

Michael C. Sarahan

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Date of Birth: May 28, 1983
Citizenship: United States

Education

Ph.D. Material Science, University of California, Davis

Committee: Nigel D. Browning (chair), Klaus van Benthem and James R. Shackelford.

B.S. Chemistry, Texas A&M University, 2005.

Fields of Interest

Scanning transmission electron microscopy (STEM), electron energy loss spectroscopy (EELS), computer vision, image processing, cluster computing and materials science applications improving catalysis, water purification and energy production.

Academic Experience

University of Glasgow, Department of Physics and Astronomy / SuperSTEM

Postdoctoral Research Associate, Alan Craven, May 2010 – Present

- Characterize magnetic films, photovoltaic materials, and ferroelectrics using high-resolution STEM and EELS
- Implement image processing and statistical analysis techniques to extract compositional information from STEM and EELS data
- Develop a programmable fast shutter control system, allowing greater dose limitation to samples and near-simultaneous acquisition of several EELS energy ranges.
- Maintain and coordinate service for the Nion-corrected VG HB501 and Nion UltraSTEM 100 dedicated STEMs
- Beta test Gatan GMS 2.0

University of California, Davis, Department of Chemical Engineering and Materials Science

Research Assistant, Nigel D. Browning, June 2007 – April 2010

- Characterize photocatalytic and hydrogen storage materials using high resolution TEM, STEM, EELS and EDX

- Develop novel tomographic reconstruction and segmentation techniques
- Implement image processing and statistical analysis techniques for low signal to noise ratio TEM and STEM images to maximize information extracted
- Maintain and coordinate service for the JEOL 2500 and probe-corrected JEOL 2100F microscopes
- Train incoming unskilled users on proper use of the microscopes
- Beta test Gatan GIF Quantum
- Coordinated and implemented online microscope reservation system with hardware access control

Teaching Assistant, EMS 232L: Advanced Transmission Electron Microscopy, Spring 2009

Teaching Assistant, EMS 230L: Introductory Transmission Electron Microscopy, Winter 2009

University of California, Davis, Department of Chemistry

Research Assistant, Frank Osterloh, December 2006 – March 2008

- Synthesized semiconductor nanoparticle photocatalysts for solar water splitting
- Characterized products via TEM, STEM, X-ray crystallography, ultraviolet-visible, infrared, and fluorescence spectroscopy

Teaching Assistant, CHEM 2 series: Introductory Chemistry, September 2006 – March 2008

Research Assistant, Giulia Galli, Eric Schwegler, Tadashi Ogitsu, Summer 2006

- Simulated systems of liquid water at atmospheric temperature and pressure to study hydrogen bonding. Simulations performed with classical molecular dynamics and density function theory calculations.
- Developed data processing and plotting routines using standard UNIX tools

PPG Industries, Lake Charles, Louisiana, USA

Chemist June 2005 – April 2006

- Created and implemented analytical methods for:
 - Phenol and semivolatile contaminant content in wastewater
 - Bromophenols content in a process stream
 - Content verification of incoming sodium thiosulfate shipments
- Evaluated potential instrument purchases
- Analyzed samples via gas chromatography, mass spectrometry, atomic absorption analysis, and wet chemistry

Texas A&M University, Department of Chemistry

Research Assistant, Sherry Yennello February 2004 – May 2005

- Created LabVIEW programs to mimic functions of pulse processing electronics
- Set up detectors and electronics for data acquisition
- Tested electronics for functionality and performance

Research Assistant, Abraham Clearfield, April 2003 – February 2004

- Synthesized materials using hydrothermal methods
- Analyzed ion exchange capabilities using atomic absorption spectroscopy
- Determined crystal structures using xray powder diffraction

Teaching Assistant, CHEM 101: Introductory Chemistry Lab, Fall 2002 – Spring 2004

Research

Working Papers

1. Hardware-assisted low-dose imaging in aberration-corrected STEM, with Quentin M. Ramasse
2. Point Defect Characterization from Multiple HAADF-STEM Images Using Multivariate Data Analysis, with Quentin M. Ramasse, Norihiko L. Okamoto and Nigel D. Browning
3. Bandgap changes in semiconductor photocatalysts induced by morphological differences, with Quentin M. Ramasse, Jeffery Aguiar, Frank Osterloh and Nigel D. Browning

Publications

5. Michael C. Sarahan, Miaofang Chi, Daniel J. Masiel, Nigel D. Browning. Point defect characterization in HAADF-STEM images using multivariate statistical analysis, *Ultramic.* 111, 251-257 (2010)
4. Sangtae Kim, Jong Soo Lee, Christoph Mitterbauer, Quentin M. Ramasse, Michael C. Sarahan, Nigel D. Browning and Hee Jung Park. NanoSheaves of CeO₂ with Anomalously High Oxygen Ionic Conductivity, *Chem. Mater.*, 21, 1182-1186 (2009)
3. Michael C. Sarahan, Elizabeth C. Carroll, Delmar S. Larsen, Nigel D. Browning, Frank E. Osterloh. K₄Nb₆O₁₇-derived Photocatalysts for Hydrogen Evolution from Water: Nanoscrolls versus Nanosheets, *J. Solid State Chem.*, 181, 1681-1686 (2008)
2. F. Andrew Frame, Elizabeth C. Carroll, Delmar S. Larsen, Michael Sarahan, Nigel D. Browning, Frank E. Osterloh. First Demonstration of CdSe as a Photocatalyst for Hydrogen Evolution from Water under UV and visible light, *Chem. Comm.*, 19, 2206-2208 (2008)

1. Chao-Yi Chiang, Jonghyuk Lee, Christopher Dalrymple, Michael C. Sarahan, Joseph H. Reibenspies, and Marcetta Y. Darensbourg. Synthesis and Molecular Structures of Mononitrosyl (N_2S_2) $M(NO)$ Complexes (M = Fe, Co), *Inorg. Chem.* 44, 9007-9016 (2005)

Invited Seminars

3. Image Processing and Computer Vision in Aberration Corrected STEM
 - Microscopy & Microanalysis 2010, Portland, Oregon, USA, August 2010
2. Image Processing with Python
 - University of California, Berkeley, Berkeley, California, USA, October 2009
1. 2D and 3D Image Processing of STEM Data: Theory and Applications
 - EMPA – Swiss Federal Laboratories for Materials Testing and Research, Dübendorf, Switzerland, September 2009
 - Los Alamos National Laboratory, Los Alamos, New Mexico, USA, August 2009

Contributed conference presentations

5. Statistical Analysis of STEM Images: Characterizing and Quantifying Point Defects
 - Microscopy Conference 2009, Graz, Austria, August 30 – September 4 2009
 - The 67th Annual Meeting of the Microscopical Society of America, Richmond, Virginia, USA, July 26 – 30 2009
 - The 138th Annual Meeting of the Minerals, Metals and Materials Society, San Francisco, California, USA, February 15 – 19 2009
4. Probing Mechanisms of Semiconductor Photocatalyst Activity with EELS
 - EDGE international EELS symposium; Banff, Alberta, Canada, May 17 – 22 2009
3. Examining Morphology Effects on Photocatalytic Activity of Niobate Water Splitting Materials
 - The 66th Annual Meeting of the Microscopical Society of America; Albuquerque, New Mexico, USA, August 3 – 7 2008
 - American Chemical Society Green Chemistry Summer School; Golden, Colorado, USA, July 9 – 17 2008
 - AAAS Pacific Division regional meeting, Waimea, Hawaii, USA, June 15 – 20 2008
2. Examining the Structure of Liquid Water Through Classical and Quantum Computer Simulations
 - Lawrence Livermore National Laboratory summer research symposium, Livermore, California, USA, August 2006

1. LabVIEW Simulation of Pulse Shape Discrimination Electronics

- Sigma Xi Student Research Conference, Montreal, Quebec, Canada, November 11 – 14 2004
- American Physical Society Division of Nuclear Physics meeting, Conference Experience for Undergraduates, Chicago, Illinois, USA, October 27 – 30 2004

Society Memberships

- American Chemical Society, 2002 – Present
- Sigma Xi, 2004 – Present
- American Physical Society, 2004 – Present
- American Association for the Advancement of Science, 2007 – Present
- The Minerals, Metals & Materials Society, 2008 – Present
- Microscopical Society of America, 2008 – Present

Honors, Awards, and Fellowships

- Borge Fellowship, University of California, Davis, Department of Chemistry, 2006 - 2008
- Superior rated presentation at Sigma Xi Student Research Conference, November 2004
- Industry-University Cooperative Chemistry Program – A.E. Martell Undergraduate Chemistry Scholarship, 2002 – 2005
- Eagle Scout, 2001

Leadership Positions

- Member, Campus Recreation Advisory Committee, UC Davis, 2007 – 2009
- Executive Committee Student Member, APS California Section, 2006 – 2007
- President, American Chemical Society – Texas A&M University Student Affiliate Chapter, 2003 – 2004
- Academic Chairman, American Chemical Society – Texas A&M University Student Affiliate Chapter, 2003 – 2004
- Webmaster, American Chemical Society – Texas A&M University Student Affiliate Chapter, 2002 – 2005
- Secretary, American Chemical Society – Texas A&M University Student Affiliate Chapter, 2002 – 2003

- Trip Coordinator, American Chemical Society – Texas A&M University Student Affiliate Chapter, 2002 – 2003

Volunteer Activities

- Website design for the Men's Story Project, October 2009 – Present
- Community involvement with UC Davis service organization, Graduate Student Community Service Committee (GSCSC), 2006 – Present
- Community involvement with PPG Friends, a company-sponsored volunteer organization in Lake Charles, Louisiana, USA, 2005 – 2006
- Judged science fair at Texas A&M Consolidated Middle School 2005
- Involvement with National Chemistry Week activities at Texas A&M – giving tours, assisting with demonstrations, 2001 – 2004
- Assistance with supervision of Science Bowl competitions hosted by Texas A&M University, 2002 – 2005
- Volunteer tutoring in all subjects, especially chemistry and math, 2001 – 2003

Miscellaneous Activities

- Building and repairing computers from parts
- Programming in Digital Micrograph script, C, C++, L^AT_EX, SQL, R, Matlab and Python
- Building and troubleshooting mixed-environment networks consisting of Linux, Windows, and Apple OS X computers
- Electronics soldering and troubleshooting using multimeters
- Structural welding of steel and aluminum using MIG, TIG, stick, and oxy-acetylene techniques

References

- Nigel D. Browning
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- Quentin M. Ramasse
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- David G. Morgan
Cryo-Electron Microscopy Facility Director
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- Sherry Yennello
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