Zachary Morgan
Neutron Scattering Scientist
Oak Ridge National Laboratory

1 Bethel Valley Rd   Neutron Scattering Division   morganzj@ornl.gov
Oak Ridge, TN 37830   Single Crystal Diffraction Group   (734) 807-0719

Appointments

R&D Associate Staff Member, Oak Ridge Nat'l. Lab. . . . . Sep 2020—Present

Education

PhD, Materials Science and Engineering, Michigan Tech. Univ. . . . . Aug 2020
  • "Multiphysics Phase Field Modeling of Electromigration."
BS, Mechanical Engineering, Michigan Technological University . . . . May 2015
  • Summa cum laude

Research

Graduate research in neutron single crystal diffraction at ORNL . . . . Apr 2018—Present
  • Developed computer programs for peak fitting and the analysis of diffuse neutron scattering from
    single crystals with correlated disorder (mentor: Dr. F. Ye)
PhD research in computational materials science at MTU . . . . Aug 2015—Present
  • Developed a multiphysics computer program package for phase field modeling of microstructure
    evolution involving electromigration (advisor: Dr. Y.M. Jin)

Internships

Modeling Engineer, ThermoAnalytics, Inc. . . . . Jan 2015—Aug 2015
  • Developed graphical tool for visualization and data extraction
Manufacturing Engineer, General Motors, Co. . . . . May 2012—Aug 2012
  • Developed workflow tool for communicating tasks in tool and die production
Laboratory Technician, Cannon Muskegon, Corp. . . . . May 2011—Aug 2011
  • Developed database tool for magnesium evaporation in superalloy production

Training

International Workshop on Hysteresis
  • Magnetocaloric, Electrocaloric and Elastocaloric Refrigeration, Dreseden, Germany . . . Feb 2017
International Institute for Multifunctional Materials for Energy Conversion
  • Summer School on Computational Materials Science, College Station, TX . . . . Jul 2016
San Diego Supercomputer Center Summer Institute
  • Discover Big Data, San Diego, CA . . . . Aug 2013

Teaching, Mentoring, and Coaching

Instructor, Introduction to Materials Science and Engineering—Part 2 . . . . Oct 2019—May 2020
  • Instruct recitations and computer laboratory sessions, 5 weeks per semester
Head Coach, Houghton Middle School math team . . . . Oct 2019—Present
  • Once a week, 1 ½ hours per practice
Teaching Assistant, Transport Phenomena . . . . Jan 2016—Present
  • Instruct computational laboratory sessions, spring semesters
Volunteer Coach, Materials Science and Engineering learning center . . . . Oct 2015—May 2017
  • Twice a week, 2 hours per session
Assistant Coach, Houghton Middle and High School math teams . . . . Sep 2015—May 2019
  • Once a week, 1 ½ hours per practice, 2018—2019
  • Twice a week, 1 ½ hours per practice 2015—2018
Volunteer Coach, Transport Phenomena help session . . . . Jan 2013—Apr 2015
  • Once a week, 2 hours per session, spring semesters

Fellowships, Awards, and Scholarships

External
- National Science Foundation Graduate Research Fellowship . . . . May 2016—Present
- Michigan Space Grant Consortium Fellowship . . . . May 2013—Apr 2014

Internal Oak Ridge National Laboratory
- Division Director Award, Computational Science and Mathematics Division, "Neutron Data Project Team" . . . . Feb 2021

Internal Michigan Technological University
- Doctoral Finishing Fellowship . . . . Jan 2020 — May 2020
- Outstanding Scholarship Award . . . . Apr 2020
- Professional Development Award for best graduate seminar presentation—fall . . . . Dec 2018
- Summer Undergraduate Research Fellowship . . . . May 2014—Aug 2014
- McArthur Research Internship . . . . Sep 2012—Apr 2014
- Materials Science and Engineering Departmental Scholar . . . . Sep 2013—Apr 2014
- Outstanding Academic Achievement: Multivariable Calculus . . . . Jan 2011—Apr 2011
- Jane and Fred Mayer Memorial Scholarship . . . . Sep 2013–Apr 2014
- Ladish Company Foundation Scholarship . . . . Sep 2012—Apr 2013
- James & Alma Van Camp Family Endowment Scholarship . . . . Sep 2012—Apr 2013
- Hale Family Memorial Endowment Scholarship . . . . Sep 2012—May 2015
- Mr & Mrs Ernest W. Kitzner Scholarship . . . . Aug 2011—May 2015
- Michigan Competitive Scholarship . . . . Aug 2011—Apr 2014
- Presidential Excellence Scholarship . . . . Aug 2010—Apr 2014

Publications

- Hao, Y.; Feng, E.; Lu, D.; Zimmer, L.; Morgan, Z.; Chakoumakos, B. C.; Zhang, G.; Cao, H. Machine-Learning-Assisted Automation of Single-Crystal Neutron Diffraction. J Appl Cryst 2023, 56 (2), 519–525.
- Zhang, C.; Morgan, Z. Advanced Image Reconstruction for MCP Detector in Event Mode. In Driving Scientific and Engineering Discoveries Through the Integration of Experiment, Big Data, and Modeling and Simulation; Nichols, J., Maccabe, A. 'Barney,' Nutaro, J., Pophale, S., Devineni, P., Ahearn, T., Verastegui, B., Eds.; Communications in Computer and Information Science; Springer International.
- Ye, F.; Matsuda, M.; Morgan, Z.; Sherline, T.; Ni, Y.; Zhao, H.; Cao, G. Magnetic Structure and Spin Fluctuations in the Colossal Magnetoresistance Ferrimagnet $Mn_3Si_2Te_6$. Phys. Rev. B 2022, 106 (18), L180402.
- Morgan, Z.; Ye, F. Toward Discord: Code for Simulating Continuous Spin Systems. JOM 2022.
- Bruhwiler, D.; Bruhwiler, K.; Hoffmann, C.; Kuhn, A.; Mensmann, J.; Messmer, P.; Moeller, P.; Morgan, Z.; Nagler, R.; Nienhaus, M.; Roemer, S.; Savici, A.; Tatulea, D.; Tucker, M. Rapid Browser-Based Visualization of Large Neutron Scattering Datasets; JACOW Publishing, Geneva, Switzerland, 2021; pp 2494–2497.
- Morgan, Z. J.; Zhou, H. D.; Chakoumakos, B. C.; Ye, F. rmc-discord: Reverse Monte Carlo Refinement of Diffuse Scattering and Correlated Disorder from Single Crystals. J Appl Cryst 2021, 54 (6).
- Bruhwiler, D.; Bruhwiler, K.; Hoffmann, C.; Kuhn, A.; Mensmann, J.; Messmer, P.; Moeller, P.; Morgan, Z.; Nagler, R.; Nienhaus, M.; Roemer, S.; Savici, A.; Tatulea, D.; Tucker, M. Rapid Browser-Based Visualization of Large Neutron Scattering Datasets; JACOW Publishing, Geneva, Switzerland, 2021; pp 2494–2497.
- Ye, F.; Morgan, Z.; Tian, W.; Chi, S.; Wang, X.; Manley, M. E.; Parker, D.; Khan, M. A.; Mitchell, J. F.; Fishman, R. Canted Antiferromagnetic Order and Spin Dynamics in the Honeycomb-Lattice Compound $Tb_2Ir_3Ga_9$. Phys. Rev. B 2021, 103 (18), 184413.
- Morgan, Z. J.; Jin, Y. M. Phase Field Modeling of Pore Electromigration in Anisotropic Conducting Polycrystals. Computational Materials Science 2020, 172, 109362.

Professional Societies

Member, The Minerals, Metals, & Materials Society .... Jan 2021—Present
Member, American Physical Society .... Jan 2022—Present
Member, American Crystallographic Association .... May 2021—Present

Workshops

Advanced Software Tools for Single Crystal Diffraction, American Crystallographic Association Meeting July 29, 2022, Xiaoping Wang, Zachary Morgan, and Christina Hoffmann

Advanced Software Tools for Single Crystal Data Analysis, a two-day satellite workshop in the Joint Nanoscience and Neutron Scattering User Meeting Aug 2-3, 2021, Xiaoping Wang, Zachary Morgan, Feng Ye and Christina Hoffmann

Presentations, Posters, and Reports

Presentations

- APS March Meeting 2023 .... Mar 2023
  - "Evolution of spin structure in Kagome metal Sc0.8Hf0.2Mn6Sn6 under magnetic field"
- American Crystallographic Association .... Jul 2022
  - "Introduction to the rmc-discord software package for single crystals"
  - "Integrated analysis for both diffuse and Bragg single crystal neutron scattering"
- APS March Meeting 2022 .... Mar 2022
  - "Canted antiferromagnetic order and spin dynamics in the honeycomb-lattice Tb2Ir3Ga9"
- American Crystallographic Association .... Jul 2021
  - *Invited*, "Reverse Monte Carlo refinement of single crystal diffuse neutron scattering and correlated magnetic disorder with program rmc-discord" Magnetic Structure Determination: Advances and Applications
- The Minerals, Metals & Materials Society 2020 Conference .... Mar 2021
  - "A refinement program to characterize single crystal magnetic diffuse scattering from neutron diffraction experiments"
  - "Modeling and simulation of stress gradient driven migration"
- American Crystallographic Association .... Jul 2021
  Introduction to Diffuse Scattering Analysis from Single Crystal Neutron Diffraction Workshop
  - *Invited*, "A reverse Monte Carlo refinement Python program for the analysis of diffuse neutron scattering from single crystals"
- The Minerals, Metals & Materials Society 2020 Conference, San Diego, CA .... Feb 2020
  - "Modeling and simulation of pore electromigration in tin solders"
- Diffuse Scattering Interest Group Seminar, Oak Ridge National Laboratory .... Sep 2019
  - "A reverse Monte Carlo refinement program for diffuse single crystal neutron scattering data"
- First Integrated Workshop on Neutron Diffuse Scattering from Single Crystals, ORNL . Jun 2019
  - "A reverse Monte Carlo refinement Python program for the analysis of single crystal neutron scattering data"
- The Minerals, Metals & Materials Society 2019 Conference, San Antonio, TX .... Mar 2019
  - "Microelasticity modeling of defects and their role in the performance of tin solder interconnects"
- Materials Science and Engineering Department Seminar .... Sep 2018
  - "Development of a reverse Monte Carlo refinement program for the analysis of magnetic diffuse neutron scattering data"
- The Minerals, Metals & Materials Society 2018 Conference, Phoenix, AZ .... Mar 2018
  - "The role of inhomogeneous properties on tin solder electromigration performance"
- Materials Science & Technology 2017 Conference, Pittsburgh, PA .... Oct 2017
  - "Effects of anisotropic properties on electromigration in tin solder interconnects"
- Materials Science and Engineering Department Seminar .... Mar 2017
  - "A partial differential equation solver: modeling materials processes with the continuum

assumption"
- Materials Science & Technology 2016 Conference, Salt Lake City, UT . . . . Oct 2016
  - "Coupled charge conduction and mass diffusion in solder interconnects"
  - "Temperature dependent damping properties of ferroelectric ceramic-reinforced metal-matrix composites"
- Materials Science & Technology 2014 Conference, Pittsburgh, PA . . . . Oct 2014
  - "Damping mechanisms in ferroelectric ceramic-reinforced metal matrix composites"
- McArthur Research Internship Presentation . . . . Jan 2014
  - "Modeling and simulation of ferroelectric barium titanate for improving damping capabilities in metal matrix composites"
- McArthur Research Internship Presentation . . . . Jan 2013
  - "Phase field modeling of composites with functionally active materials"

Posters
- Materials Research Society Fall Meetings & Exhibits, Boston, MA . . . . Dec 2019
  - "Modeling and simulation of pore migration in tin solders at high homologous temperatures subjected to large electric currents and stress gradients"
- International Mechanical Engineering Congress and Exposition, Pittsburgh, PA . . . . . . Nov 2018
  - "Microelasticity modeling of microstructures"

Service

Guest editor, JOM Technical Topic . . . . June 2023
- "Advanced Magnetic Materials for Energy and Other Functional Applications and Devices"

External Advisory Board, Michigan Tech. Univ. Mat'ls Sci. & Eng. Dept. . . . . Apr 2021—Present

Allocations

XSEDE Allocations
- Phase field modeling of defect migration" . . . . Dec 2018—Dec 2019
- Charge conduction, mass diffusion, and microstructure evolution in copper-tin solder interconnects" . . . . Jun 2017—Jun 2018

Programming Languages

C/C++, Fortran, Python

Leadership

Treasurer, Pi Tau Sigma—Michigan Tech Sigma Iota . . . . May 2013—Apr 2015
- International Mechanical Engineering Honor Society

Officer, Tau Beta Pi—Michigan Beta . . . . May 2014—Apr 2015
- The Engineering Honor Society

Secretary, Materials United . . . . May 2012—Apr 2014
- Material Advantage and American Foundry Society, Michigan Tech student chapter

President, Materials United . . . . May 2011—Apr 2012
- Material Advantage and American Foundry Society, Michigan Tech student chapter

Knowledge Dissemination

Congressional Visits Day 2012, Washington, DC . . . . Apr 2012
- Spoke to Michigan congressmen about the "Materials Genome Initiative"