SUHAS SOMNATH, PhD

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EDUCATION

Ph. D., Mechanical Engineering July 2014
University of Illinois at Urbana-Champaign Urbana, IL
Thesis: "Fundamentals of Heat Transfer and Thermal-Mechanical Control for Improved Atomic Force Microscopy"

M. S., Mechanical Engineering May 2011
University of Illinois at Urbana-Champaign Urbana, IL
Thesis: "Improved Nanotopography Sensing via Temperature Control of a Heated Atomic Force Microscope Cantilever"

B. S., Mechanical Engineering (*highest honors*) July 2009
Rutgers University, New-Brunswick Piscataway, NJ

B. S., Computer Science (*high honors*) July 2009
Rutgers University, New-Brunswick Piscataway, NJ

WORK EXPERIENCE

Computer Scientist, Oak Ridge National Laboratory Jun '17 - Present
Advanced Data and Workflows Group, National Center for Computational Sciences

- Serving as a liaison between the physical sciences and computational sciences directorates at ORNL to accelerate scientific research in the physical sciences using computational and computing resources.
- Developing deep learning and machine-learning solutions for scientific problems on high performance computing (HPC) resources.
- Developing and deploying software, infrastructure, and tools to accelerate scientific research including:
  - Universal Spectroscopy and Imaging Data (USID) for representing any measurement data
  - Software packages such as pyUSID for framing scientific problems as computational problems
  - Scaling domain-scientist-developed data analysis codes to run on HPC
  - Catalog of important datasets generated at ORNL and generation of DOIs for data associated with journal publication
  - JupyterHub based workflow solutions for supporting user research and in-house research

Postdoctoral Research Associate, Oak Ridge National Laboratory Oct '14 – Jun '17
Scanning Probe Microscopy Group, Center for Nanophase Materials Sciences

- Developed new scanning probe microscopy and spectroscopy techniques that stream the complete information from the microscope sensor(s) and use big and deep data techniques for extracting material properties. Few highlights:
  - 3,500x faster spectroscopy technique for ultra-fast, high resolution imaging of polarization switching in ferroelectric materials
  - 500x faster current-voltage spectroscopy complemented with Bayesian inference methods
- Founder and lead developer of *pycroscopy* – an open-source python package for processing, analyzing, visualizing microscopy data of low (2D) to high dimensionality (N-D) using an open and universal data format - https://github.com/pycroscopy/pycroscopy

- Developer for *BEAM* - a software platform to perform data analysis and simulation using high performance computing and storage resources at ORNL - http://beam.ornl.gov/
  - Translated several materials science problems to computational problems that would use high performance computing facilities
- Regularly teach and help fellow researchers and users in experiments, data analytics, programming and instrumentation

Graduate Research Assistant, University of Illinois, Sep '09 – Jul '14
Nanoengineering Lab**,** Mechanical Science & Engineering**,**

- Designed, micro-fabricated, numerically modeled, and characterized cantilevers with integrated solid-state heater-thermometers
- Developed new thermal microscopy, lithography, and material characterization techniques for thermal AFM probes using custom hardware, software, and electronics
- Improved AFM microscopy throughput by 1000x using arrays of heated AFM probes in parallel
- Mentored graduate students for their masters theses

AWARDS & HONORS

1. 2017 Postdoctoral Researcher Award – ORNL Awards Night, *Oak Ridge National Laboratory*, Oct 28 2017.
2. Best Poster Award nomination at Materials Research Society Spring 2017 Conference for poster on "Pycroscopy – An open source approach for analyzing and storing material science data", April 19, 2017.
3. 2016 Outstanding Reviewer Award, *Institute of Physics (IOP) Publishing*, Feb 3, 2017
4. Significant Event Award for "Harnessing HPC Capability at OLCF with R Language for Deep Data Science", *Oak Ridge National Laboratory*, Dec 2016
5. 2016 R&D 100 Award for "G-mode: Full Information Acquisition in Scanning Probe Microscopy and Spectroscopy," *The R&D 100 Awards Committee*, Nov 3, 2016
6. 2016 Microscopy Today Innovation Award for novel technique titled "General Mode (G-mode) Microscopy & Spectroscopy", *Microscopy Society of America (MSA) and the Microanalysis Society (MAS)*, July 27, 2016
7. 2016 Microscopy and Microanalysis Postdoctoral Meeting Award for paper titled "Submicron Spatial Resolution in Thermal Desorption Mass Spectroscopy via Rapid Heating Functions using Thermal AFM Probes", *Microscopy Society of America (MSA) and the Microanalysis Society (MAS)*, July 25, 2016
8. Significant Event Award for "The Bellerophon Environment for Analysis of Materials (BEAM)Project – Designed and developed to integrate the computational and analytical power of HPC with advanced instrumentation at CNMS and SNS to perform near real-time, scalable data analysis and computational modeling", *Oak Ridge National Laboratory ORNL*, Apr 2016
9. Finalist for Science as Art competition for poster title "Ferroelectric Butterfly from Big Data Garden," *Materials Research Society (MRS) Spring 2016 Meeting*, Mar 25, 2016
10. Best Poster Award, *Center For Nanoscale Science and Technology (CNST) 10th Annual Nanotechnology Workshop*, *University of Illinois, Urbana-Champaign*, May 2-3, 2012
11. Best Presentation Award – Senior Design Project, *Department of Mechanical Engineering, Rutgers University*, Spring 2009
12. School of Engineering Scholarship, Rutgers University, Aug 2006 – May 2007

13. Dean's List – Handpicked by the School of Engineering dean for outstanding academic performance, *Rutgers University,* Aug 2005 – May 2009

PATENTS

1. US Patent 9,612,257 - "Full Information acquisition in Scanning Probe microscopy and Spectroscopy"

JOURNAL PUBLICATIONS AND BOOK CHAPTERS

Google Scholar: https://scholar.google.com/citations?user=ti-2g0IAAAAJ;

- ≈ 355 citations (as of May 23 2018)
- h-index of 12,
- i10-index of 17.

1. **Somnath, S.**, C. R. Smith, S. V. Kalinin, M. Chi, A. Borisevich, N. Cross, G. Duscher, S. Jesse, "Feature extraction via similarity search: application to atom finding and denoising in electron and scanning probe microscopy imaging," *Advanced Structural and Chemical Imaging,* **4** (1), 3, 2018.
2. Young, S. R., A. Maksov, M. Ziatdinov, Y. Cao, M. Burch, J. Balachandran, L. Li, S. Somnath, R. M. Patton, S. V. Kalinin, and R. K. Vasudevan, "Data Mining for better material synthesis: the case of pulsed laser deposition of complex oxide," *Journal of Applied Physics*, **123**, (11) 115303, 2018.
3. Jesse S., L. Collins, S. Neumayer, **S. Somnath**, and S. V. Kalinin, "Dynamic Modes in Kelvin Probe Force Microscopy: Band Excitation and G-Mode," *Kelvin Probe Force Microscopy*, 49-99
4. **Somnath S.**, K. J. H. Law, A. N. Morozovska, P. Maksymovych, Y. Kim, X. Lu, M. Alexe, R. Archibald, S. V. Kalinin, S. Jesse, and R. K. Vasudevan, "Ultrafast current imaging by Bayesian inversion," *Nature Communications*, **9** (1), 2018.
5. Ganeshkumar, R., **S. Somnath**, C. C. Wei, S. Jesse, S. V. Kalinin, and Z. Rong, "Systematic investigation of ferroelectricity in perovskite nanofiber with scanning probe microscopy," *ACS Applied Materials & Interfaces*, **9** (48) 42131-42138, 2017.
6. Jesse, S., **S. Somnath**, L. Collins, and S. V. Kalinin. "Full Information Acquisition in Scanning Probe Microscopy." *Microscopy Today*, **25** (4), 34-45, 2017
7. **Somnath, S.**, S. Jesse, G. J. Van Berkel, S. V. Kalinin, and O. S. Ovchinnikova, "Improved Spatial Resolution for Spot Sampling in Thermal Desorption Atomic Force Microscopy - Mass Spectrometry via Rapid Heating Functions," *Nanoscale*, **9** (17), 5708-5717, 2017.
8. Li L., Q. Zheng, Q. Zou, S. Rajput, A. Ijaduola, Z. Wu, X. Wang, H. Cao, **S. Somnath**, S. Jesse, M. Chi, Z. Gai, D. Parker, and A. Sefat "Improving superconductivity in BaFe2As2-based crystals by cobalt clustering and electronic uniformity," *Scientific Reports*, **7**, 949, 2017.
9. Li, L., Y. Cao, **S. Somnath**, Y. Yang, S. Jesse, Y. Ehara, H. Funakubo, L-Q Chen, S. V. Kalinin and R. K. Vasudevan., "Direct imaging of the relaxation of individual ferroelectric interfaces in a tensile-strained film," *Advanced Electronic Materials*, vol 3, 1600508, 2017.
10. Hu, H., H. J. Kim, and **S. Somnath**, "Tip-Based Nanofabrication for Scalable Manufacturing," *Micromachines*, 8, no. 3: 90, 2017.
11. **Somnath, S.**, A. Belianinov, S. V. Kalinin, and S. Jesse, "Rapid Mapping of Polarization Switching through Complete Information Acquisition," *Nature Communications*, 7, 13290, 2016.
12. Kalinin, S. V., E. Strelcov, A. Belianinov, **S. Somnath**, R. K. Vasudevan, E. J. Lingerfelt, R. K. Archibald, C. Chen, R. Proksch, N. Laanait, and S. Jesse, "Big, Deep, and Smart Data in Scanning Probe Microscopy," *ACS Nano*, 9068-9086, 2016

13. **Somnath, S.**, Collins L., M. A. Matheson, S. R. Sukumar, S. V. Kalinin, and S. Jesse, "Imaging via complete cantilever dynamic detection: General Dynamic Mode Imaging and Spectroscopy in Scanning Probe Microscopy," *Nanotechnology,* **27**, 414003*,* 2016.
14. Collins, L., A. Belianinov, **S. Somnath**, N. Balke, S. V. Kalinin, and S. Jesse, "Full data acquisition in Kelvin Probe Force Microscopy: Mapping dynamic electric phenomena in real space," vol. 6, 30557, *Scientific Reports*, 2016.
15. Lingerfelt, E. J., A. Belianinov, E. Endeve, O. Ovchinnikov, **S. Somnath**, J. Borreguero, N. Grodowitz, B. Park, R. K. Archibald, C. T. Symons, S. V. Kalinin, O. E. B. Messer, M. Shankar and S. Jesse "BEAM: A Computational Workflow System for Managing and Modeling Material Characterization Data in HPC Environments," *Procedia Computer Science*, vol 80, 2276-80, 2016.
16. Cheng, S., V. Bocharova, A. Belianinov, S. Xiong, A. Kisliuk, **S. Somnath**, A. P. Holt, O. S. Ovchinnikova, S. Jesse, H. Martin, T. Etampawala, M. Dadmun and A. P. Sokolov "Unraveling the Mechanism of Nanoscale Mechanical Reinforcement in Glassy Polymer Nanocomposites," *Nano Lett*, 2016.
17. Collins, L., A. Belianinov, **S. Somnath**, B. Rodriguez, N. Balke, S. V. Kalinin, S. Jesse, "Multifrequency spectrum analysis using fully digital G Mode-Kelvin probe force microscopy," vol 27, 105706, *Nanotechnology*, 2016.
18. **Somnath, S.**, A. Belianinov, S. V. Kalinin, and S. Jesse, "Full information acquisition in piezoresponse force microscopy," vol 107, 263102, *Applied Physics Letters*, 2015.
19. **Somnath, S.**, J. O. Liu, M. Bakir, C. B. Prater, and W. P. King, "Multifunctional Atomic Force Microscope Cantilevers with Lorentz Force Actuation and Self-heating Capability," *Nanotechnology,* vol. 25, 395501*,* 2014.
20. **Somnath, S.** and W. P. King, "An Investigation of Heat Transfer between a Microcantilever and a Substrate for Improved Thermal Topography Imaging," *Nanotechnology,* vol. 25, 365501*,* 2014.
21. Seong, M. H., **S. Somnath**, H. J. Kim, and W. P. King, "Parallel Nanoimaging using an Array of 30 Heated Cantilevers," *RSC Advances*, vol 4., 24747-54*,* 2014.
22. Hu, Huan, H. Cho, **S. Somnath**, A. F. Vakakis, W. P. King, "Silicon Nano-Mechanical Resonators Fabricated using Tip-based Nanofabrication," *Nanotechnology*, 25 275301*,* 2014.
23. **Somnath, S**., H. Hu, H. J. Kim, and W. P. King, "Parallel Nanoimaging and Nanolithography using a Heated Microcantilever Array," *Nanotechnology*, vol. 25, 014001, 2013.
24. Carroll, K. M, X. Lu, S. Kim, Y. Gao, H. J. Kim**, S. Somnath**, L. Polloni, R. Sordan, W. P. King, J. E. Curtis, E. Riedo, "Parallelization of Themochemical Nanolithography," *Nanoscale,*vol. 6, 1299-1304, 2014.
25. Hu H., P. K. Mohseni, L. Pan, **S. Somnath**, J. R. Felts, M. A. Shannon, W. P. King, "Fabrication of arbitrarily-shaped silicon and silicon oxide nanostructures using tip-based nanofabrication," *Journal of Vacuum Science & Technology B.,* vol. 31, 06FJ01, 2013.
26. Liu, J. O., **S. Somnath**, and W. P. King, "Heated Atomic Force Microscope Cantilever with High Resistivity for Improved Temperature Sensitivity," *Sensors and Actuators A-Physical,* vol. 201, pp. 141-147, 2013.
27. King, W. P., B. Bhatia, J. R. Felts, H. J. Kim, B. Kwon, B. Lee, **S. Somnath**, and M. Rosenberger, "Heated Atomic Force Microscope Cantilevers and their Applications," *Annual Review of Heat Transfer*, vol. 12, 287-326, 2013.
28. Lee, B., **S. Somnath**, and W. P. King, "Fast Nanotopography Imaging Using a High Speed Cantilever with Integrated Heater-Thermometer," *Nanotechnology* 24, 135501, 2013.
29. **Somnath, S.** and W. P. King, "Heated Atomic Force Cantilever Closed Loop Temperature Control and Application to High Speed Nanotopography Imaging," *Sensors and Actuators A-Physical*, 192, 27-33, 2013.

30. Kim, H. J, N. Moldovan, J. R Felts, **S. Somnath**, Z. Dai, T. D. B. Jacobs, R. W. Carpick, J. A. Carlisle, and W. P. King "Ultrananocrystalline Diamond Tip Integrated onto a Heated Atomic Force Microscope Cantilever," *Nanotechnology* 23, 495302, 2012
31. Felts, J. R., **S. Somnath**, R. H. Ewoldt, and W. P. King, "Nanometer-Scale Flow of Molten Polyethylene from a Heated Atomic Force Microscope Tip," *Nanotechnology* 23, 215301, 2012.
32. **Somnath, S.**, E. A. Corbin and W. P. King, "Improved Nanotopography Sensing via Temperature Control of a Heated Atomic Force Microscope Cantilever," *IEEE Sensors Journal* 11, 2664-2670, 2011.

WORKSHOPS & TUTORIALS

1. Vasudevan, R., S. Jesse, C. R. Smith, and **S. Somnath,** "Imaging and Spectral Data Analysis in Python," *2018 Center for Nanophase Materials Science User Meeting*, Aug 13 2018, Oak Ridge, TN.
2. Jesse, S., A. Belianinov, **S. Somnath**, C. R. Smith, "Multivariate Methods and Image-processing for Quantitative Microscopy," *Microscopy and Microanalysis 2018*, Aug 5 2018, Baltimore, MD.
3. Jesse, S., C. R. Smith and **S. Somnath**, "Advanced Imaging and Spectral Data Analysis via Multivariate Statistical Methods," *Fall 2017 Materials Research Society Conference*, Nov 26 2017, Boston, MA.
4. Jesse, S., A. Belianinov, **S. Somnath**, C. R. Smith, and S. V. Kalinin, "Large Scale Data Acquisition and Analysis for Materials Imaging and Spectroscopy," *Microscopy and Microanalysis 2017*, Aug 9 2017, St. Louis, MO.

INVITED TALKS

1. **Somnath, S.**, "Pycroscopy - a python package for analyzing, storing, and visualizing multidimensional scientific imaging data," *ImageXD 2018*, Berkeley, CA, May 2018
2. **Somnath, S.**, "Jupyter for Supporting a Materials Imaging User Facility," *Jupyter and HPC: Current State and Future Roadmap, Exascale Computing Project*, Oak Ridge, TN, Feb 28, 2018.
3. **Somnath, S.**, S. V. Kalinin, and S. Jesse, [KEYNOTE] "Ultrafast and High-Resolution Imaging of Polarization Switching in Ferroelectrics", *International Meeting on Ferroelectricity 2017*, San Antonio, TX, Sep 2017.
4. **Somnath, S.**, and D. Schmidt, "Cross-Facility Discovery at ORNL: Workflows offer Analytics at Scale," *Smoky Mountains Conference 2017*, Gattlinburg, TN, Aug 30 2017.
5. **Somnath, S.** and M. Shankar, "Scalable Data Services at the Oak Ridge Leadership Computing Facility and Compute and Data Environment for Sciences," *Materials Informatics Workshop, 2017 Joint Nanoscience and Neutron Scattering User Meeting,* Oak Ridge, TN, Aug 3 2017.
6. **Somnath, S.**, "Community-Driven Imaging in the Information Dimension," *Materials Informatics Workshop, 2017 Joint Nanoscience and Neutron Scattering User Meeting,* Oak Ridge, TN, Aug 3 2017.
7. **Somnath, S.**, "Imaging in the Information Dimension," *Advanced Data Workflow Group, National Center for Computational Sciences, Oak Ridge National Laboratory,* Oak Ridge, Mar 30, 2017.
8. **Somnath, S.**, "Microscopy in the era of Information Science," *Asylum Research,* Santa Barbara, Mar 20, 2017.
9. **Somnath, S.**, A. Belianinov, S. V. Kalinin, and S. Jesse, "Complete Information Acquisition in SPM and Application to Ultrafast Imaging of Polarization Switching in Ferroelectrics," *Deep Data in Materials Characterization CNMS Workshop*, Oak Ridge, TN, Aug 2016.

10. **Somnath, S.**, "Parallel Operation, Big Data, and Data Analytics Techniques for Atomic Force Microscopy," *Nion Seminar Series*, Kirkland, WA, Aug 2016.

CONFERENCE PRESENTATIONS

1. **Somnath, S.**, S. Jesse, G. J. Van Berkel, S. V. Kalinin and O. S. Ovchinnikova, "Submicron spot sampling resolution in thermal desorption atomic force microscopy - mass spectrometry via rapid heating functions," *American Vacuum Society 64th International Symposium and Exhibition*, Tampa, FL, Nov 2 2017.
2. **Somnath, S.**, S. V. Kalinin, and S. Jesse, "An ultrafast scanning probe microscopy technique for imaging polarization switching in ferroelectric materials," *American Vacuum Society 64th International Symposium and Exhibition*, Tampa, FL, Oct 30 2017.
3. **Somnath, S.**, C. R. Smith, S. Jesse, A. Ievlev, R. K. Vasudevan, N. Laanait, "Pycroscopy – Community-driven software for analyzing microscopy data," *American Vacuum Society 64th International Symposium and Exhibition*, Tampa, FL, Oct 31 2017.
4. **Somnath, S.**, S. Jesse, S. V. Kalinin, and R. K. Vasudevan, "Rapid Measurement of I-V Curves in Scanning Probe Microscopy via Bayesian Inference," *American Vacuum Society 64th International Symposium and Exhibition*, Tampa, FL, Oct 30 2017.
5. **Somnath, S.**, S. V. Kalinin, and S. Jesse, "Ultrafast and High-Resolution Imaging of Polarization Switching in Ferroelectrics", *International Meeting on Ferroelectricity 2017*, San Antonio, TX, Sep 2017.
6. **Somnath, S.**, and D. Schmidt, "Cross-Facility Discovery at ORNL: Workflows offer Analytics at Scale," *Smoky Mountains Conference 2017*, Gattlinburg, TN, Aug 30 2017.
7. **Somnath, S.**, S. V. Kalinin, and S. Jesse, "G-mode – Full Information Capture Applied to Scanning Probe Microscopy", *Microscopy and Microanalysis 2017*, St. Louis, MO, Aug 2017.
8. **Somnath, S.**, C. R. Smith, S. Jesse, A. Ievlev, R. K. Vasudevan, and N. Laanait, "Pycroscopy – An Open Source Approach to Microscopy and Microanalysis in the Age of Big Data and Open Science", *Microscopy and Microanalysis 2017*, St. Louis, MO, Aug 2017.
9. **Somnath, S.** and M. Shankar, "Scalable Data Services at the Oak Ridge Leadership Computing Facility and Compute and Data Environment for Sciences," *Materials Informatics Workshop, 2017 Joint Nanoscience and Neutron Scattering User Meeting,* Oak Ridge, TN, Aug 3 2017.
10. **Somnath, S.**, "Community-Driven Imaging in the Information Dimension," *Materials Informatics Workshop, 2017 Joint Nanoscience and Neutron Scattering User Meeting,* Oak Ridge, TN, Aug 3 2017.
11. Collins L., A. Belianinov, **S. Somnath**, N. Wisinger, S. V. Kalinin, and S. Jesse, "G-Mode KPFM: Bringing Kelvin probe force microscopy into the information age," *2017 Joint IEEE International Symposium on Applications of Ferroelectrics (ISAF), International Workshop on Acoustic Transduction Materials and Devices (IWATMD), Piezoresponse Force Microscopy Workshop (PFM),* Atlanta, GA, May 2017.
12. **Somnath, S.**, S. V. Kalinin, and S. Jesse, "Full Information Acquisition in Piezoresponse Force Microscopy for Ultrafast imaging of Polarization Switching", *2017 Joint IEEE International Symposium on Applications of Ferroelectrics (ISAF), International Workshop on Acoustic Transduction Materials and Devices (IWATMD), Piezoresponse Force Microscopy Workshop (PFM)*, Atlanta, GA, May 2017.
13. Collins L., A. Belianinov, **S. Somnath**, N. Wisinger, S. V. Kalinin, and S. Jesse, "G-Mode KPFM: Bringing Kelvin probe force microscopy into the information age," *Materials Research Society Spring 2017 Meeting*, Phoenix, AZ, Apr 2017.
14. **Somnath, S.**, S. Jesse, S. V. Kalinin, and R. K. Vasudevan, "Ultrafast current-voltage measurements in scanning probe microscopy," *Materials Research Society Spring 2017 Meeting*, Phoenix, AZ, Apr 2017.

15. **Somnath, S.**, C. R. Smith, S. Jesse, A. Ievlev, R. K. Vasudevan, and N. Laanait, "Pycroscopy – An open source approach for analyzing and storing material science data," *Materials Research Society Spring 2017 Meeting*, Phoenix, AZ, Apr 2017.
16. **Somnath, S.**, S. V. Kalinin, and S. Jesse, "Rapid imaging of polarization switching in ferroelectrics using the complete information stream from scanning probe microscopes," *Materials Research Society Spring 2017 Meeting*, Phoenix, AZ, Apr 2017.
17. **Somnath, S.**, S. V. Kalinin, and S. Jesse, "A novel scanning probe microscopy technique for ultrafast imaging of polarization switching in ferroelectric and multiferroic materials," *Materials Research Society Spring 2017 Meeting*, Phoenix, AZ, Apr 2017.
18. Lingerfelt, E., E. Endeve, Y. Hui, C. R. Smith, **S. Somnath**, N. Grodowitz, J, Borreguero, F. Bao, J. Niedziela, D. Bansal, R. Archibald, A. Belianinov, M. Shankar, and S. Jesse "BEAM: An HPC Pipeline for Nanoscale Materials Analysis and Neutron Data Modeling", *American Physical Society March Meeting 2017,* New Orleans, LA, Mar 2017.
19. Vasudevan, R. K., **S. Somnath**, M. Ziatdinov, P. Maksymovych, S. Jesse, and S. V. Kalinin, "Understanding materials through a big-deep data approach in microscopy," *Information Utilization of Advanced Measurement Informatics Mass Data Era Workshop*, Tsukuba, Japan, Jan 2017.
20. **Somnath, S.**, S. V. Kalinin, and S. Jesse, "Scanning Probe Microscopy Techniques for Ultrafast Probing of Ferroelectric Materials," *Materials Research Society Fall 2016 Meeting*, Boston, MA, Dec 2016.
21. Vasudevan, R. K., **S. Somnath**, A. Baddorf, S. V. Kalinin, and P. Maksymovych, "Controlling metal-insulator transitions in a manganite thin film by pressure," *Materials Research Society Fall 2016 Meeting*, Boston, MA, Dec 2016.
22. Lingerfelt, E., A. Belianinov, E. Endeve, O. S. Ovchinnikov, **S. Somnath**, R. K. Archibald, S. V. Kalinin, and S. Jesse "Bellerophon Environment for Analysis of Materials (BEAM), A High Performance Computing Workflow Platform for Materials Research", *American Physical Society March Meeting 2017,* New Orleans, LA, Mar 2017.
23. **Somnath, S.**, A. Belianinov, S. V. Kalinin, and S. Jesse, "Ultrafast Imaging of Polarization Switching in Ferroelectrics via Complete Information Acquisition in SPM," *American Vacuuum Society 63rd International Symposium & Exhibition*, Nashville, TN, Nov 2016.
24. Vasudevan R. K., N. Wisinger, **S. Somnath**, S. Jesse, and S. V. Kalinin, "Rapid and rigorous: Breakneck acquisition of local hysteresis loops, and a quantitative understanding of piezoresponse force microscopy," *13th International Symposium on Ferroic Domains & Micro- to Nano-scopic Structures (ISFD-13)*, Vancouver, Canada, Oct 2016.
25. **Somnath, S.**, S. Jesse, G. J. Van Berkel, S. V. Kalinin, and O. S. Ovchinnikova, "Submicron Spatial Resolution in Thermal Desorption Mass Spectrometry via Rapid Heating Functions using Thermal AFM Probes," *Microscopy and Microanalysis 2016*, Columbus, OH, Jul 2016.
26. **Somnath, S.**, A. Belianinov, S. V. Kalinin, and S. Jesse, "A Novel Spectroscopy Technique for Ultrafast Polarization Switching in Ferroelectrics," *Materials Research Society Fall 2015 Meeting*, Boston, MA, Dec 2015.
27. **Somnath, S.**, S. Jesse, G. J. Van Berkel, S. V. Kalinin, and O. S. Ovchinnikova, "Tailored Heating Functions in Heated AFM Probes for Submicron Spatial Resolutions in Thermal Desorption Mass Spectrometry," *Materials Research Society Fall 2015 Meeting*, Boston, MA, Dec 2015.
28. **Somnath, S.**, A. Belianinov, S. V. Kalinin, and S. Jesse, "Big Data in Nanoscience: Improved Measurement Speed and Spatial Resolution by Streaming the Complete Information from the Detector," *Materials Research Society Fall 2015 Meeting*, Boston, MA, Dec 2015.
29. Belianinov, A., **S. Somnath**, S. V. Kalinin, and S. Jesse, "Data driven Dynamic Force-Distance Curve reconstruction in G-mode tapping Atomic Force Microscopy," *Materials Research Society Fall 2015 Meeting*, Boston, MA, Dec 2015.

30. Kalinin, S. V., **S. Somnath**, L. Collins, A. Maksov, A. Belianinov, and S. Jesse, "Scanning Probe Microscopy: Exploring the Information Dimension," *Materials Research Society Fall 2015 Meeting*, Boston, MA, Dec 2015.
31. **Somnath, S.**, S. Jesse, G. J. Van Berkel, S. V. Kalinin, and O. S. Ovchinnikova, "Improved submicron spatial resolution of thermal desorption mass spectrometry via short tailored pulse heating with thermal AFM probes," 63rd *American Society of Mass Spectrometry Conference on Mass Spectrometry and Allied Topics*, St. Louis, MO, June 2015.
32. **Somnath, S.**, and W. P. King, "An Investigation of Heat Transfer between a Microcantilever and a Substrate for Improved Thermal Nanoimaging," *International Conference on Nanoscience + Technology (ICN+T)*, Vail, July 2014.
33. **Somnath, S.**, J.O. Liu, M. Bakir, C. B. Prater, and W.P. King, "Multifunctional Atomic Force Microscope Cantilever with Lorentz Force Actuation and Self-Heating for Nanomechanical Measurements in Air and Water," *Hilton Head Workshop 2014: A Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head, USA, June 2014*.
34. Curtis, J. E, K. Carroll, X. Lu, S. Kim, Y. Gao, H. J. Kim, **S. Somnath**, L. Polloni, R. Sordan, W. P. King, and E. Riedo, "Parallelization of Thermochemical Nanolithography," *APS March Meeting 2014*, Denver, Colorado, March 2014.
35. **Somnath, S.**, H.J. Kim, H. Hu, and W.P. King, "High Speed and Parallel Nanoimaging using an Array of Heated Atomic Force Microscope Cantilevers*," Transducers 2013 and Eurosensors XXVII The 17th International Conference on Solid-State Sensors, Actuators, and Systems*, Barcelona, Spain, June 2013.
36. Kim, H.J., N. Moldovan, J.R. Felts, **S. Somnath**, Z. Dai, T.D.B. Jacobs, R.W. Carpick, J.A. Carlisle, and W.P. King, "Heated Atomic Force Microscope Cantilevers with Wear-Resistance Ultrananocrystalline Diamond Tips," *Proceedings of the IEEE MEMS Conference*, Taiwan, 2013.
37. Ewoldt, R., J.R. Felts, **S. Somnath**, and W.P. King, "Nanometer-Scale Free Surface Flow of Molten Polyethylene from a Heated Atomic Force Microscope Tip," *2012 Meeting of the American Physical Society, Division of Fluid Dynamics*, San Diego, CA, November 2012.
38. Kim, H.J., J.R. Felts, **S. Somnath**, Z. Dai, T.D. Jacobs, N. Moldovan, J.A. Carlisle, R.W. Carpick, and W.P. King, "Heated AFM Microcantilevers with Ultrananocrystalline Diamond Tips," *International Conference on Nanoscience + Technology (ICN+T)*, Paris, July 2012.
39. **Somnath, S.**, H. Hu, H. J. Kim, and W. P. King, "Parallel Nano Imaging and Lithography using a Cantilever Probe Array in a Commercial AFM System," *International Conference on Nanoscience + Technology (ICN+T)*, Paris, July 2012.
40. **Somnath, S.**, Z. Dai, and W. P. King, "Parallel Nanotopography Imaging with a Heated Microcantilever Array," *Technologies for Future Micro-Nano Manufacturing Workshop,* Napa, CA, 214-217, August 2011.
41. Felts, J.R., L. Thompson, **S. Somnath**, C. Murphy, and W.P. King, "Rapid Nanofabrication of Gold Nanorod Raman Enhancing Nanostructures using Heated Probe Lithography," *Technologies for Future Micro-Nano Manufacturing Workshop*, Napa, CA, 246-249, 2011.
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43. Felts, J. R., P. C. Fletcher, **S. Somnath**, J. Pikul, B. Bhatia, N. Maniscalco, Z. Dai, and W. P. King, "Advances in Nanometer Scale Manufacturing Using Heated Atomic Force Microscope Probes," *Materials Research Society Symposium Fall Meeting*, Boston MA, November 2010.
44. **Somnath, S.**, E. A. Corbin and W. P. King, "Six-Fold Improvement in Nanotopography Sensing via Temperature Control of a Heated Atomic Force Microscope Cantilever," *IEEE Sensors Conference*, Honolulu, Hawaii, 2010.

MENTORING EXPERIENCE

- Chris R. Smith – Astrophysicist – Development of infrastructure and algorithms for pycroscopy as a core developer - June 2015 – Dec 2018
- Whitney Nelson – Graduate Student – Prototyping a catalog of scientifically important datasets – Summer of 2018

TEACHING EXPERIENCE

Undergraduate Teaching Assistant, Introduction to Computer Science Aug '08-May '09
Computer Science Department, Rutgers University, New Brunswick Piscataway, NJ

2. Conducted recitation sessions to revisit topics taught in lectures, answered questions regarding concepts and homework problems
3. Prepared weekly list of representative problems and walked students through solving the problems

Peer Mentor, **Calculus II** Aug 2007 – Dec 2008
Mathematics Department, Rutgers University, New Brunswick Piscataway, NJ

4. Assisted a graduate teaching assistant in weekly recitation sessions
5. Graded homeworks and posted solutions

PROFESSIONAL SERVICE

- Guest Lead Editor for Scanning, an open-access, international, peer-reviewed journal from Hindawi
    - Writing call for papers
    - Writing editorial columns and opinion pieces
    - Assigning reviewers for papers that meet minimum standards, etc.
- Moderator of Scanning Probe Microscopy focus topic, 2017 64th American Vacuum Society International Symposium and Exhibition, Tampa FL, Oct 31, 2017.
- Invited to serve as the moderator of a session at the 2016 63rd American Vacuum Society conference, Nashville, TN.
- Reviewer for multiple international peer-reviewed journals including:
    - Nature Communications
    - Nature Scientific Reports
    - Journal of Vacuum Science and Technology A & B
    - Physical Review Applied
    - Journal of Physics D
    - Acta Materialia
    - Carbon
    - Advanced Materials Technologies
    - IEEE Sensors
    - IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control
    - Advances in Mechanical Engineering
    - The Journal of The Minerals, Metals & Materials
    - Transactions on NanoBioscience

PROFESSIONAL MEMBERSHIPS

- Materials Research Society
- Microscopy Society of America

- American Society of Mechanical Engineers
- Tau Beta Pi
- Sigma Pi Tau

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