

## RESEARCH INTERESTS

- Advanced manufacturing, specifically additive manufacturing of metals and alloys
- Model-based simulations of materials using frameworks such as crystal plasticity
- Microstructure characterization through conventional and advanced (e.g., synchrotron) techniques
- Data science and machine learning approaches to elucidate process-structure-property relationships

## RESEARCH EXPERIENCE

Purdue University, *West Lafayette, IN*

[Hypersonics Advanced Manufacturing Technology Center \(HAMTC\)](#)

Mar 2023 – Present

Research Engineer

- Supporting projects on i) novel niobium alloy development for additive manufacturing, ii) scramjet redesign, and iii) critical joining technologies for boost glide vehicles

[Michael D. Sangid Research Group](#)

Jul 2021 – Present

Postdoctoral Research Associate

- Working to integrate crystal plasticity models, high energy x-ray diffraction experiments, and machine learning to promote the rapid qualification of additively manufactured materials

David L. McDowell Research Group, Georgia Institute of Technology, *Atlanta, GA*

Aug 2016 – May 2021

Graduate Research Assistant

- Performed large-scale crystal plasticity finite element method simulations of duplex Ti-6Al-4V and Al 7075-T6
- Implemented Python-scripted workflows to explore extreme value fatigue response of intrinsic (grain size, shape, and orientation distributions) and extrinsic (residual stress, surface roughness, inclusions, or pores, etc.) microstructure attributes under various loading (e.g., multiaxial) and boundary conditions
- Developed and currently maintain [PRISMS-Fatigue](#) open-source modeling framework

X-ray Science Division, Argonne National Laboratory, *Lemont, IL*

May – Sep 2020

Graduate Researcher

- Analyzed high-energy x-ray diffraction data collected *in situ* during fatigue testing of Ti-6Al-4V
- Reconstructed digital microstructure for crystal plasticity simulations using data fusion approaches

## EDUCATION

Doctor of Philosophy, Mechanical Engineering

May 2021

Georgia Institute of Technology, *Atlanta, GA*

*Thesis:* [“Integrated Computational Materials Engineering Workflows for Microstructure-Sensitive Fatigue of Advanced Alloys”](#)

*Advisor:* Dr. David L. McDowell

Master of Science, Mechanical Engineering

May 2018

Georgia Institute of Technology, *Atlanta, GA*

Bachelor of Science, Mechanical Engineering

Nov 2015

Minor in Computational Science

Rose-Hulman Institute of Technology, *Terre Haute, IN*

## PEER-REVIEWED PUBLICATIONS

15. K. S. Stopka, A. Desrosiers, A. Andreaco, and M. D. Sangid. A methodology for the rapid qualification of additively manufactured materials based on pore defect structures. (in review)
14. K. S. Stopka and M. D. Sangid. Modeling fatigue behavior of additively manufactured alloys with an emphasis on pore defect morphology. *J. Mech. Phys. Solids*, **181**, 105429 (2023) [doi](#)
13. M. Yaghoobi, K. S. Stopka, D. L. McDowell, L. Graham-Brady, and K. Teferra. Effect of sample size on the maximum value distribution of fatigue driving forces in metals and alloys. *Int. J. Fatigue*, **176**, 107853 (2023) [doi](#)

12. **K. S. Stopka**, A. Desrosiers, T. Nicodemus, N. Krutz, A. Andreaco, and M. D. Sangid. Intentionally seeding pores in additively manufactured alloy 718: process parameters, microstructure, defects, and fatigue. *Addit. Manuf.*, **66**, 103450 (2023) [doi](#)
11. T. Gu, **K. S. Stopka**, C. Xu, and D. L. McDowell. Modeling the statistical distribution of fatigue crack formation lifetime in large volumes of polycrystalline microstructures. *Acta Mater.*, **246**, 118715 (2023) [doi](#)
10. **K. S. Stopka**, M. Yaghoobi, J. E. Allison, and D. L. McDowell. Microstructure-sensitive modeling of surface roughness and notch effects on extreme value fatigue response. *Int. J. Fatigue*, **166**, 107295 (2023) [doi](#)
9. **K. S. Stopka**, M. Yaghoobi, J. E. Allison, and D. L. McDowell. Simulated effects of sample size and grain neighborhood on the modeling of extreme value fatigue response. *Acta Mater.*, **224**, 117524 (2022) [doi](#)
8. A. Lakshmanan, M. Yaghoobi, **K. S. Stopka**, et al. Crystal plasticity finite element modeling of grain size and morphology effects on yield strength and extreme value fatigue response. *J. Mater. Res. Technol.*, **19**, 3337-3354 (2022) [doi](#)
7. **K. S. Stopka**, M. Yaghoobi, J. E. Allison, and D. L. McDowell. Effects of boundary conditions on microstructure-sensitive fatigue crystal plasticity analysis. *Integr. Mater. Manuf. Innov.*, **10**, 393-412 (2021) [doi](#)
6. M. Yaghoobi, **K. S. Stopka**, A. Lakshmanan, V. Sundararaghavan, et al. PRISMS-Fatigue computational framework for fatigue analysis in polycrystalline metals and alloys. *npj Comput. Mater.*, **7**, 38 (2021) [doi](#)
5. **K. S. Stopka** and D. L. McDowell. Microstructure-sensitive computational multiaxial fatigue of Al 7075-T6 and duplex Ti-6Al-4V. *Int. J. Fatigue*, **133**, 105460 (2020) [doi](#)
4. **K. S. Stopka** and D. L. McDowell. Microstructure-sensitive computational estimates of driving forces for surface versus subsurface fatigue crack formation in duplex Ti-6Al-4V and Al 7075-T6. *JOM*, **72**, 28-38 (2020) [doi](#)
3. **K. S. Stopka**, T. Gu, and D. L. McDowell. Effects of algorithmic simulation parameters on the prediction of extreme value fatigue indicator parameters in duplex Ti-6Al-4V. *Int. J. Fatigue*, **141**, 105865 (2020) [doi](#)
2. T. Gu, **K. S. Stopka**, C. Xu, and D. L. McDowell. Prediction of maximum fatigue indicator parameters for duplex Ti-6Al-4V using extreme value theory. *Acta Mater.*, **188**, 504-516 (2020) [doi](#)
1. A. E. Tallman, **K. S. Stopka**, L. P. Swiler, Y. Wang, et al. Gaussian-process-driven adaptive sampling for reduced-order modeling of texture effects in polycrystalline alpha-Ti. *JOM*, **71**, 2646-2656 (2019) [doi](#)

#### **CONFERENCE PROCEEDINGS**

2. **K. S. Stopka**, J. Smallwood, A. Chokshi, S. D. Heister, and M. D. Sangid. Structural and fatigue analysis of a rotating detonation rocket engine. *American Institute of Aeronautics and Astronautics (AIAA) SciTech Forum* (2023) [doi](#)
1. **K. S. Stopka**, G. Whelan, and D. L. McDowell. Microstructure-sensitive ICME workflows for fatigue critical applications. *Society of the Advancement of Material and Process Engineering (SAMPE)* (2019) [doi](#)

#### **CONFERENCE PRESENTATIONS AND TALKS**

21. **UPCOMING: K. S. Stopka**, Y. Sun, P. Kenesei, J-S. Park, J. Solano, A. Desrosiers, A. Andreaco, G. Lin, and M. D. Sangid. Multimodal Characterization and Modeling of Additively Manufactured Alloys with Intentionally Seeded Pores. *The Minerals, Metals & Materials Society (TMS 2024)*, Orlando, FL, March 2024.
20. **UPCOMING: K. S. Stopka** and M. D. Sangid. Crystal Plasticity Fatigue Modeling of Additively Manufactured Materials with Various Pore Defect Morphology. *TMS 2024*, Orlando, FL, March 2024.
19. **K. S. Stopka**, A. Desrosiers, T. Nicodemus, N. Krutz, A. Andreaco, and M. D. Sangid. Intentionally seeding pores in laser powder bed fusion IN718: microstructure, defects, and fatigue. *TMS 2023*, San Diego, CA, March 22<sup>nd</sup>, 2023.
18. **K. S. Stopka** and M. D. Sangid. Modeling fatigue resistance in additively manufactured alloys with porosity defects. *TMS 2023*, San Diego, CA, March 22<sup>nd</sup>, 2023.
17. **K. S. Stopka**, J. Smallwood, A. Chokshi, S. D. Heister, and M. D. Sangid. Structural and fatigue analysis of a rotating detonation rocket engine. *AIAA SciTech Forum*, National Harbor, MD, January 26<sup>th</sup>, 2023.
16. **K. S. Stopka** and M. D. Sangid. Experimental validation of crystal plasticity models with additively manufactured defects. *AIAA SciTech Forum*, National Harbor, MD, January 23<sup>rd</sup>, 2023.
15. **K. S. Stopka**, A. Desrosiers, T. Nicodemus, A. Andreaco, and M. D. Sangid. Examining the micromechanical response of additively manufactured Alloy 718 intentionally seeded with pores. *Workshop on High-Energy Diffraction Microscopy analysis using Microstructural Imaging using Diffraction Analysis Software (MIDAS)*, Lemont, IL, November 9<sup>th</sup>, 2022.
14. **INVITED: K. S. Stopka** and M. D. Sangid. Micromechanical modeling of porosity defects in additively manufactured alloys. *International Conference on Additive Manufacturing (ICAM 2022)*, Orlando, FL, November 3<sup>rd</sup>, 2022.
13. **K. S. Stopka**, A. Desrosiers, T. Nicodemus, A. Andreaco, and M. D. Sangid. Progress towards a standard for rapid qualification of additively manufactured materials based on defect structures. *ICAM 2022*, Orlando, FL, November 2<sup>nd</sup>, 2022.

12. **INVITED: K. S. Stopka**, M. Yaghoobi, J. E. Allison, D. L. McDowell, and M. D. Sangid. Modeling fatigue using digital microstructures: applications of DREAM.3D. *2022 Workshop on Methods for Three-Dimensional Microstructure Studies*, Pittsburgh, PA, August 17<sup>th</sup>, 2022.
11. **K. S. Stopka**, M. Yaghoobi, A. Lakshmanan, J. E. Allison, and D. L. McDowell. Microstructure-sensitive modeling of surface roughness and notch effects on extreme value fatigue response. *2022 Annual PRISMS Center Workshop*, August 12<sup>th</sup>, 2022, virtual event.
10. **K. S. Stopka**, M. Yaghoobi, J. E. Allison, and D. L. McDowell. Effects of boundary conditions on microstructure-sensitive fatigue crystal plasticity analysis. *The 6th World Congress on Integrated Computational Materials Engineering (ICME 2022)*, Incline Village, NV, April 25<sup>th</sup>, 2022.
9. **K. S. Stopka** and M. D. Sangid. Micromechanical modeling of porosity defects in additively manufactured alloys. *TMS 2022*, Anaheim, CA, March 2<sup>nd</sup>, 2022.
8. **K. S. Stopka**, M. Yaghoobi, J. E. Allison, and D. L. McDowell. Microstructure effects on the extreme value fatigue response of FCC metals and alloys: effects of sample size and grain neighborhood. *TMS 2022*, Anaheim, CA, March 1<sup>st</sup>, 2022.
7. **K. S. Stopka**, M. Yaghoobi, A. Lakshmanan, V. Sundararaghavan, J. E. Allison, and D. L. McDowell. PRISMS-Fatigue: overview and case studies. *2021 Annual PRISMS Center Workshop*, August 3<sup>rd</sup>, 2021, virtual event.
6. **K. S. Stopka**, J.S. Park, H. Sharma, et al. Reconstruction of microstructure and defects in an Alpha + Beta processed Ti-6Al-4V plate product using High-energy X-ray Diffraction Microscopy and DREAM.3D. *5<sup>th</sup> International Congress on 3D Materials Science (3DMS 2021)*, July 1<sup>st</sup>, 2021, virtual event.
5. **K. S. Stopka** and D. L. McDowell. Effects of surface roughness on microstructure-sensitive computations of fatigue crack formation driving force in duplex Ti-6Al-4V and Al 7075-T6. *TMS 2020*, San Diego, CA, February 26<sup>th</sup>, 2020.
4. **K. S. Stopka** and D. L. McDowell. Microstructure-sensitive computational estimates of driving forces for surface vs. subsurface fatigue crack formation in Duplex Ti-6Al-4V and Al 7075-T6. *Materials Science and Technology (MS&T) 2019*, Portland, OR, September 30<sup>th</sup>, 2019.
3. **K. S. Stopka** and D. L. McDowell. Microstructure-sensitive computational multiaxial fatigue. *12<sup>th</sup> International Conference on Multiaxial Fatigue and Fracture (ICMFF12) 2019*, Bordeaux, France, June 24<sup>th</sup>, 2019.
2. **K. S. Stopka**, A. E. Tallman, L. P. Swiler, Y. Wang, S. R. Kalidindi, and D. L. McDowell. Gaussian-process-driven adaptive sampling for reduced-order modeling of texture effects in polycrystalline alpha-Ti. *TMS 2019*, San Antonio, TX, March 12<sup>th</sup>, 2019.
1. **K. S. Stopka** and D. L. McDowell. Computational statistics of formation and early growth of microstructurally small cracks in Ti-6Al-4V. *MS&T 2018*, Columbus, OH, October 17<sup>th</sup>, 2018.

## MENTORSHIP

Georgia Institute of Technology, Atlanta, GA

Aug 2018 – May 2019

### Leadership Education and Development (LEAD) Coach

- Met one-on-one with undergraduate and graduate students for personalized coaching sessions
- Developed a total of six students during the 2018-2019 academic year

Purdue University, West Lafayette, IN

July 2021 – Present

Postdoctoral Research Associate, Michael D. Sangid Research Group

- Mentored an undergraduate student as part of the 2021 [Summer Undergraduate Research Fellowship \(SURF\) program](#) and another undergraduate pursuing research within Dr. Sangid's research group
- Meeting weekly with two first-year graduate students as well as on-demand with other graduate students

## PROFESSIONAL DEVELOPMENT

Georgia Institute of Technology, Atlanta, GA

Fall 2019 – Fall 2020

### Tech to Teaching, Center for Teaching and Learning

- Completed two graduate-level courses and a capstone teaching experience to prepare future faculty
- Delivered six lectures in graduate-level courses on Fatigue and Fracture Mechanics

## EDITORIAL EXPERIENCE

Peer Reviewer for the following journals, [Publons Profile](#)

Mar 2019 – Present

- International Journal of Fatigue, International Journal of Fracture, Engineering Failure Analysis, Acta Materialia, Materialia, Frontiers in Materials, JOM, Mathematics, Applied Science

## **PROPOSAL PREPARATION**

**Purdue University, West Lafayette, IN**

July 2021 – Present

### **Postdoctoral Research Associate**

- Wrote a [Guest User Proposal \(GUP\)](#) that was awarded beamtime at the [Advanced Photon Source](#)
- Assisted in writing a proposal for a NASA [Space Technology Research Institutes \(STRI\)](#) solicitation

## **INDUSTRY EXPERIENCE**

**B/E Aerospace, Rockford, IL**

Dec 2015 – Jul 2016

### **Project Engineer**

- Conducted Root Cause Analysis to improve reliability of Vacuum Pump
- Worked with customers / suppliers to improve Vacuum Pump performance for multiple aircraft
- Collaborated with design engineers to redesign Embraer Vacuum Waste System

**GE Aviation, Evendale, OH**

Jun – Aug 2015

### **GEEnx Engine Performance Intern**

- Remedied process of deriving humidity and condensation fan speed adders for production
- Calculated Test Vectors to support new 76K thrust rating for Boeing
- Determined effects of engine's physical turbine deviation on thrust and SFC

**Space Exploration Technologies (SpaceX), Hawthorne, CA**

Sep – Nov 2014

### **Structures Intern**

- Designed testing fixture for v2.0 Landing Leg weather seal Research and Development
- Directed tensile, fatigue, torch, and vacuum testing to validate Pyron and Nomex felts as replacement for cork as Temperature Protection System on Falcon 9 Landing Legs
- Evaluated strength of Carbon Fiber samples with Composi-lok fasteners for v2.0 Landing Legs

**GE Aviation, Rockford, IL**

Jun – Aug 2014

### **Manufacturing Engineering Intern**

- Appraised LEAP combustor Nacelle Anti-Ice Valve drawings for manufacturability and cost
- Enhanced Qualification Matrix to expand site worker versatility
- Created drawings and process plans for developmental parts using SolidWorks

**Tesla Motors, Fremont, CA**

Sep 2013 – Feb 2014

### **Craftsmanship Vehicle Engineering Intern**

- Determined root cause and solution to Model S Instrument Panel fitment inconsistency
- Enriched Research and Development for Model X program to study what competitor vehicles are doing and set competitive or class leading margins for interior and exterior components
- Sourced an E-Cube and Blue Buck project to aid Model X future dimensional quality
- Lead and assisted in custom Model S builds to assess new and modified components

**GE Aviation, Terre Haute, IN**

Mar – Aug 2013

### **Manufacturing Engineering Intern**

- Completed weld certifications and gathered dimensional data for Passport and LEAP combustors
- Interpreted GD&T blueprints for online characteristic accountability system
- Updated operation sketches, part routers and check sheets

**Diesel Radiator Company, Melrose Park, IL**

Jun – Aug 2012

### **Design and Manufacturing Engineering Intern**

- Reduced steel scrap by an average of 9.7% for high quantity radiator jobs
- Designed facility apparatuses, such as stainless-steel ductwork, and a brass uncoiler and shear rail
- Resolved day to day computer numerical control issues affecting production