

# Eric R. Hoglund

## Curriculum Vitae

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### EDUCATION

- 2020 **Ph.D. in Materials Science & Engineering** 12/18/2020  
University of Virginia, Charlottesville, Virginia  
Advisor: James M. Howe  
Thesis Committee: Jon Ihlefeld (Chair) MSE, William Soffa MSE, James Howe  
(Advisor) MSE, Petra Reinke MSE, Keivan Esfarjani MAE,  
Brent Fultz CalTech
- 2017 **M.S. in Materials Science & Engineering** 12/21/2017  
University of Virginia, Charlottesville, Virginia
- 2015 **B.S. in Materials Science & Engineering** 05/09/2015  
North Carolina State University, Raleigh, North Carolina

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### RESEARCH INTERESTS

My interest lies in applying advanced transmission electron microscopy and spectroscopy techniques toward understanding properties and phenomena that are associated with defects in functional and quantum materials. This involves relating local atomic structure to vibrational and electronic behavior of materials using monochromated electron energy-loss spectroscopy, aberration corrected imaging, and 4D-STEM at ambient and cryogenic temperatures.

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### RESEARCH EXPERIENCE

Present- **Postdoctoral Research Associate (Oak Ridge National Laboratory)**

- 2023 *Project 7* – Impact of Interfaces on the behavior of AlN-(Al)GaN Superlattices with Nanometer to Sub-unit-cell Ordering
- Project 6* – Determine the Impact of Polar Topologies on Vibrations in PbTiO<sub>3</sub>-SrTiO<sub>3</sub> Superlattices
- Project 5* – Three-dimensional Order-Disorder Transitions of Polar Topologies in PbZrTiO<sub>3</sub>-SrTiO<sub>3</sub> Heterostructures
- Project 4* – Understanding the Influence of Defects in Self-assembled PbSe Quantum Dot Superlattices on Delocalized Superlattice Electronic States and Excitons from room to Cryogenic Temperatures
- Project 3* – Grain size dependence of Quantized Miniband Electronic State in Quantum Dot Superlattices
- Project 2* – Anisotropic of Phonon Polariton dispersions in  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> using Monochromated STEM-EELS Interferometry
- Project 1* – Mixed Real- and Reciprocal-space measurement of Phonon Dispersions

2023- **Postdoctoral Research Associate (University of Virginia)**

- 2020 *Project 6* – Understanding Thermal Vibrations in Heterostructures via 4D-STEM
- Project 5* – Impact of Interfaces on the behavior of AlN-(Al)GaN Superlattices with Nanometer to Sub-unit-cell Ordering

- Project 4* – Determine the Impact of Interfaces in Naturally Occurring Chalcogenide Perovskite Superlattices on Atomic Vibrations
- Project 3* – Determine the Impact of Polar Topologies on Vibrations in PbTiO<sub>3</sub>-SrTiO<sub>3</sub> Superlattices
- Project 2* – Determine the Impact of Interface Structure on Localized Interface Vibrations in SrTiO<sub>3</sub>-CaTiO<sub>3</sub> Superlattices
- Project 1* – In-Situ Characterization of Phase Change Materials

2020- **Graduate Research Assistant**

- 2017 *Project 4* – Determine the Impact of Interface Structure on Localized Interface Vibrations in SrTiO<sub>3</sub>-CaTiO<sub>3</sub> Superlattices
- Project 3* – In-Situ Cryogenic Characterization of PbSe/PbI<sub>2</sub> to Elucidate Decreased Infrared Absorption During Heating
- Project 2* – In-Situ Characterization of Phase Change Materials
- Project 1* – Characterization of Altered Valence Electron Behavior at Al Grain through Characterization of Plasmons

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## AWARDS

- 2023 **2023 M&M Postdoctoral Scholar Award**  
For “The Impact of Local Stoichiometry, Bonding, and Structure on Interface Vibrations” at M&M 2020 Minneapolis Minnesota
- 2020 **Fred D. Rosi Outstanding Citizen Award**  
For demonstrating leadership and teamwork helping students, faculty and researchers meet their electron microscopy needs and serving as MSA's Student Council Chair. The award also recognizes his academic accomplishments and involvement in the Graduate Student Body of MSE.
- 2019 **Graduate Teaching Fellowship**  
To teach and develop the course Transmission Electron Microscopy under the advisement of Prof. Howe
- 2019 **ASU HREM Winter School Scholarship**  
To attend the 2019 high resolution electron microscopy course at Arizona State University
- 2018 **2018 M&M Student Scholar Award**  
For “Momentum Resolved EELS of Plasmons at Al GBs without a q-Slit Aperture” at M&M 2018 Baltimore Maryland

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## PUBLICATIONS

31. “Direct Visualization of Localized Vibrations at Complex Grain Boundaries” **Eric R. Hoglund**, De-Liang Bao, Andrew O’Hara, Thomas W. Pfeifer, Md Shafkat Bin Hoque, Sara Makarem, James M. Howe, Sokrates T. Pantelides, Patrick E. Hopkins, and Jordan A. Hachtel, *Adv. Mat.*, 35, no. 13 (2023)
30. “Emergent interface vibrational structure of oxide superlattices” **Eric R. Hoglund**, De-Liang Bao, Andrew O’Hara, Sara Makarem, Zachary T. Piontkowski, Joseph R. Matson, Ajay K. Yadav, et al., *Nature*, 601, no. 7894 (2022)

29. “Non-equivalent Atomic Vibrations at Interfaces in a Piezoelectric Superlattice” **Eric R. Høglund**, Harrison Walker, Kamal Hussain, De-Liang Bao, Haoyang Ni, Jeffery Baxter, Asif Khan, Sokrates T. Pantelides, Patrick E. Hopkins, and Jordan A. Hachtel, *Nat. Comm.*, (in review)
28. “Interlayer coupling controlled phases in polar vortex superlattices” Peter Meisenheimer, Arundhati Ghosal, **Eric Høglund**, Zhiyang Wang, Piush Behera, Fernando Gómez-Ortiz, Pravin Kavle, Evgenia Karapetrova, Pablo García-Fernández, Lane W. Martin, Archana Raja, Long-Qing Chen, Patrick Hopkins, Javier Junquera, Ramamoorthy Ramesh, *Nano Letters.*, (accepted)
27. “Broadband reduction in vibrational thermal conductivity of Ruddlesden-popper ( $Ba_{n+1}Zr_nS_{3n+1}$ ) phases of perovskite chalcogenide  $BaZrS_3$ ” Md Shafkat Bin Hoque\*, **Eric R. Høglund**\*, Boyang Zhao\*, Deliang Bao, Hao Zhou, Muhammad Akif Rahman, Eric Osei-Agyemang, Kevin Ye, Khalid Hattar, Ethan A. Scott, Mythili Surendran, Sandip Thakur, Jordan A. Hachtel, John A. Tomko, John T. Gaskins, Kiumars Aryana, Sara Makarem, Rafael Jaramillo, Ganesh Balasubramanian, Ashutosh Giri, Tianli Feng, Sokrates T Pantelides, Jayakanth Ravichandran, and Patrick E. Hopkins, *Nat. Mat.*, (in review)
26. “Modulated Displacement Structure in One-Unit Cell  $CaTiO_3$ - $SrTiO_3$  Superlattices” **Eric R. Høglund**, Zachary T. Piontkowski, Ajay K. Yadav, Jayakanth Ravichandran, Ramamoorthy Ramesh, Thomas E. Beechem, Patrick E. Hopkins, and James M. Howe, *Science Adv.*, (in review)
25. “Thermal properties and ablation properties of a high-entropy metal diboride:  $(Hf_{0.2}Zr_{0.2}Ti_{0.2}Ta_{0.2}Nb_{0.2})B_2$ ” Md Shafkat Bin Hoque, Milena Milich, Md Sabbir Akhanda, Sashank Shivakumar, **Eric R. Høglund**, Dragos Staicu, Mingde Qin, Kathleen F. Quiambao-Tomko, John A. Tomko, Jeffrey L. Braun; Joshua Gild, David H. Olson, Kiumars Aryana, Yee Rui Koh, Galib Roisul, Luka Vlahovic, Davide Robba, John T. Gaskins, Mona Zebarjadi, Jian Luo and Patrick E. Hopkins, *J. Eur. Ceram. Soc.* 43, no. 11 (2023)
24. “Revisited precipitation process in dilute Mg-Ca-Zn alloys” Zehao Li, Du Cheng, Kang Wang, **Eric R Høglund**, James M Howe, Bi-Cheng Zhou, Tadakatsu Ohkubo, and Kazuhiro Hono, *Acta. Mat.* 257 (2023)
23. “Compositionally dependent acoustic and thermal properties of amorphous  $AlN/Al_2O_3$  multilayers” Md Shafkat Bin Hoque, Ian A. Brummel, **Eric R. Høglund**, C. Jaymes Dionne, Kiumars Aryana, John A. Tomko, John T. Gaskins, Daniel Hirt, Sean W. Smith, Thomas Beechem, James M. Howe, Ashutosh Giri, Jon F. Ihlefeld, and Patrick E. Hopkins, *Phys. Rev. Mat.* 7, no. 2 (2023)
22. “FIB-induced surface defects measured via thermoreflectance” Thomas W. Pfeifer, Eric R. Høglund, Md Shafkat Bin Hoque, and Patrick E Hopkins, *Rev. Sci. Instrum.* (near completion)

21. “Measuring Sub-surface Spatially Varying Thermal Conductivity of Silicon Implanted with Krypton” Thomas W. Pfeifer, John A. Tomko, **Eric R. Hoglund**, Kenny Huynh, Michael Liao, Ethan Scott, Khalid Hattar, Mark Goorsky, and Patrick E. Hopkins, *J. Appl. Phys.*, 132 (2022)
20. “Atomic Structures of Ordered Monolayer GP Zones in Mg-Zn-X (X= Ca, Nd) Systems.” Cheng, Du, **Eric R. Hoglund**, Kang Wang, James M. Howe, Sean R. Agnew, and Bi-Cheng Zhou., *Scripta Mat.*, 216, 114744 (July 2022)
19. “Impact of Oxygen Content on Crystallization and Ferroelectric Behavior of Hafnium Oxide Thin Films Deposited by Reactive High-Power Impulse Magnetron Sputtering” Samantha T. Jaszewski, **Eric R. Hoglund**, Anna Costine, Marc Weber, Shelby S. Fields, Maria G. Sales, Jaykumar Vaidya, Leah Bellcase, Katie Loughlin, Alejandro Salanova, Diane Dickie, Steven L. Wolfley, M. David Henry, Jon-Paul Maria, Jacob L. Jones, Nikhil Shukla, Stephen J. McDonnell, Petra Reinke, James M. Howe , and Jon F. Ihlefeld, *Acta Mater.*, 239 (2022)
18. “Tailoring Thermal and Chemical Properties of a Multi-component Environmental Barrier Coating Candidate (Sc,Nd,Er,Yb,Lu)<sub>2</sub>Si<sub>2</sub>O<sub>7</sub>” Mackenzie J. Ridley, Kathleen Q. Tomko, John A. Tomko, **Eric R. Hoglund**, James M. Howe, Patrick E. Hopkins, Elizabeth J. Opila, *Materialia*, 26 (2022)
17. “Observation of solid-state bidirectional thermal conductivity switching in antiferroelectric lead zirconate (PbZrO<sub>3</sub>)” Kiumars Aryana, John A. Tomko, Ran Gao, **Eric R. Hoglund**, Takanori Mimura, Sara Makarem, Alejandro Salanova, Md Shafkat Bin Hoque, Thomas W. Pfeifer, David H. Olson, Jeffery L. Braun, Joyeeta Nag, John C. Read, James M. Howe, Elizabeth J. Opila, Lane W. Martin, Jon F. Ihlefeld, and Patrick E. Hopkins, *Nature Comm.*, 13, no. 1, 1573 (December 2022)
16. “Observation of Grain Boundary Plasmon and Associated Deconvolution Techniques for Low-Loss Electron Energy-Loss (EEL) Spectra Acquired from Grain Boundaries” Proloy Nandi, **Eric R. Hoglund**, and James M. Howe, *Ultramicroscopy*, 234, 113478 (2022)
15. “Suppressed electronic contribution in thermal conductivity of Ge<sub>2</sub>Sb<sub>2</sub>Se<sub>4</sub>Te” Kiumars Aryana, Yifei Zhang, John Tomko, Md Shafkat Bin Hoque, **Eric Hoglund**, David Olson, Joyeeta Nag, John Read, Carlos Ríos, Juejun Hu, and Patrick Hopkins, *Nature Comm.* 12, no. 7187, 1-9 (2021)
14. “Thermal Conductivity Measurements of Sub-Surface Buried Substrates by Steady-State Thermoreflectance” Md Shafkat Bin Hoque, Yee Rui Koh, Kiumars Aryana, **Eric Hoglund**, Jeffrey L. Braun, David H. Olson, John T. Gaskins, Habib Ahmad, Mirza Mohammad Mahbube Elahi, Jennifer K. Hite, Zayd C. Leseman, W. Alan Doolittle, and Patrick E. Hopkins, *Rev. Sci. Instrum.* 92, no. 6, 064906-12 (2021)
13. “Interface Controlled Thermal Properties of Ultra-thin Chalcogenide-Based Phase Change Memory Devices” Kiumars Aryana, John T Gaskins, Joyeeta Nag, Derek A Stewart, Zhaoqiang Bai, Saikat Mukhopadhyay, John C Read, David H Olson, **Eric R**

- Hoglund**, James M Howe, Ashutosh Giri, Michael K Grobis, and Patrick E Hopkins, *Nature Comm.* 12, no. 774, 1-11 (2021)
12. “Towards Synthetic L<sub>10</sub>-FeNi: Detecting the Absence of Cubic Symmetry in Laser-Ablated Fe-Ni Nanoparticles” Qiyuan Lin, Ruksan Nadarajah, **Eric Hoglund**, Anna Semisalova, James M. Howe, Bilal Gökce, and Giovanni Zangari, *Appl. Surf. Sci.* 567, 150664-10 (2021)
  11. “Interfacial Reactions between B<sub>2</sub>O<sub>3</sub> and Spark Plasma Sintered Yb<sub>2</sub>Si<sub>2</sub>O<sub>7</sub>” Guarriello, Rachel, **Eric Hoglund**, Helge Heinrich, and Elizabeth Opila. *J. Am. Ceram. Soc.* 104, no. 10, 5392-5400 (2021)
  10. “High In-Plane Thermal Conductivity of Aluminum Nitride Thin Films” Md Shafkat Bin Hoque, Yee Rui Koh, Jeffrey L. Braun, Abdullah Mamun, Zeyu Liu, Kenny Huynh, Michael E. Liao, Kamal Hussain, Zhe Cheng, **Eric R. Hoglund**, David H. Olson, John A. Tomko, Kiumars Aryana, Roisul Galib, John T. Gaskins, Mirza Mohammad Mahbube Elahi, Zayd C. Leseman, James M. Howe, Tengfei Luo, Samuel Graham, Mark S. Goorsky, Asif Khan, and Patrick E. Hopkins, *ACS Nano* 15, no. 6, 9588-9599 (2021)
  9. “High Thermal Conductivity and Thermal Boundary Conductance of Homoepitaxially Grown Gallium Nitride (GaN) Thin Films” Yee Rui Koh, Md Shafkat Bin Hoque, Habib Ahmad, David H. Olson, Zeyu Liu, Jingjing Shi, Wang Steven, Kenny Huynh, **Eric R. Hoglund**, Kiumars Aryana, James M. Howe, Mark S. Goorsky, Samuel Graham, Tengfei Luo, Jennifer K. Hite, W. Alan Doolittle, and Patrick E. Hopkins, *Phys. Rev. Mat.* 5, no. 10, 104604-6 (2021)
  8. “Hydrogen Effects on the Thermal Conductivity of Delocalized Vibrational Modes in Amorphous Silicon Nitride (a-SiN<sub>x</sub>:H)” Jeffrey L. Braun, Sean W. King, **Eric R. Hoglund**, Mehrdad Abbasi Gharacheh, Ethan A. Scott, Ashutosh Giri, John A. Tomko, John T. Gaskins, Ahmad Al-kukhun, Gyanendra Bhattarai, Michelle M. Paquette, Georges Chollon, Benjamin Willey, G. Andrew Antonelli, David W. Gidley, Jinwoo Hwang, James M. Howe, and Patrick E. Hopkins, et al., *Phys. Rev. Mat.* 5, no. 3, 035604-22 (2020)
  7. “Photoelectrochemistry of Self-Limiting Electrodeposition of Ni Film onto GaAs”, Yin Xu, Rasin Ahmed, Juan Zheng, **Eric Hoglund**, Qiyuan Lin, Qiyuan Lin, Enrico Berretti, Alessandro Lavacchi, and Giovanni Zangari, *Small* 16, no. 39, 2003112-9 (2020)
  6. “Photoconductive Mechanism of IR-Sensitive Iodized PbSe Thin Films via Strong Hole-Phonon Interaction and Minority Carrier Diffusion” Moon-Hyung Jang, **Eric R. Hoglund**, Peter M. Litwin, Sung-Shik Yoo, Stephen J. McDonnell, James M. Howe, and Mool C. Gupta, *Appl. Opt.* 59, no. 33, 10228-10235 (2020)
  5. “Polymersome Poration and Rupture Mediated by Plasmonic Nanoparticles in Response to Single-Pulse Irradiation”, Gina M. DiSalvo, Abby R. Robinson,

- Mohamad S. Aly, **Eric R. Hoglund**, Sean M. O'Malley, and Julianne C. Griepenburg, *Polymers* 12, no. 10, 2381(2020)
4. "Electrodeposition of Fe-Ni alloy on Au(111) substrate: metastable BCC growth via hydrogen evolution and interactions", Qiyuan Lin, **Eric Hoglund**, and Giovanni Zangari, *Electrochim. Acta* 338, 135876-10 (2020)
  3. "Thermal Conductivity and Phonon Scattering Processes of ALD Grown PbTe–PbSe Thermoelectric Thin Films", Mallory E DeCoster, Xin Chen, Kai Zhang, Christina M Rost, **Eric R. Hoglund**, James M. Howe, Thomas E. Beechem, Helmut Baumgart, Patrick E. Hopkins, *Adv. Funct. Mater.* 29, 1904073-8 (2019)
  2. "Nanoscale Mapping of the Electron Density at Al Grain Boundaries and Correlation with Grain-Boundary Energy", Proloy Nandi, Xiahan Sang, **Eric R. Hoglund**, Raymond R. Unocic, Dmitri A. Molodov, and James M. Howe, *Phys. Rev. Materials* 3, no. 5, 053805-7 (2019)
  1. "Synthesis of TiO<sub>2</sub>-Based Nanocomposites by Anodizing and Hydrogen Annealing for Efficient Photoelectrochemical Water Oxidation", Y. Yu, Q. Lin, R Ahmed, **E. R. Hoglund**, and G. Zangari, *J. Power Sources* 410–411, 59–68 (2019)

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## ABSTRACTS

14. "Vibrational and Electronic Structure of Superlattices using Monochromated Electron Energy-Loss Spectroscopy" Eric R Hoglund, De-Liang Bao, Mahmut S Kavrik, Geemin Kim, Matt Law, Patrick E Hopkins, Sokrates T Pantelides, Jordan A Hachtel, Materials Research Society Fall. (2023)
13. "Structural and Temperature Dependence of Emergent Electronic States in PbSe Quantum Dot Superlattices" Eric R Hoglund, Geemin Kim, Mahmut S Kavrik, Matt Law, Jordan A Hachtel, Microscopy and Microanalysis 2023. (2023)
12. "The Influence of Local Stoichiometry, Bonding, and Structure on Interface Vibrations" Eric R Hoglund, De-Liang Bao, Andrew O'Hara, Md Shafkat Bin Hoque, James M Howe, Sokrates T Pantelides, Patrick E Hopkins, Jordan A Hachtel, Microscopy and Microanalysis 2023. (2023)
11. "Nanoscale STEM/EELS and Theory Investigations of Vibronic Properties of Superlattices" Eric R. Hoglund, De-Liang Bao, Andrew O'Hara, Sara Makarem, John A. Tomko, Jordan A. Hachtel, Sokrates T. Pantelides, Patrick E. Hopkins, and James M. Howe, Microscopy and Microanalysis 2022. (2022)
10. "Emergent Interface Vibrational Structure of Oxide Superlattices" Eric R. Hoglund, De-Liang Bao, Andrew O'Hara, Sara Makarem<sup>1</sup>, John A. Tomko, Jordan A. Hachtel, Sokrates T. Pantelides, Patrick E. Hopkins, and James M. Howe, Materials Research Society Spring. (2022)

9. “Nanoscale STEM/EELS and Theory Investigations of Vibronic Properties of Superlattices” Eric Hoglund, Jordan Hachtel, De-Liang Bao, Andrew O'Hara, Sokrates Pantelides, Patrick Hopkins, James Howe, *Microscopy Microanalysis* (2021)
8. “Emergent Interface Vibrational Structure of Oxide Superlattices” Eric R. Hoglund, De-Liang Bao, Andrew O'Hara, Jordan A. Hachtel, Sokrates T. Pantelides, Patrick E. Hopkins, and James M. Howe, *Materials* 2022. (2022)
7. “Nanoscale Phonon Spectroscopy Reveals Emergent Interface Vibrational Structure of Superlattices” Eric Hoglund, Jordan Hachtel, De-Liang Bao, Andrew O'Hara, Sokrates Pantelides, Patrick Hopkins, James Howe *Electron Beam Spectroscopy for Nanooptics*. (2021)
6. “Emergent Structural and Vibrational Properties in SrTiO<sub>3</sub>-CaTiO<sub>3</sub> Superlattices Versus Layer Thickness using Atomic-resolution Microscopy and Theory”, **Eric Hoglund**, Jordan Hachtel, De-Liang Bao, Andrew O'Hara, Sokrates Pantelides, Patrick Hopkins, James Howe, *American Physical Society*. (2021)
5. “Emergent Structural and Vibrational Properties in SrTiO<sub>3</sub>-CaTiO<sub>3</sub> Superlattices Versus Layer Thickness using Atomic-resolution Microscopy and Theory”, **Eric Hoglund**, Jordan Hachtel, De-Liang Bao, Andrew O'Hara, Sokrates Pantelides, Patrick Hopkins, James Howe, *Electronic Materials and Applications* (2021)
4. “Vibrational EELS of CaTiO<sub>3</sub>-SrTiO<sub>3</sub> Superlattices Versus Layer Thickness”, **E. Hoglund**, J. M. Howe, & T. E. Beechem, *Microscopy Microanalysis* (2020)
3. “Localization of Plasmon Resonance using Momentum-Resolved EELS”, **E. Hoglund**, & J. M. Howe, *Microscopy Microanalysis* 25 S2, 642-643 (2019)
2. “Momentum Resolved EELS of Plasmons at Al GBs without a q-Slit Aperture”, **E. Hoglund**, & J. M. Howe, *Microscopy Microanalysis* 24 S1, 466-467 (2018)
1. “Determining the Electron Density and Volume Expansion at Grain Boundaries Using Electron Energy-Loss Spectroscopy”, P. Nandi, **E. Hoglund**, X. Sang, R. R. Unocic, & J. M. Howe, *Microscopy Microanalysis* 23, 414–415 (2017)

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## PRESENTATIONS

15. **Eric R Hoglund**, Harrison Walker, De-Liang Bao, Geemin Kim, Matt Law, Patrick E Hopkins, Sokrates T Pantelides, Jordan A Hachtel “Vibrational and Electronic Structure of Superlattices using Monochromated Electron Energy-Loss Spectroscopy”, Presented at Materials Research Society Fall, December 1, 2023 (Invited Talk)
14. **Eric R. Hoglund**, De-Liang Bao, Harrison Walker, Sokrates Pantelides, Jordan Hachtel “The Influence of Local Stoichiometry, Bonding, and Structure on Interface Vibrations” Presented at Microscopy and Microanalysis 2023, July 24, 2023 (Talk)
13. **Eric R. Hoglund**, “Understanding Local Defect Vibrations Through Structure and Bonding”, presented at University of Maryland, February 01, 2023 (invited seminar)

12. **Eric R. Hogleund**, “Understanding Local Defect Vibrations Through Structure and Bonding”, presented at National Institute for Science and Technology, January 4, 2023 (invited seminar)
11. **Eric R. Hogleund**, De-Liang Bao, Andrew O’Hara, Sara Makarem<sup>1</sup>, John A. Tomko, Jordan A. Hachtel, Sokrates T. Pantelides, Patrick E. Hopkins, and James M. Howe “Nanoscale STEM/EELS and Theory Investigations of Vibronic Properties of Superlattices”, presented at Microscopy and Microanalysis 2022. August 1, 2022 (Talk)
10. **Eric R. Hogleund**, De-Liang Bao, Andrew O’Hara, Sara Makarem<sup>1</sup>, John A. Tomko, Jordan A. Hachtel, Sokrates T. Pantelides, Patrick E. Hopkins, and James M. Howe “Emergent Interface Vibrational Structure of Oxide Superlattices”, presented at Materials Research Society Spring. May 12, 2022 (Talk)
9. **Eric R. Hogleund**, De-Liang Bao, Andrew O’Hara, Jordan A. Hachtel, Sokrates T. Pantelides, Patrick E. Hopkins, and James M. Howe “Emergent Interface Vibrational Structure of Oxide Superlattices”, presented at Materials 2022. April 22, 2022 (Invited talk)
8. **Eric Hogleund**, Jordan Hachtel, De-Liang Bao, Andrew O’Hara, Sokrates Pantelides, Patrick Hopkins, James Howe “Nanoscale STEM/EELS and Theory Investigations of Vibronic Properties of Superlattices” presented at Microscopy and Microanalysis 2021, Virtual, August 2, 2021. (Talk)
7. **Eric Hogleund**, Jordan Hachtel, De-Liang Bao, Andrew O’Hara, Sokrates Pantelides, Patrick Hopkins, James Howe “Nanoscale Phonon Spectroscopy Reveals Emergent Interface Vibrational Structure of Superlattices” presented at Electron Beam Spectroscopy for Nanooptics Workshop, Virtual, January 14-15, 2021. (Poster)
6. **Eric Hogleund**, Jordan Hachtel, De-Liang Bao, Andrew O’Hara, Sokrates Pantelides, Patrick Hopkins, James Howe “Emergent Structural and Vibrational Properties in SrTiO<sub>3</sub>-CaTiO<sub>3</sub> Superlattices using Atomic-resolution Microscopy and Theory” presented at the American Physical Society, Virtual, March 16, 2021. (Talk)
5. **Eric Hogleund**, Jordan Hachtel, De-Liang Bao, Andrew O’Hara, Sokrates Pantelides, Patrick Hopkins, James Howe “Emergent Structural and Vibrational Properties in SrTiO<sub>3</sub>-CaTiO<sub>3</sub> Superlattices using Atomic-resolution Microscopy and Theory” presented at the Electronic Materials and Applications, Virtual, January 20, 2021. (Talk)
4. **Eric R. Hogleund**, Jordan A. Hachtel, James M. Howe. “Vibrational EELS of CaTiO<sub>3</sub>-SrTiO<sub>3</sub> Superlattices Versus Layer Thickness” presented at the Microscopy and Microanalysis 2020, Virtual, August 7, 2020. (Talk)
3. Proloy Nandi, Xiahan Sang, **Eric R. Hogleund**, Raymond R. Unocic, Dmitri A. Molodov, and James M. Howe. “Nanoscale mapping of the electron density at Al grain boundaries and correlation with grain-boundary energy” presented at IIB 2019, Paris, France, July 1, 2019. (Invited Talk)
2. **Eric R. Hogleund**, and James M. Howe “Momentum Resolved EELS of Plasmons at Al Grain Boundaries without a Q-Slit Aperture.” presented at the Microscopy and Microanalysis 2018, Baltimore, MD, August 9, 2018. (Poster)



1. **Eric R. Hoglund**, and Proloy Nandi. “Determining the Electron Density and Volume Expansion at Grain Boundaries Using Electron Energy-Loss Spectroscopy.” presented at the Microscopy and Microanalysis 2017, Saint Louis, MD, August 8, 2018 (Poster)

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## WORK SHOPS

- 2020 **AI For Atoms**, Oak Ridge National Lab  
Workshop for applying machine learning to microscopy and spectroscopy data.
- 2019 **ASU HREM Winter School**, Arizona State University  
Summer school teaching theory and application of high-resolution (S)TEM.
- 2018 **M&M 2018 Pycroscopy Workshop**, Saint Louis Missouri  
Pre-meeting workshop overviewing image analysis using python.

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## TEACHING EXPERIENCE

**Instructor**, University of Virginia

Spring 2019 MSE 6120- Transmission Electron Microscopy

**Teaching Assistant**, University of Virginia

*Graduate Courses*

Spring 2016 MSE 6120- Transmission Electron Microscopy  
- 2020

Fall 2018 MSE 7340- Phase Transformations

*Undergraduate Courses*

- MSE 3060- Structure and Defects of Materials, Fall 2017

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## LEADERSHIP EXPERIENCE

**Microscopy Society of America Student Council**

2023-2024 **Postdoctoral committee:**

Provided support and opportunity for postdoctoral microscopists. Engaged with the StC premeeting congress to ensure inclusion and optimal exposure of postdoctoral researchers.

2020-2021 **Educational Outreach committee:**

Organized educational, career, and diversity webinars that provided a platform for world lead experts to teach researchers electron and optical microscopy techniques, provide experienced based career advice for career academic and industry career paths, and discuss pathways for diversity and inclusion.

2019-2020 **PMCx60 Chair:**

Lead organizer for the “PMCX60 - Annual Pre-Meeting Congress for Students, Post-Docs, and Early-Career Professionals” at Microscopy and Microanalysis. In this role I lead three graduate students. As a team we raised ~\$21,000 of industry sponsorship, organized four symposia, a poster session, and networking events. In total this provided a platform for twelve scientists from diverse backgrounds and research areas to present their research. This pre-meeting provided four scientists with the opportunity to share their research and a platform for Students, Post-Docs, and Early-Career to connect

with other academic and industry scientists. The 2020 PMCX60 was the first ever virtual Microscopy and Microanalysis, and our team redesigned the conference at large with the Microscopy and Microanalysis Executive Council and management to maintain an engaging, high quality, conference experience.

2018-2019 **PMCx60 Physical Science co-chair:**

Lead organizer for the Physical Sciences Symposium during the “PMCX60 - Annual Pre-Meeting Congress for Students, Post-Docs, and Early-Career Professionals” at Microscopy and Microanalysis. As a team we raised ~\$22,000 of industry sponsorship, organized five symposia, a poster session, and networking events. In this role I provided four scientists the opportunity to share their research and a platform for Students, Post-Docs, and Early-Career to connect with other academic and industry scientists.

**Graduate Student Body, University of Virginia**

2019-2020 **Liaison to the chair:**

Responsible for communicating action items of the Graduate Student Body to the department chair.

2016-2018 **Chair for qualifying exams:**

As the Graduate Student Body Qualifying Exams Chair, I aided students prepare for their qualifying exams. To do this I organized a meeting with a faculty panel so that students could receive firsthand advice from multiple professors. I also organized mock examinations to provide an opportunity for students to practice answering questions in front of peers in a similar environment to the actual examinations.

**Graduate Recruitment, University of Virginia**

2016-2020 **Planning through Graduate Student Body and participation during the recruitment weekend**

While serving on the Graduate Student Body I helped organize a recruitment weekend and continued to participate in later years.

**Nano Days, University of Virginia**

2015-2018 **Teaching participant**

I participated as a teacher at Nano Days events, where students in the Materials Science Department traveled to local grade schools and demonstrated various aspects of material science through hands on activities.

**NC Skate, North Carolina State University**

2012-2015 **Vice president  
Event Coordinator**

In these roles I helped lead and organize a school sponsored student sport team. As a group we hosted competitions and traveled to schools along the easter coast of the Unites States. In addition, we organized charitable events for underprivileged youth or people with health conditions. We repeatedly ranked as the number one charitable sports club at the university.

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## ADDITIONAL OUTREACH

2023-2024 *Microscopy Today* Micrograph Competition co-chair

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## SOCIETY AFFILIATIONS

2017-Present Microscopy Society of America  
2017-Present Microanalysis Society  
2022-Present Materials Research Society  
2018-2021 American Physical Society  
2020-2021 UVA Raven Society  
2018-2019 TMS  
2018-2019 ACerS  
2018-2019 ASM

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## SKILLS

### Experimental Techniques and Instruments

#### (S)TEM imaging, diffraction, and spectroscopy:

Aberration-corrected scanning electron microscopy

Electron energy-loss spectroscopy

- Monochromated and non-monochromated
- Core-loss for compositional quantification and near-edge structure analysis for local electronic structure
- Low-loss electron energy-loss spectroscopy including excitons and plasmons
- Vibrational electron energy-loss spectroscopy

4D-STEM

- Atomic resolution order – disorder crystal phase mapping
- Strain analysis
- Orientation mapping
- Center-of-mass imaging

TEM diffraction imaging

- Weak beam darkfield imaging
- Selected area diffraction

In-situ cryogenic and heating

#### Sample preparation

- Focused-Ion Beam
- Multiprep mechanical polishing
- Twin jet electropolishing
- Precision ion polishing
- Dimple grinding

#### Other Characterization

- Raman
- Fourier-transform Infrared Spectroscopy
- White light interferometer

- X-Ray diffraction
- Atomic force microscopy
- Time-domain thermoreflectance
- Time-domain Brillouin zone scattering
- Picosecond acoustics

### **Electron Microscopes**

- Nion Ultra-HERMES (MAC-STEM)
- Nion UltraSTEM 100
- Nion UltraSTEM 200
- Probe-corrected monochromated ThemisZ STEM
- Probe-corrected Titan 80-30kV TEM/STEM
- Titan 80-30kV TEM/STEM
- JEOL 2000FX
- Helios Dual Beam Focused-Ion Beam

### **Scripting and Simulation**

- Advanced custom Python coding
  - o custom scripting image and spectral analysis
  - o machine learning
  - o experience with hyperspectral modules like HyperSpy, py4DSTEM, pxXEM, Atomap
- AbTEM for image and diffraction simulation
- Python structural and vibrational packages
  - o Phonopy
  - o Atomic Simulation Environment

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## REFERENCES

### Reference 1

Name: Professor Patrick E. Hopkins  
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### Reference 3

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Relation External University Collaborator  
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### Reference 4

Name: Professor James M. Howe  
Relation Doctoral and Post-doc. Advisor (UVA)  
E-mail: jh9s@virginia.edu  
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