Carter K. Cocke

cartercocke.github.io

Education

California Institute of Technology Expected 2028
Ph.D. in Mechanical Engineering Pasadena, CA

- Advisor: Dr. Kaushik Bhattacharya

University of Utah 2022
M.S. in Mechanical Engineering Salt Lake City, UT

- Advisor: Dr. Ashley D. Spear

University of Utah 2022
Honors B.S. in Mechanical Engineering, summa cum laude Salt Lake City, UT

- Solid Mechanics Emphasis, Honors Ecology and Legacy Minor

Research Experience

University of Utah Multiscale Mechanics & Materials Laboratory Aug. 2019 – Aug. 2022
MS/BS Research Assistant Salt Lake City, UT
Funded by: Department of Energy (DOE) Nuclear Energy University Program (NEUP)
Topic: Estimating macroscale ductility using microstructure-sensitive scaling relationships

- Published one first-author journal article (one additional first-author publication under-review) detailing novel methods in FFT-based crystal plasticity modeling
- Leveraged and extended FFT-based methods to win two first-place awards in additive manufacturing-based research challenges (NIST AM-Bench & AFRL AM Challenge)
- Developed serial and parallelized Python, Fortran, and C++ code for computational solid and materials science research applications
- Leveraged high-performance computing (HPC) for running OpenMP and MPI parallelized codes on a Linux cluster environment using the Slurm workload manager

Los Alamos National Laboratory May 2021 – Aug. 2021
Graduate Research Assistant Remote

- Developed a method to model material indentation using a large strain EVPFFT model through formulation and code modifications
- Substantially improved EVPFFT simulation execution time through serial code optimizations, OpenMP parallelization, and external library implementations

Publications

- **C. K. Cocke**, H. Mirmohammad, M. Zecevic, B. Phung, R. Lebensohn, O. Kingstedt, A. Spear, "Implementation and experimental validation of nonlocal damage in a large-strain elasto-viscoplastic FFT-based framework for predicting ductile fracture in 3D polycrystalline materials," *Under review*.
- **C. K. Cocke**, A. Rollett, R. Lebensohn, A. Spear, "The AFRL Additive Manufacturing Modeling Challenge: Predicting Micromechanical Fields in AM IN625 Using an FFT-Based Method with Direct Input from a 3D Microstructural Image," *Integrating Materials Manufacturing and Innovation*, 2021. https://doi.org/10.1007/s40192-021-00211-w

Conference Presentations (*presenter)

- A. Rollett*, J. Pauza, **C. K. Cocke**, R. Lebensohn, A. Spear, "Combining Modeling & Measurement in Metals Additive," *AM-Bench 2022*, Bethesda, MD, August 2022.
- **C. K. Cocke***, H. Mirmohammad, M. Zecevic, B. Phung, R. Lebensohn, O. Kingstedt, A. Spear, "Implementation and experimental validation of nonlocal damage in a large-strain elasto-viscoplastic FFT-based framework for predicting ductile fracture in 3D polycrystalline materials," *WCCM 15*, Virtual, August 2022.
- **C. K. Cocke***, H. Mirmohammad, M. Zecevic, B. Phung, R. A. Lebensohn, O. T. Kingstedt, A. D. Spear, "Implementation and experimental validation of nonlocal damage in a large-strain elasto-viscoplastic FFT-based framework for predicting ductile fracture in 3D polycrystalline materials," *ESMC 11*, Galway, Ireland, July 2022.
- **C. K. Cocke***, H. Mirmohammad, M. Zecevic, B. Phung, R. Lebensohn, O. Kingstedt, A. Spear, "Implementation and experimental validation of nonlocal damage in a large-strain elasto-viscoplastic FFT-based framework for predicting ductile fracture in 3D polycrystalline materials," *3DMS 6*, Washington, D.C., June 2022.
- **C. K. Cocke***, A. Rollett, R. Lebensohn, A. Spear, "The AFRL AM Modeling Challenge: Predicting Micromechanical Fields in AM IN625 Using an FFT-Based Method with Direct Input from a 3D Microstructural Image," *USNCCM 16*, Virtual, July 2021.
- **C. K. Cocke***, A. Rollett, R. Lebensohn, A. Spear, "The AFRL AM Modeling Challenge: Predicting Micromechanical Fields in AM IN625 Using an FFT-based Method with Direct Input from a 3D Microstructural Image," *3DMS 5*, Virtual, June 2021.
- A. Rollett*, R. Suter, R. Lim, M. Wilkin, Y. Zhang, P. Promoppatum, **C. K. Cocke**, A. Spear, R. Lebensohn, J. Gordon, "Probing Microstructural Evolution in Deformation with Electrons and X-rays," *TMS 2021*, Virtual, March 2021.

Teaching Experience

- Teaching Assistant: Continuum Mechanics (ME EN 5530/6530) Fall 2021

Professional Experience

Corning June 2018 – June 2019

Engineering Intern Salt Lake City, UT

- Reduced automation downtime and improved operator safety of several systems through custom designed (SolidWorks) and machined metal and plastic parts (manual/CNC milling)
- Improved cycle time and enhanced user safety of a testing fixture by redesigning the electronics system and reworking PLC ladder logic

Honors & Awards

2022: 1st Place: NIST AM-Bench - Best modeling results predicting subcontinuum tensile behavior of as-built IN625
2022: Travel Award: 15th World Congress on Computational Mechanics (WCCM 15)
2022: Session Chair: 11th European Solid Mechanics Conference (ESMC 11)
2021: 1st Place: ASME/IEEE Heat Sink Design Competition 2021 (1st of 20+ international submissions)
2020: 1st Place: AFRL Additive Manufacturing (AM) Modeling Challenge #4.
2019: Larry DeVries Scholarship: awarded to outstanding mechanical engineering students
2019: Mechanical Engineering Tuition Waiver
2017–2021: Utah Flagship Scholarship

Projects

Heat Sink Design Competition: Team leader for a competition-winning natural convection heat sink designed using Ansys and COMSOL computational fluid dynamics (CFD) software
Keyboard Design: Completely designed and built a custom keyboard number pad from scratch (PCB, electronics, case, code) using KiCad, SolidWorks, Blender, and C

Skills

Programming: Python, Fortran, MATLAB, C++, C
Tools: Git, Linux, Slurm, OpenMP, MPI, CUDA, LaTeX
Software: DREAM.3D, ParaView, ABAQUS, FRANC3D, COMSOL, SolidWorks