin, KS Edgett, R Dotson, DM Fey, KE Herkenhoff, BJ Hallet, MR Kennedy

- 2148 *The Mineralogy of the K-Pg Transition on the Peak Ring of the Chicxulub Impact Crater in Drill Cores of IODP-ICDP Expedition 364*; A Wittmann, SP Gulick, JV Morgan, E Chenot, GL Christeson, PF Claeys, CS Cockell, MJ Coolen
- 2150 *Visualizing Iron Oxidation State in a Possible Cometary Clast from Carbonaceous Meteorite LAP 02342*; BT De Gregorio, RM Stroud
- 2152 *High Resolution Imaging of Short-Range Order Materials (Allophane) with Aberration Corrected TEM and Direct Electron Detection*; TG Sharp, SL Chang
- 2154 *Electron Energy Loss Near Edge Structures as a tool to elucidate natural and artificial minerals structures.*; T Dennenwaldt, F Nabiei, DT Alexander, J Badro, P Gillet, H Piet, C Hébert
- 2156 *Accurate Grain and Phase Boundary Location by Dictionary-Based Indexing of Geological EBSD Data*; S Singh, K Marquardt, Graef, M De Graef
- 2158 *Optimization of specimen preparation methods for cryo electron microscopy of oil-in-water emulsions*; DH Anjum, S Medina, AR Behzad, SA Tabatabai, T Leiknes
- 2160 *Quantitative Processing of EDS Maps: A Presentation of Solutions to Mapping Artifacts and Applications in Cosmochemistry*; L Kööp, AM Davis
- 2162 *Iterative reconstruction techniques for X-ray microscopy in Geosciences*; MG Andrew, S Graham, W Thompson
- 2164 *Enhancing Petrographic Analysis Through Data Fusion*; N Vito, C Burt, E Goergen
- 2166 *Correlating Complementary Data for Improving Electron Backscatter Diffraction (EBSD) Microstructural Characterization of Geological Materials*; MM Nowell, SW Wallace, J Rafaelsen, TL Nylese, Kloe, R de SI Wright
- 2168 *Advancements in Minerals Identification and Characterization in Geo-Metallurgy: Comparing E-Beam and Micro-X-ray-Fluorescence Technologies*; S Scheller, R Tagle, G Gloy, M Barraza, A Menzies
- 2170 *In Situ Contact Angle Measurements of Supercritical CO₂, Brine, and Sandstone Cores Using Micro-CT Imaging*; LE Dalton, D Crandall, A Goodman
- 2172 *Imaging and Analytical Approaches for Characterization of Soil Mineral Weathering*; A Dohnalkova, L Kovarik, B Arey, T Varga, M Miller
- 2174 *3D Core-Scale Organic and Mineral Material Characterization of Source Rocks with Simultaneous Neutron and X-Ray Imaging*; W LI, W-S Chiang, J LaManna, J Kone, J-H Chen, Y Liu
- 2176 *A New Approach to Microns-Resolution Trace Element and Mineralogy Mapping at PPM Sensitivity for Digital Rock and Geological Research*; SJ Lewis, W Yun, S Lau, B Stripe, A Lyon, D Reynolds, S Chen, RI Spink
- 2178 *Effective SEM Analytical Techniques for the Cathodoluminescence Visualization of Intergranular Cements in Saint Peter Sandstone: A Round Robin Exercise*; W Schneider, C MacRae, J Fournelle

- 2180 *Requirements for a Complete Geological Analysis Solution with EDS*; M Hiscock
- 2182 *Study on nanophase minerals and their associated trace elements in freshwater ferromanganese nodules from Green Bay, Lake Michigan*; S Lee, H Xu
- 2184 *Direct Observation of Vacancies, Impurities, Adsorbed Heavy Metals, Cation Ordering, and Interface Structures in Minerals Using Aberration-Corrected STEM*; H Xu
- 2186 *Study of morphological changes of the lime putties during maturing by SEM/ESEM*; E Navrátilová, V Neděla
- 2188 *Microanalysis of Geologic Materials Exposed to Surface Conditions on the Planet Venus*; BG Radoman-Shaw, RP Harvey, GC Costa, NS Jacobson, LM Nakley
- 2190 *FIB/STEM Investigation of Four Impact Craters from the Stardust Comet Sample Return Mission Foils*; BA Haas, RM Stroud, C Floss
- 2192 *Laboratory evidence of slow-cooling for carbon droplets in red-giant atmospheres*; PB Fraundorf, M Lipp, TJ Savage, D Osborn
- 2194 *Quantifying the 3-Dimensional Shape of Lunar Regolith Particles Using X-Ray Computed Tomography and Scanning Electron Microscopy at Sub- λ Resolution*; AN Chiaramonti, JD Goguen, EJ Garboczi
- 2196 *Dynamical in situ study of morphological changes of bentonite in ESEM*; E Navrátilová, V Neděla, H Sun, D Mašín

Application of Advanced Characterization Methods to Examine Materials Used in Nuclear Power Systems

- 2198 *Revealing Nanometre-scaled Solutes Clusters in Neutron Irradiated Low Alloy Steels*; JJ Lim, MG Burke
- 2200 *Investigating the Influence of Zircaloy-4 Grain Orientation on Oxide Corrosion Films Formed in an Autoclave Environment*; GA Lucadamo, JA Gruber
- 2202 *The Corrosion of Secondary Phase Precipitates in Zircaloy in Superheated Water*; I MacLaren, KJ Annand, M Gass
- 2204 *Microstructural characterization of Pu-Zr fuels*; A Aitkaliyeva, CA Papesch
- 2206 *Understanding Corrosion of 304 Stainless Steels Using Atom Probe Tomography*; K Fisher, EA Marquis
- 2208 *Dynamic Secondary Ion Mass Spectrometry (SIMS) Imaging of Materials for the Nuclear Industry: Historical Perspectives and Recent Advances*; G McMahon, B Miller, G Burke
- 2210 *Characterization of Corrosion Films on Austenitic Stainless Steels Exposed to High Temperature Deaerated Water*; JK Heuer, MJ Stiger
- 2212 *EBSD and TEM Analysis of the Heat Affected Zone of Laser Welded AISI 304/308 Stainless Steel*; K Mao, Y Wu, JP Wharry

- 2214 *Microstructure characterization of ion-irradiated Ferritic/Martensitic HT9 steel*; D Kaoumi, C Zheng
- 2216 *Using in-situ TEM Triple Ion Beam Irradiations to Study the Effects of Deuterium, Helium, and Radiation Damage on TPBAR Components*; C Taylor, B Muntifering, C Snow, D Senior, K Hattar
- 2218 *Combining Transmission Kikuchi Diffraction and Scanning Transmission Electron Microscopy for Irradiated Materials Studies*; CM Parish, K Wang, PD Edmondson, KA Terrani, X Hu, RL Seibert, Y Katoh
- 2220 *Understanding Nanoscale 4D Microstructural Evolution in Aluminum Alloys using Transmission X-Ray Microscopy (TXM)*; CS Kaira, V De Andrade, SS Singh, C Kantzos, Carlo, F De N Chawla
- 2222 *Overcoming the Challenges of Beam-sensitivity in Fuel Cell Electrodes*; DA Cullen, BT Sneed, KL More
- 2224 *EBSD and TEM Microstructural Studies of New Fuel Cladding in Generation IV Sodium-cooled Fast Nuclear Reactors*; P Nowakowski, BS Bonifacio, MJ Campin, ML Ray, PE Fischione, S Mathieu
- 2226 *Assessment of Corrosion Resistance of Candidate Alloys for Accident Tolerant Fuel Cladding under Reactor Conditions*; S Rouvimov, S Grdanovska
- 2228 *Structural Characterization of Fission Products in Irradiated TRISO Fuels using Transmission Kikuchi Diffraction, Transmission Electron Microscopy, and Synchrotron X-ray Absorption Spectroscopy*; RL Seibert, CM Parish, JD Hunn, CA Baldwin, KA Terrani, J Terry
- 2230 *Identification of Fluorescent Material Using FE-SEM/EDS and a Variable Pressure Secondary Electron Detector*; H Ajo, D DiPrete
- 2232 *He⁺ Irradiation Induced Cracking and Exfoliating on the Surface of Ti₃AlC₂*; H Shen
- 2234 *Measurement of Irradiation-induced Swelling in Stainless Steels with a New Transmission Electron Microscopy Method*; L He, H Xu, L Tan, PM Voyles, K Sridharan
- 2236 *Defect Characterization in Irradiated Nanocrystalline Materials via Automated Crystal Orientation Mapping*; PK Suri, JE Nathaniel, CM Barr, JK Baldwin, K Hattar, ML Taheri
- 2238 *Surface Morphology Analysis of Ti-6Al-4V, V-4Ti-5Cr, and Molybdenum Exposed to Low Power Nd:YAG Laser*; H Aglan, A Kumar, K Muir, A Hassanein
- 2240 *Discontinuous Precipitation in Aged Welded Joints of High Cr-Ni Superalloy*; JC Spadotto, G Solórzano
- 2242 *Morphological Evolution and Coalescence of γ' Precipitates*; CG Garay-Reyes, SE Hernández-Martínez, JL Hernández-Rivera, JJ Cruz-Rivera, MC Maldonado-Orozco, I Estrada-Guel, HJ Dorantes-Rosales, R Martínez-Sánchez
- 2244 *Microstructure Evolution of Ti Tritides During Aging*; HF Wang, SM Peng, HH Shen, XS Zhou
- 2246 *STEM Imaging and Phase Mapping of Precipitation in Alloy 718 Using an Electron Microscope Pixel Array Detector*; CA Wade, E Yucelen, S Sluyterman, B Freitag, G Burke

- 2248 *Microstructural Characterization of Irradiated and Hydrurate Zr-2.5%Nb and Zr – 1%Nb*; C Vazquez, AM Fortis, PB Bozzano, RA Versaci
- 2250 *Microstructure Evolution of Ni-base Superalloy 625: from Conventional Thermomechanical Processed to Selective Laser Melting Processed*; C Labre, AL Pinto, IG Solórzano
- 2252 *Microstructural Study of the Heat-treated 17-4PH Stainless Steel Parts Prepared by Selective Laser Melting*; Y Sun, M Aindow, RJ Hebert
- 2254 *A Snapshot of the Microstructural Evolution of Alloy 800H under Heavy Ion Irradiation*; E Anderson, E Marquis
- 2256 *Precipitation in an Irradiated 625 Plus Alloy*; L-J Yu, E Marquis
- 2258 *Auger Electron Spectroscopy Analysis of Pit Initiation at MnS Nano-inclusions in Carbon Steel*; JG Newman, JS Hammond, BH Davis, Z Suo, R Avci, DF Paul, I Beech

75th Anniversary Session: Diamonds: From the Origins of the Universe to Quantum Sensing in Materials and Biological Science Applications

- 2260 *CVD Diamond Films – Synthesis, Microstructure, Applications*; W Jaeger
- 2262 *Graphitization of Diamond by Means of UV Laser Writing: a Transmission Electron Microscopy Study*; A Taurino, M Catalano, Feudis, M De AP Caricato, M Martino, Q Wang, MJ Kim
- 2264 *Formation of dynamic topographic patterns during electron beam induced etching of diamond*; AA Martin, A Bah, J Bishop, I Aharonovich, M Toth
- 2266 *Nitrogen Defects in Diamond Examined by an Electron Microprobe*; NC Wilson, CM MacRae, A Torpy, A Tomkins
- 2268 *TEM Study of Amorphous Carbon with Fully sp³-Bonded Structure*; J Wen, Z Zeng, L Yang, Q Zeng, DJ Miller, W Yang, H-K Mao
- 2270 *Atomic and Electronic Structures of Functionalized Nanodiamond Particles*; SL Chang, C Dwyer, K March, M Mermoux, N Nunn, O Shenderova, E Osawa, AS Barnard
- 2272 *Polycrystalline Diamond Films produced by Hot-Filament Chemical Vapor Deposition*; MJ Arellano-Jimenez, JJ Alcantar-Pena, E Ortega Aguilar, M Jose Yacaman, O Auciello
- 2274 *EELS Studies on Nanodiamonds and Amorphous Diamond-like Carbon Materials*; R Arenal
- 2276 *The Enigmatic Origin of Meteoritic Nanodiamonds – An Approach with Atom-Probe Tomography*; PR Heck
- 2278 *Did Nanodiamonds Rain from the Sky as Woolly Mammoths Fell in their Tracks Across North America 12,900 Years Ago?*; TL Daulton, S Amari, AC Scott, M Hardiman, N Pinter, RS Anderson
- 2280 *Multimodal Analysis of Diamond Crystals and Layers using RISE microscopy*; R Váňa, J Dluhoš, M Varga, C Schmid, A Kromka

- 2282 *Use of C-C and C-N Molecular Emissions in Laser-Induced Breakdown Spectroscopy Data to Determine Diamond Provenance*; CE McManus, J Dowe, NJ McMillan
- 2284 *Cathodoluminescence Study of Microdiamonds and Improvements of Signal Detection by Lowering Temperature of the Sample*; N Vaskovicova, R Skoupy, A Patak, K Hrubanova, V Krzyzaneck
- 2286 *SEM and EPMA Analyses of Metallic Inclusions in Diamonds – Probing the Earth’s Deep Mantle*; ES Bullock, EM Smith, SB Shirey
- 2288 *Microstructural Characterization of Polycrystalline Diamond Sintered at Ultrahigh Pressures*; EG Minnaar, J Neethling, J Westraadt

Anniversary Lectures

- 2290 *Development of High-Resolution TEM for Imaging Native, Radiation-Sensitive Biological Macromolecules*; RM Glaeser
- 2292 *Smarter than an iPhone: the emergence of the modern electron microscope*; OL Krivanek
- 2294 *Microanalysis: What Is It, Where Did It Come From, and Where Is It Going?*; DE Newbury
- 2296 *Microscopes Without Lenses*; JA Panitz

Technologist Forum and Outreach Symposia

Microscopy in the Classroom: Strategies for Education and Outreach

- 2298 *Perspectives on Atomic-Force Microscopy Education*; NA Burnham
- 2300 *Online Microscope Simulators for Training and Outreach*; C Fuery, J Whiting, B Cribb, J Williams, J Cairney
- 2302 *Using Virtual Reality (VR) for Education in Nanoscience*; S Kim, M Kim, A Klick
- 2304 *Eutectic Solidification in Zn-Sn Binary Alloys: An Experiment for High Schools*; J Aindow, H Yu, MA Bellinger, M Aindow
- 2306 *Complex Web Construction: Additional Clues to Mechanical Properties*; D Shattuck, W Delise, N Lloyd, J Schmidt, K Baum, D Roos, R Dettelbach, K Sanon
- 2308 *Sensitivity of TEM data on lightspeed to camera-length’s voltage variation*; P Fraundorf, D Osborn, T McBroom

Tech Forum: Cryo-Tomography of Macromolecular Complexes in Whole Cells: Lessons in Cryo-Fib Milling and Vitreous Cryo-sectioning

- 2310 *Successful Cryo Electron Tomography of Vitreous Cryo Sections*; J Pierson, PJ Peters
- 2312 *Cryo-FIB Milling and Lift-Out for Preparation of Specimens for Cryo-TEM*; MJ Zachman, JM Noble, LF Kourkoutis

2314 *Electron Cryotomography of Vitreous Cryosections and Cryo-Focused Ion Beam Milled Lamellae.*; MT Swulius, SK Mageswaran, GJ Jensen

Tech Forum: Atomic Force Microscopy for Imaging and Materials/Biomaterials Properties: Characterization of Surfaces, Films, and Interfaces

2316 *Atomic Force Microscopy: A Multifunctional Tool for Materials Characterization in Shared Resource Centers.*; BB Massani

2318 *Applications of Atomic Force Microscopy in Biological Research.*; J Wallace

Tech Forum: Light Sheet Microscopy

2320 *Optimized Live Volumetric Imaging with Light Sheet Microscopy and Related Strategies.*; TV Truong

2322 *diSPIM allows three-dimensional characterization of calcium activity in intact islets of Langerhans.*; Z Lavagnino, DW Piston

> Welcome from the Society Presidents

On behalf of the sponsoring societies, we are excited to welcome you to St. Louis, Missouri for Microscopy & Microanalysis 2017! **The theme of the M&M 2017 meeting is “Anniversaries.”** The Microscopy Society of America and the Microanalysis Society, which established the joint M&M meeting format more than twenty years ago, are celebrating their 75th and 50th anniversaries, respectively. In addition, the M&M meeting is cosponsored for the first time by the International Field Emission Society to commemorate the 50th anniversary of the invention of the atom probe.

We are excited to offer special anniversary programming this year! Anniversary lectures by pioneering figures in microscopy and microanalysis are featured in special morning and midday sessions. You'll be able to hear about the development and future prospects for instrumentation and techniques that are at the forefront of our field today, while enjoying some complimentary coffee and a breakfast item. MSA's Student Council will be hosting an inaugural pre-meeting event on Saturday that will treat attendees to a sampling of the best work, across scientific disciplines, presented at the meeting by early career scientists.

The technical program kicks off with our annual Monday morning plenary session, featuring the major awards ceremonies for the sponsoring societies, the M&M meeting awards, and two exciting plenary talks by Eric Betzig, winner of the 2014 Nobel Prize in Chemistry “for the development of super-resolved fluorescence microscopy,” and Keith Riles, a member of the LIGO Scientific Collaboration that in 2015 detected gravitational waves, a prediction of Einstein's theory of general relativity. The Exhibition Hall opens at noon, and is the largest annual exhibition in the field showcasing the latest state-of-the-art instrumentation and accessories in microscopy and microanalysis. M&M 2017 will provide you with the opportunity to stay abreast of the latest new technologies, hear the latest developments in the techniques and applications of all areas of microscopy and microanalysis, and most importantly network with colleagues.



Ian M. Anderson
*President,
Microscopy Society
of America*



Masashi Watanabe
*President,
Microanalysis Society*



David J. Larson
*President, International
Field Emission Society*



Welcome to Microscopy and Microanalysis 2017 in St. Louis, Missouri, and to our exciting Anniversary celebration!

The Microscopy Society of America, the Microanalysis Society and the International Field Emission Society welcome you to Microscopy and Microanalysis 2017 in historic St. Louis, Missouri. As you have come to expect, Microscopy and Microanalysis 2017 will highlight the latest innovations in many different microscopy and microanalysis techniques as well as their applications to important research in biological, physical and materials sciences.

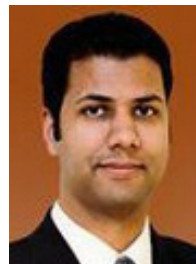
In addition, we are offering four exciting pre-meeting Congresses – including the inaugural Pre-Meeting Congress for Early Career Professionals, organized by the MSA Student Council. The Exhibition will again feature and display the newest developments in commercial technologies aimed at providing new and improved capabilities in your laboratory. Plan to attend the lively daily poster sessions, held in the exhibit hall – they are fun and engaging social events too!

We are pleased to offer what are sure to be fascinating plenary talks: Eric Betzig, winner of the 2014 Nobel Prize in Chemistry “for the development of super-resolved fluorescence microscopy”, will speak on Imaging Cellular Structure and Dynamics from Molecules to Organisms. Keith Riles, a member of the LIGO Scientific Collaboration, that in 2015 detected gravitational waves, a prediction of Einstein’s theory of general relativity, will speak on Detecting Massive Black Holes via Attometry – Gravitational Wave Astronomy Begins.

The Executive Program Committee and all of our symposium organizers have worked tirelessly to produce the technical program for Microscopy and Microanalysis 2017. On behalf of the program committee, MSA, MAS and IFES, welcome to Microscopy and Microanalysis 2017 and St. Louis, Missouri. Have a great week!



Jay Potts
Program Committee Chair
University of South Carolina
School of Medicine



Yoosuf Picard
Program Vice-Chair
Carnegie Mellon University



Kat Crispin
MAS Co-Chair
Pennsylvania State University



Michael Moody
IFES Co-Chair
University of Oxford,
United Kingdom

Imaging Cellular Structure and Dynamics from Molecules to Organisms

MONDAY 9:00 AM ROOM: America's Ballroom (2nd Level)

Eric Betzig, Ph.D., Janelia Farm Research Campus, Ashburn, Virginia



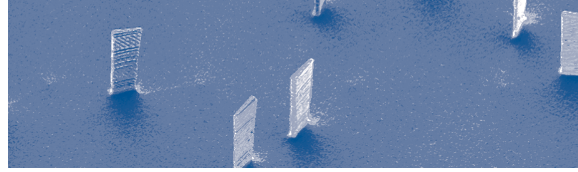
Eric Betzig obtained a B.S. in Physics from Caltech and a Ph.D. in Applied Physics at Cornell. In 1988, he became a PI at AT&T Bell Labs where he extended his thesis work on near-field optical microscopy, the first method to break the diffraction barrier. By 1993, he held a world record for data storage density and recorded the first super-resolution fluorescence images of cells as well as the first single molecule images at ambient temperature. Frustrated with technical limitations and declining standards as more jumped into the field, he quit science and by 1996 was working for his father's machine tool company. The commercial failure of the technologies he developed there left him unemployed in 2003 and looking for new directions. This search eventually culminated in his co-invention of the super-resolution technique photo-activated localization microscopy (PALM) with his best friend, Bell Labs colleague Harald Hess. For this work, Betzig was co-recipient of the 2014 Nobel Prize in Chemistry along with Stefan Hell and William E. Moerner. Since 2005, he has been a Group Leader at the Janelia Research Campus, developing new optical imaging technologies for biology.

Eric Betzig¹

¹. Janelia Research Campus, Howard Hughes Medical Institute, Ashburn, VA USA.

The hallmark of life is that it is animate. Every living thing is a complex pocket of reduced entropy through which matter and energy flow continuously. Thus, although structural imaging is informative, a more complete understanding of the molecular basis of cellular physiology requires high-resolution imaging of the dynamics of the cell in its native state across all four dimensions of spacetime simultaneously.

Unfortunately, several factors conspire to render such unperturbed, physiological 4D imaging difficult. First, as powerful as genetically encoded fluorescent proteins have become, until recently they have rarely been used at endogenous expression levels, and therefore can upset the homeostatic balance of the cell. New genome editing technologies, specifically CRISPR / CAS9, address this problem. Second, conventional live cell imaging tools such as spinning disk confocal microscopy are too slow to study fast cellular processes across cellular volumes, create out-of-focus photo-induced damage and fluorescence photobleaching, and subject the cell at the point of measurement (i.e., the excitation focus) to peak intensities orders of magnitude beyond that under which life evolved. In the past few years, we have used “non-diffracting” beams, specifically Bessel beams and 2D optical lattices, to create ultra-thin light sheets capable of imaging of sub-cellular dynamics in 3D across whole cells and small embryos with near-isotropic resolution at up to 1000 image planes/sec over hundreds of time points ([1], Fig. 1). We have worked with over fifty different groups to apply these tools in areas including: mitotic spindle alignment during asymmetric stem cell division [2]; actomyosin contractions driving the initial gastrulation of *C. elegans* embryos [3]; binding kinetics of single transcription factor molecules to DNA in live stem cells [4]; dynamic, heterogeneous remodeling of P granule proteins in *C. elegans* embryos [5]; asymmetric formation of clathrin-coated pits on the dorsal /ventral surfaces at the leading edge of motile cells [6]; rapid 3D redistribution of actin in T cells during the formation for the immunological synapse [7]; and spatiotemporal quantification of microtubule growth tracks throughout the cellular volume at all mitotic stages [8].



Finally, much of the contribution of optical microscopy to cell biology has come from observing individual cells cultured onto glass substrates, and yet it is certain that they did not evolve there. True physiological imaging likely requires studying cells in their parent organisms, where all the external environmental cues that drive gene expression, and hence their structural and functional phenotypes, are present. However, such imaging is compromised by the highly inhomogeneous refractive index of most biological tissues, which distorts light rays and thereby degrades both resolution and signal. We have adopted methods of adaptive optics (AO), initially developed in astronomy, to recover diffraction-limited performance deep within living systems ([9], Fig. 2, left and bottom), and have recently combined AO on both the excitation and detection arms of our lattice light sheet microscope to image sub-cellular dynamics noninvasively within multicellular systems such as developing zebrafish embryos (unpublished, Fig. 2, upper right).

References:

- [1] B.-C. Chen, *et al.*, *Science* **346**, (2014), 1257998.
- [2] S.J. Habib, *et al.*, *Science* **339**, (2013), p. 1445.
- [3] M. Roh-Johnson, *et al.*, *Science* **335**, (2012), p. 1232.
- [4] J. Chen, *et al.*, *Cell* **156**, (2014), p. 1274.
- [5] J.T. Wang, *et al.*, *eLife* **3**, (2014), p. e04591.
- [6] C. Kural, *et al.*, *Mol. Biol. Cell* **26**, (2015), p. 2044.
- [7] A.T. Ritter, *et al.*, *Immunity* **42**, (2015), p. 864.
- [8] N. Yamashita, *et al.*, *J. Biomed. Opt.* **20**, (2015), p. 101206.
- [9] K. Wang, *et al.*, *Nat. Meth.* **11**, (2014), p. 625.

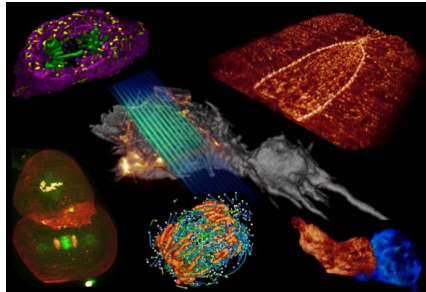


Figure 1. In lattice light sheet microscopy, an ultrathin illumination plane (blue-green, center) excites fluorescence (orange) in successive planes as it sweeps through a specimen (gray) to generate a 3D image. Applications in mitosis, embryonic development, and immunology are shown in several surrounding examples [1].

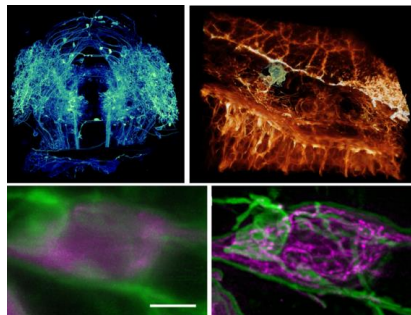


Figure 2. Top Left: Adaptive optical (AO) two-photon image of a sparse set of neurons across 240 x 240 x 270 μm in the developing zebrafish brain [9]. Bottom: Two color confocal images of plasma membranes (green) and mitochondria (magenta) in a neuron 150 μm deep, before (left) and after (right) AO correction [9]. Top Right: AO lattice light sheet microscopy of different cell types in the developing zebrafish ear, showing skin cells (top layer), the fluid-filled perilymphatic space (middle) containing a neutrophil (light blue), and hindbrain neurons (bottom layer).

> Plenary Talk #2

Detecting Massive Black Holes via Attometry—Gravitational Wave Astronomy Begins

MONDAY 11:15 AM **ROOM: America's Ballroom (2nd Level)**

Keith Riles, Ph.D., University of Michigan, Ann Arbor



In their first observing run, the two detectors of the Advanced Laser Interferometer Gravitational-Wave Observatory (Advanced LIGO) simultaneously observed transient gravitational-wave signals. The detected waveforms indicated the inspiral and merger of pairs of massive black holes more than 1 billion years ago. These discoveries marked the first direct detections of gravitational waves and the first observations of binary black hole mergers. Ironically but perhaps not surprisingly, the detection of these cataclysmic events so far away depended on measuring distance changes between mirrors at the attometer level. The first gravitational-wave discoveries and the instruments that made them possible are presented.

Professor Riles carries out research into the fundamental forces of nature, working in both gravitational wave and elementary particle physics. He leads the Michigan Gravitational Wave Group and is a member of the LIGO Scientific Collaboration (LSC), which in September 2015 discovered gravitational waves from the merger of two massive black holes. This \$300 million project, led by Caltech and MIT, operates 4-km Michelson laser interferometers at sites in Hanford, Washington and Livingston, Louisiana. These interferometers are designed to measure minute disturbances in space itself to a relative precision better than 1 part in a billion trillion (10^{-21}). Transient “ripples in space” can emanate from violent but distant astrophysical phenomena, including colliding black holes or neutron stars and supernovae.

Using LIGO data, the Michigan Gravitational Wave Group has placed upper limits on longer-lived but still weaker ($<10^{-24}$) ripples from unknown, rapidly spinning neutron stars in the Milky Way. Searches are now under way for gravitational waves emitted by isolated neutron stars using an algorithm called PowerFlux for binary neutron stars, using an algorithm called TwoSpect. Both programs were developed by the University of Michigan group. In addition, the group has carried out extensive work on LIGO detector characterization, including calibration, and on detector commissioning.

Professor Riles has also spent part of his research time in recent years studying the physics potential and the detector requirements of a future linear electron-positron collider with a center of mass energy of 350 GeV and higher.

2017 COUNCIL – OFFICERS & DIRECTORS

President	Ian M. Anderson
Past President	Michael Marko
President-Elect	Robert L. Price
Secretary	Pamela F. Lloyd
Treasurer	Peter A. Crozier
Director	Esther Bullitt
Director	Luisa Amelia Dempere
Director	Elizabeth A. Dickey
Director	Andreas Holzenburg
Director	Deborah F. Kelly
Director (Local Affiliated Societies)	Beverly E. Maleeff
Director	Paul M. Voyles

APPOINTED OFFICERS

Archives	Michael Marko
Awards Committee Chair	Christine A. Brantner
Bylaws	Michael Marko
Certification Board Chair	Edward P. Calomeni
Educational Outreach Committee Chairs	Dave Becker Alyssa Waldron
Educational Resources Chair	Elizabeth R. Wright
Fellows Chair	Robert L. Price
Finance	Peter A. Crozier
Information Technology	Nestor J. Zaluzec
International Committee	David C. Bell
Membership Committee Chair	Jeffrey Lengyel
Nominating Committee Chair	Michael Marko
Placement Office	David W. Tomlin
Sustaining Members Chair	Stephen E. Mick
Student Council President	Joshua Silverstein
Technologists' Forum	Caroline A. Miller

FOCUSED INTEREST GROUPS

Focused Interest Group Chair	Andrew D. Vogt
3D Electron Microscopy in the Biological Sciences	Teresa Ruiz Michael Radermacher
Aberration-Corrected Electron Microscopy	Paul M. Voyles
Atom Probe Field Ion Microscopy	Arun Devaraj
Cryo-preparation	Kim Rensing
Diagnostic Microscopy	Jon E. Charlesworth
Electron Crystallography and Automated Mapping Techniques	Yoosuf N. Picard
Electron Microscopy in Liquids and Gas (EMLG)	Raymond R. Unocic
Facilities Operation & Management (FOM)	Christine A. Brantner
Focused Ion Beam	Nicholas Antoniou
Pharmaceuticals	John-Bruce D. Green
MicroAnalytic Standards	Julien M. Allaz

2017 STUDENT COUNCIL

President	Joshua Silverstein
Past President	James P. Kilcrease
President-Elect	Janet L. Gbur
Secretary	A. Cameron Varano
Treasurer	Ethan L. Lawrence
Program Chair	William J. Bowman

PUBLICATIONS

Microscopy and Microanalysis Editor in Chief	John F. Mansfield
Onsite Program Guide Editor	Richard L. Martens
M&M 2017 Proceedings Editor	Gail J. Celio
Microscopy Today Editor	Charles E. Lyman

M&M 2017 ANNUAL MEETING PROGRAM CHAIR

Jay D. Potts

SOCIETY & MEETING MANAGEMENT

Association Management	Drohan Management Group
Managing Director	Robert Dziuban
Meeting Management	Conference Managers
Meeting & Registration Managers	Nicole Guy, Maeve Carey, Corey Siembieda
Exhibition Management	Corcoran Expositions, Inc.
Exhibits & Sponsorship Managers	Doreen Bonnema, Mary Michalik

MSA PAST PRESIDENTS

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

2017

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

2016

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

2015

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

2014

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

2013

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

2012

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

2011

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

2010

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

2009 *(Inaugural Class)*

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

PHYSICAL SCIENCES (2017)

Nestor J. Zaluzec
Argonne National Laboratory



A Fellow of both Oak Ridge National Laboratory and the Computational Institute of the University of Chicago, Zaluzec has and continues to hold the tripartite role of Senior Scientist, Educator and Inventor at Argonne National Laboratory. As an innovator, his research includes development of instrumentation and techniques for state-of-the-art analysis in X-ray and electron spectroscopy, as well as electron optics, targeted toward expanding the impact of electron-optical beam lines for characterization of soft and hard matter in both static and dynamic states. In addition to creating tools for science, as a researcher he also wields these bleeding edge technologies with collaborators to study vexing problems in technologically important materials. Over the last 40 years, this research has included studies of: structural phase transformations, radiation damage in metals and ceramics, immobilization of nuclear waste, magnetic nano-arrays, elemental segregation in: alloys, semiconductors, polymers, and catalysts; in vacuum, gases and liquids. He is now expanding his interests into the realm of soft-matter and cryo-microscopy of proteins and macromolecules. One of the earliest to realize the impact of the Internet he established the TelePresence Microscopy Collaboratory, which served as a early model for outreach to the community providing unencumbered access to scientific resources. For the last quarter of a century, he has also presided over the Microscopy Listserver, a communication forum that links over four thousand microscopists and microanalysts worldwide. In addition to his prior and current adjunct and visiting professorial appointments at universities (IIT, UIUC, UIC, NIU, Manchester), he is also a member of several professional societies (MSA, MAS, MSC/SMC, ACMM, EMS, and MMMS) and has held various roles therein. He also engages the next generation of scientists through his work with middle and high school students via the Illinois Junior Academy of Science.

BIOLOGICAL SCIENCES (2017)

David W. Piston
Washington University



David W. Piston is the Edward J. Mallinckrodt Jr. Professor of Cell Biology & Physiology, Physics, and Bioengineering at Washington University in St. Louis. Dr. Piston received his training in physics with a bachelor degree from Grinnell College, followed by M.S. and Ph.D. degrees from the University of Illinois. His doctoral research was performed with Enrico Gratton, and he subsequently completed a postdoctoral research fellowship in Applied Physics with Watt Webb at Cornell University. During his time at Cornell, two-photon excitation microscopy was invented, which led Dr. Piston into biomedical research. From 1992 to 2014, Dr. Piston was on the faculty at Vanderbilt University. He was a Beckman Young Investigator Award (1993), NIH Study Section Chair (2004-2006), a member of the Searle Scholars Advisory Board (2006-2012), and is currently the Associate Editor for Cell Biophysics of the Biophysical Journal. His diverse research group focuses on the understanding the molecular mechanisms that underlie hormone secretion from islets of Langerhans in the pancreas. Driven by this biomedical focus, the lab develops and applies novel fluorescence microscopies to improve temporal resolution and increase information content. These approaches include multi-color fluctuation spectroscopy, light sheet microscopy, hyperspectral imaging, and correlative light and electron microscopy. To optimize these methods, his lab also develops novel biosensors, largely based on the Green Fluorescent Protein and its relatives. His lab combines these new approaches and probes to allow quantitative measurements of constituent islet cell behaviors in situ at various points along key signaling pathways for glucose homeostasis.

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

	BIOLOGICAL SCIENCES	PHYSICAL SCIENCES
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 C. Steven	Ondrej L. Krivanek
2009	Jacques Dubochet	Robert Sinclair
2010	George Papas	Michael S. Isaacson
2011	Ueli Aebi	Hannes Lichte
2012	Timothy S. Baker	Ulrich Dahmen
2013	David J. DeRosier	C. Barry Carter
2014	Wah Chiu	David J. Smith
2015	Michael W. Davidson	Peter W. Hawkes
2016	Kenneth H. Downing	George W. Smith

BURTON MEDAL AWARD (2017)

Christopher J. Russo

MRC Laboratory of Molecular Biology

Born in Detroit, Michigan, Chris attended the University of Notre Dame where he studied electrical engineering and philosophy, obtaining two bachelors degrees. He then went on to graduate school at Harvard and MIT as part of the HST Medical Engineering and Medical Physics program, a joint course between Harvard College, MIT and Harvard Medical School, where he studied physics and medicine. Under the supervision of Jene Golovchenko (Physics, Engineering) and Daniel Branton (Biology), he completed his PhD thesis on imaging DNA attached to carbon nanotubes using several microscopy methods, including scanning probe and high-resolution aberration corrected electron microscopy.

After his PhD he did a short Post-Doc in the Physics Department at Harvard. During this time, he developed a new technique to create nanopores in graphene with atomic precision that combined ion bombardment with high energy electron irradiation.

He then moved to the MRC Laboratory of Molecular Biology in Cambridge UK to do a post-doc with Lori Passmore. Together, they worked on developing new methods for electron cryomicroscopy (cryo-EM), and in particular focused on how the specimen support could affect the resolution of cryo-EM images. This led to a number of advances including simple techniques to modify graphene for use as a specimen support for biological molecules and the development of a new specimen support structure, made entirely of gold, that reduced movement during imaging fifty-fold. Chris has since started his own group at LMB, and continues to study the physical phenomena that limit resolution in cryo-EM and thus enable the development of new devices, instruments and methods to improve the imaging power of the electron microscope in biology.



MORTON D. MASER DISTINGUISHED SERVICE AWARD (2017)

David W. Tomlin

Azimuth Corporation

Dave Tomlin has been a member of MSA since 1999. He has served as: Chair of the Education Committee (2013-2015), MegaBooth Committee member (2003-2014), Coordinator of the MegaBooth (2015-present), Placement Office Co-Chair (2012-2014), Placement Office Chair (2015-present), Director-Local Affiliated Societies (2009-2011), Symposium Organizer and Session Chair (2007), MSA Logo and Website Redesign Team (2009), Website Redesign Team (2015) and is a Technologist Forum member. He is also an active member of his local affiliate society, the Microscopy Society of the Ohio River Valley (MSORV) where he is currently the webmaster and is finishing his second year as President. He has also served as Chair, Bulletin Editor, Webmaster and Treasurer for the Dayton Local Section of the American Chemical Society. Dave has also been active in his local community, where he served on the board of the local youth soccer program, was the Committee and Advancement Chair for BSA Troop 114, and for the last 7 years he has served as President and Treasurer of the Tri-County North Band Boosters.

Dave received his B.S. in Chemistry (1985) and Ph.D. in Physical Chemistry (1990), both from Miami University in Oxford, OH. While completing his doctorate, he held a Department of Energy Research Participation Fellowship (1986-1990) at the EG&G Mound Labs, Miamisburg, OH. He also held a National Research Council Post-Doctoral Fellowship (1991-1993) at the Naval Research Laboratory, Washington, DC. For the last 22 years he has been at the Air Force Research Laboratory, Materials and Manufacturing Directorate, Wright-Patterson Air Force Base, Ohio. His research interests are focused on utilizing optical, confocal, electron and ion beam microscopies, to investigate failures in semiconductor and electronic devices.



YEAR RECIPIENT

1975	James Lake	1998	Ian M. Anderson
1976	Michael S. Isaacson	1999	Zhong Lin Wang
1977	Robert Sinclair	2000	Eva Nogales
1978	David C. Joy	2001	Jian Min Zuo
1979	Norton B. Gilula	2002	Nigel D. Browning
1980	John C.H. Spence	2003	Frances M. Ross
1981	Barbara J. Panessa-Warren	2004	Z. Hong Zhou
1982	Nestor J. Zaluzec	2005	David J. Larson
1983	Ronald Gronsky	2006	David A. Muller
1984	David B. Williams	2007	Peter D. Nellist
1985	Richard D. Leapman	2008	Steven J. Ludtke
1986	J. Murray Gibson	2009	Eric A. Stach
1987	Ron A. Milligan	2010	Sergei V. Kalinin
1988	A.D. Romig, Jr.	2011	Radostin Danev
1989	Laurence D. Marks	2012	David S. Ginger
1990	W. Mason Skiff	2013	John L. Rubinstein
1991	Joseph R. Michael	2014	Maria Varela
1992	Kannan M. Krishnan	2015	Andrew M. Minor
1993	Joseph A.N. Zasadzinski	2106	Miaofang Chi
1994	Jan M. Chabala		
1995	Joanna L. Batstone		
1996	Vinayak P. Dravid		
1997	P.M. Ajayan		

YEAR RECIPIENT

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

ALBERT CREWE AWARD (2017)

Pinshane Y. Huang

University of Illinois, Urbana-Champaign

Pinshane Y. Huang is an Assistant Professor in Materials Science and Engineering at the University of Illinois Urbana-Champaign. She holds a PhD in Applied Physics from Cornell University and completed a postdoctoral fellowship at Columbia University. Huang's work in aberration-corrected microscopy and spectroscopy has been instrumental in the discovery of novel physical phenomena in two-dimensional (2D) materials and the realization of atomically-thin electronics. Her key contributions include: elucidating the structure and properties of defects in single atomic layers of graphene and 2D semiconductors, providing the first atomic-scale view into the structure and dynamics of a two-dimensional silica glass, and characterizing interfaces in 2D devices. Since starting her research lab at the University of Illinois in 2015, Huang has established a research group focused on using electron microscopy and spectroscopy to design a new generation of flexible electronics and energy harvesting devices.

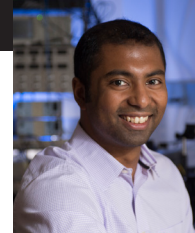


GEORGE PALADE AWARD (2017)

Rengasayee Veeraraghavan

Virginia Tech Carilion Research Institute

Rengasayee (Sai) Veeraraghavan earned his PhD from the University of Utah's Department of Bioengineering and completed postdoctoral training at the University of Utah's Department of Mathematics and at the Virginia Tech Carilion Research Institute. He is currently a Research Assistant Professor at the Virginia Tech Carilion Research Institute investigating the structural underpinnings of the propagation of electrical excitation through the heart in health and in disease. As a postdoctoral trainee, he investigated the functional implications of the spatial organization of proteins and their ultrastructural milieu by combining an array of techniques including single molecule localization microscopy, transmission electron microscopy and whole heart optical voltage mapping. As part of this work, he developed Stochastic Optical Reconstruction Microscopy-based Relative Localization Analysis, a novel approach for high throughput quantitative assessment of the spatial organization of proteins from single molecule localization data. Using this approach, he has identified a sodium channel-rich nanodomain within the cardiomyocyte intercalated disk and its involvement in non-canonical mechanisms of electrical communication between cardiomyocytes. These findings could prompt a paradigm shift in our understanding of the mechanisms underlying cardiac excitation spread and provide the basis for the development of novel anti-arrhythmic therapies. In ongoing research, he is investigating the role of vascular dysfunction in dysregulating intercalated disk nanodomains and the contribution of these effects to the genesis and progression of atrial fibrillation.



YEAR RECIPIENT

2012	Wu Zhou
2013	Lena Fitting-Kourkoutis
2014	Jinwoo Hwang
2015	Meng Gu
2016	Ryo Ishikawa

YEAR RECIPIENT

2012	Gabriel C. Lander
2013	Peng Ge
2014	Ricardo C. Guerrero-Ferreira
2015	Alexey Amunts
2016	Dmitry Lyumkis

HILDEGARD H. CROWLEY OUTSTANDING TECHNOLOGIST AWARD FOR BIOLOGICAL SCIENCES (2017)



Patricia S. Connelly
National Institutes of Health

Patricia Stranen Connelly has a B.A. in biology from Immaculata University and began her career in electron microscopy in 1971 with Gerd Maul at Temple University Health Sciences Center. She continued at the Wistar Institute of Anatomy and Biology and was recruited in 1976 to join the labs of Shinya Inoué and Lew Tilney at the University of Pennsylvania where she remained until Lew's retirement in 2005. Her career continued at the National Heart, Lung, and Blood Institute of NIH where she assisted Mathew P. Daniels in the founding of the Electron Microscopy Core Facility.

Pat has received recognitions such as Outstanding Basic Science Award and an Orloff Science Award from NHLBI. Her main focus has been to assist others, from students to seasoned investigators, by passing on the knowledge and wisdom she has gained through the years on teaching microscopy, protocols, machines, and on moving EM laboratories and microscopes. This is accomplished not only by replying to requests of past students and co-workers and those on the Microscopy List Server but also those whom she comes in contact with at M&M each year. She has been an active member of the Facilities Operation and Management Focus Interest Group and has served as its secretary. She volunteers at the Outreach/Project Micro Booth and assists with the Family Affair Session.

CHUCK FIORI OUTSTANDING TECHNOLOGIST AWARD FOR PHYSICAL SCIENCES (2017)



Richard L. Martens
The University of Alabama

Richard L. Martens began his electron microscopy career at "the turn of the century." After receiving his BA in English in 1995 from The University of Wisconsin, Madison and an AD in Electron Microscopy from the Madison Area Technical College in Madison, Wisconsin, Richard worked at Imago Scientific Instruments, (now Cameca Instruments, Inc.) developing instrumentation and specimen preparation techniques for the local electrode atom probe microscope. Richard became manager of the Central Analytical Facility (CAF) at The University of Alabama in 2006. The CAF maintains major research instrumentation and is a "hands-on" user facility – training and educating students, faculty and staff on using research instrumentation. The CAF is a premier microanalytical and microstructural characterization facility within the Southeast region. In 2012, Richard was on the local organizing committee for the 53rd International Field Emission Symposium, (IFES) that was held at the University of Alabama. In 2013, he was elected to leader of the MSA Atom Probe Focused Interest group. In 2016, Richard became the Editor of the M&M Onsite Program Guide, helped organize the NSF sponsored 1st Atom Probe Tomography (APT) Workshop for Earth Sciences and the 1st MSA Pre-Meeting Congress on APT. He was also on the organizing committee for the MAS 5th Topical Conference on EBSD.

YEAR RECIPIENT

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

YEAR RECIPIENT

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

Established 1968

MAS 2017 COUNCIL – OFFICERS

EXECUTIVE COUNCIL

President	Masashi Watanabe
President-Elect	Rhonda Stroud
Secretary	Heather A. Lowers
Treasurer	Elaine Schumacher

DIRECTORS

Katherine (Kat) Crispin
 Yoosuf Picard
 Julie Chouinard
 Vincent (Vin) Smentkowski
 Emma Bullock
 Roseann Csencsits
 Sihar Hihath (Student Liaison)

COMMITTEE CHAIRS

Archivist	John H. Fournelle
Affiliated Regional Societies & Tour Speakers	Kerry Siebein
Awards Committee	Nicholas W.M. Ritchie
Computer Activities	Nicholas W.M. Ritchie
Corporate Liaison	Vernon E. Robertson
Education	Inga Holl Musselman
Finance	Joseph R. Michael
International Liaison	James McGee
M&M 2016 Co-Chair	Brian Gorman
M&M 2017 Co-Chair	Katherine L. Crispin
Membership Services	Mike Nagorka
MicroNews Editor	Assel Aitkaliyeva
Microscopy and Microanalysis Editorial Board	Donovan Leonard
Nominations	Rhonda Stroud
Social Media	Katherine L. Crispin
Strategic Planning	Keana Scott
Sustaining Membership	Lucille Giannuzzi
Topical Conferences	Paul K. Carpenter

PAST PRESIDENTS

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

DUNCUMB AWARD FOR EXCELLENCE IN MICROANALYSIS

Thomas F. Kelly

Thomas F. Kelly received his B.S. with highest honors in Mechanical Engineering from Northeastern University in June 1977 and a Ph.D. in Materials Science in December 1981 from the Massachusetts Institute of Technology. He was on the faculty at the University of Wisconsin-Madison from January 1983 until September 2001. Tom was also Director of the Materials Science Center from 1992 to 1999.



While serving as a professor of Materials Science and Engineering in the University of Wisconsin-Madison College of Engineering until September 2001, Tom founded Imago Scientific Instruments to commercialize the Local Electrode Atom Probe, or LEAP. The LEAP is a major advance for atom probe tomography by capturing a three-dimensional atom-by-atom "images" of materials at high speeds and high resolution.

Tom Kelly has been active in the fields of analytical electron microscopy, atom probe microscopy, rapidly solidified materials, and electronic and superconducting materials for over 40 years. He has published over 250 papers and 17 patents in these fields in that time. Tom has driven innovation in instrumentation for atom probe tomography over the past two decades. He continues to pursue microscopy innovations such as atomic-scale tomography by developing new detector technologies and combining atom probe tomography with electron microscopy in a single instrument.

Tom was a member of the executive council of the Microscopy Society of America from 2000 to 2002, the International Steering Committee of the International Field Emission Society from 2002 to 2008 and President of the International Field Emission Society from 2006 to 2008. He has served as the inaugural chair of the Microscopy Today Innovation Awards Committee for the Microscopy Society of America since 2010. Tom was an Editor of Microscopy and Microanalysis from 2010 to 2015 and is on the Editorial Board of Microscopy Today. From 2010 to 2012, Tom served on the Council of the Microanalysis Society. In 2012, he was elected President of the Microanalysis Society and served as President from August 2014 to August 2016. He is a fellow of the Microscopy Society of America and the International Field Emission Society.

Previous Awardees

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

KURT F.J. HEINRICH AWARD

Andrew Herzing

Andrew Herzing received his M.Sc. and Ph.D. in materials science and engineering from Lehigh University under the supervision of Professor Christopher Kiely. During this period he was awarded the George P. Conard award for outstanding graduate student. He then spent two years as a National Research Council postdoctoral fellow at the National Institute of Standards and Technology in Gaithersburg, MD, where he is now a staff scientist in the Material Measurement Laboratory. Andrew's research is centered on the quantitative structural and chemical characterization of small volumes of material using electron microscopy techniques. In particular, he is currently focused on the characterization of organic composites, developing quantitative methods for three-dimensional characterization of materials using tomographic techniques, and the measurement of surface plasmon resonance behavior in individual nanostructures. He has contributed to over 70 peer-reviewed publications and three book chapters in a wide variety of fields involving electron microscopy.



Previous Awardees

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

PRESIDENTIAL SCIENCE AWARD

Michael K. Miller

Michael K. Miller, of ORNL's Materials Science and Technology Division, began his career at ORNL in the Metals and Ceramics Division in 1983. He received his D. Phil. from the Department of Metallurgy and Science of Materials, Oxford University, in 1977 and continued there as a Science Research Council Fellow until 1979. He spent 4 years as a visiting scientist at the U.S. Steel Research Laboratory in Monroeville, Pennsylvania, before joining ORNL.



Dr. Miller is recognized as one of the premier scientific leaders in the field of atom probe field-ion microscopy and atom probe tomography. He has pioneered the application of these techniques to a broad range of materials, statistical data, analysis methods, and new instrument design.

During his tenure at ORNL, Miller has established himself as the preeminent researcher in atom probe field-ion microscopy and atom probe tomography. He is currently leading ORNL's fundamental experimental efforts to understand and exploit the unprecedented properties and behaviors of nanostructured ferritic steels.

His scientific impact is demonstrated not only by his ongoing research and development accomplishments, but also by his contributions to the continued success of the Shared Research Equipment (SHaRE) User program at ORNL. His work attracts atom probe users from domestic and international universities, industry, and other national laboratories, helping to make the SHaRE atom probe facility into the leading laboratory of its kind.

Miller has authored or co-authored more than 460 publications in peer-reviewed journals, written three books, co-edited a book and 13 special volumes, and has made more than 730 presentations, of which 125 were invited. He has been honored with several major awards, including the Coslett Award in 2004 from the Microbeam Analysis Society and the Prince Hassan Medal for Scientific Contributions at the International Level in 1998. Most recently, Miller, a resident of Oak Ridge, was recognized as a 2009 Fellow of The Minerals, Metals and Materials Society (TMS) and as a 2010 Fellow of the Microscopy Society of America.

Miller became a Corporate Fellow in 2010.

PRESIDENTIAL SERVICE AWARD

Daniel Kremser

Dr. Dan Kremser joined Battelle in January 2005 and is a Principal Research Scientist in their Advanced Materials Resource Group. He has over 35 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 electron 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 in 1982 and has served our society with distinction and tireless energy in several roles, starting as MAS Director from 2005-2007, Membership Services Chair from 2008-2012 and finally as Treasurer from 2013-2016. 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 of each of the above as well as other council positions.

Previous Awardees

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

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	2016	H. Lowers

MAS OUTSTANDING PAPER AWARDS (2017)

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

RAYMOND CASTAING – BEST STUDENT PAPER AWARD:

Volatile Addition to the Inner Solar System Between 4.566 and 4.564 Ga: Evidence from Angrite Meteorites

A. R. Sarafian¹, S. G. Nielsen¹, H. R. Marschall¹, G. A. Gaetani¹, E. H. Hauri², K. Righter³, E. Sarafian¹

¹Woods Hole Oceanographic Institution, 266 Woods Hole Rd. Woods Hole MA

²Department of Terrestrial Magnetism, Carnegie Institution of Washington, Washington, DC

³NASA-JSC, Mailcode XI2, 2101 NASA Pkwy, Houston, TX

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

Multi-Beam Scanning Electron Microscope Design

Pieter Kruit¹ and Yan Ren¹

¹Delft University of Technology, Department of Imaging Physics; Delft, The Netherlands

V.E. COSSLETT – BEST INVITED PAPER AWARD:

Microanalysis of Fossil Micrometeorites and Meteorites to Study A Major Asteroid Collision ~470 Million Years Ago

Philipp R. Heck^{1,2} and Birger Schmitz^{1,3}

¹Robert A. Pritzker Center for Meteoritics and Polar Studies, The Field Museum of Natural History; Chicago, IL, USA.

²Chicago Center for Cosmochemistry and Department of the Geophysical Sciences, The University of Chicago; Chicago, IL, USA.

³Astrogeobiology Laboratory, Department of Physics; Lund University, Sweden.

L.S. BIRKS – BEST CONTRIBUTED PAPER AWARD:

Dissociation of Molecular Ions During the DC Field Evaporation of ZnO in Atom Probe Tomography

Ivan Blum^{1*}, David Zanuttini¹, Lorenzo Rigutti¹, François Vurpillot¹, Julie Douady², Emmanuelle Jacquet², Pierre-Matthieu Anglade², Benoit Gervais², Angela Vella¹, Aurore Gaillard¹

¹Groupe de Physique des Matériaux (GPM), UMR CNRS 6634, Université et INSA de Rouen, Avenue de l'Université, BP 12, 76801 Saint Étienne du Rouvray, France

²Centre de Recherche sur les Ions, les Matériaux et la Photonique (CIMAP), UMR CNRS 6252, ENSICAEN, CNRS, CEA/IRAMIS, Université de Caen, Boulevard Henri Becquerel, BP5133, 14070 CAEN Cedex 05, France

2016-2018 IFES Steering Committee

David J. Larson	President
François Vurpillot	Vice-President
Gregory Thompson	Secretary
Michael Moody	Treasurer
Julie Cairney	
Mattias Thuvander	
Stephan A. A. Gerstl	
Gang Sha	
Ross Marceau	
Baptiste Gault	

IFES Past Presidents

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

IFES Fellows

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

E.W. Müller Young Scientist Award

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

2017 IFES Travel Scholarship Awards

Ziron Peng

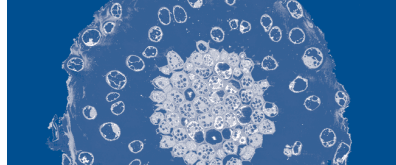
On the Multiple Event Detection in Atom Probe Tomography

Shyam Katnagallu

High Fidelity Reconstruction of Experimental Field Ion Microscopy Data by Atomic Relaxation Simulations

Vahid Adineh

Metallic Nanoshell for Three-Dimensional Chemical Mapping of Low Conductive Materials with Pulsed-Voltage Atom Probe Tomography



> M&M Meeting Awards

M&M STUDENT SCHOLAR AWARDS – SPONSORED BY MSA



Jay Aindow, Academy of Aerospace and Engineering – *K-12 Student Scholarship*
Marwa Belhaj, University of South Carolina
Gabriel Calderon Ortiz, The Ohio State University
Alessandra DiCorato, Northwestern University
Ismail El Baggari, Cornell University
Bryan Esser, The Ohio State University
Everett Grimley, North Carolina State University
Diane Haiber, Arizona State University
Liang Hong, University of Victoria, Canada
Yi Jiang, Cornell University
Takaaki Kinoshita, Soka University, Japan
James Kizziah, University of Alabama, Birmingham
Prashant Kumar, University of Maryland
Jiayao Li, Monash University, Australia
Alexandra Machen, University of Kansas
Vinal Menon, University of South Carolina
Katerina Naydenova, University of Cambridge, United Kingdom
S.M. Bukola Obayomi, Arizona State University
Katherine Spoth, Cornell University
Congli Sun, University of Wisconsin
Aakash Varambhia, Oxford University
Kartik Venkatraman, Arizona State University
Hsin Wei Wu, Arizona State University
Jie Yang, Boston University – *Raleigh & Clara Miller Memorial Scholarship*
Chenyu Zhang, University of Wisconsin
Pei Zhang, University of Wisconsin
Yong Zhang, Monash University, Australia

M&M STUDENT SCHOLAR AWARDS – SPONSORED BY MAS



Elaina Anderson, University of Michigan
Yi-Sheng Chen, Oxford University, United Kingdom
Philipp Kürsteiner, Max Planck Institute for Iron Research, Germany
Genevieve Lee, The Ohio State University
Seungyeol Lee, University of Wisconsin
Gen Maeda, Kogakuin University, Japan
Benjamin Martineau, Cambridge University, United Kingdom
Yang Ning, University of Houston
Alan Pryor, University of California, Los Angeles
Saransh Singh, Carnegie Mellon University
Joseph Tessmer, Carnegie Mellon University
Weiyi Xie, The Ohio State University
Xuyang Zhou, University of Alabama

M&M POSTDOCTORAL SCHOLAR AWARDS

Priyamvada Acharya, National Institutes of Health – *Robert P. Apkarian Memorial Scholarship, Biological Sciences*
Cédric Barroo, Free University of Brussels, Belgium
Hamish Brown, Monash University, Australia – *Robert P. Apkarian Memorial Scholarship, Physical Sciences*
Wei Guo, Oak Ridge National Laboratory
Lewys Jones, University of Oxford, United Kingdom – *Eric Samuel Scholarship*
Emi Kano, University of Alberta, Canada
Linze Li, University of California, Irvine
Dustin McCraw, National Institutes of Health
Michelle Thompson, National Aeronautics and Space Administration
Canhui Wang, National Institute of Standards and Technology
Weizong Zu, North Carolina State University
Aiming Yan, University of California, Berkeley
Yue Zhou, University of Illinois

M&M PROFESSIONAL TECHNICAL STAFF AWARD

Isabel Boona, The Ohio State University