Scott Feister, Ph.D.

scott.feister@csuci.edu
Professional Website

EDUCATION

Postdoctoral Scholar, Astronomy & Astrophysics
University of Chicago, Chicago, Illinois — 2016 - 2018

Doctorate of Philosophy, Physics
The Ohio State University, Columbus, Ohio — May 2016

Masters of Science, Physics
The Ohio State University, Columbus, Ohio — December 2012

Bachelor of Science, Physics
University of Notre Dame, Notre Dame, Indiana — May 2009
Concentration: Physics
Minor: French

AWARDS

Supercomputing Resource Allocation — 2024-2025
Title: "Molecular Dynamics and Mixed Reality Visualization of Drug Candidates and Metal Corrosion"
Department of Energy Exploratory Award
National Energy Research Scientific Computing Center (NERSC)
NERSC Award DDR-ERCAP0029176
CPU Node Hours Awarded: 1,000

Supercomputing Resource Allocation — 2024-2025
Title: "Two-Laser Proton Acceleration"
Department of Energy Mission Science Award
National Energy Research Scientific Computing Center (NERSC)
NERSC Award FES-ERCAP0028770
CPU Node Hours Awarded: 1,000

Supercomputing Resource Allocation — 2024-2025
Title: "Teaching Computer Organization & Architecture via Parallel Programming Exercises"
Department of Energy Education Award
National Energy Research Scientific Computing Center (NERSC)
NERSC Award DDR-ERCAP0028737
CPU Node Hours Awarded: 120 GPU Node Hours Award: 120

Supercomputing Resource Allocation — 2022-2023
Title: "Two-Laser Proton Acceleration"
Department of Energy Mission Science Award
National Energy Research Scientific Computing Center (NERSC)
NERSC Award FES-ERCAP0021282
CPU Node Hours Awarded: 11,925

Subcontract — 2022-2023
Title: "Subcontract: Sidekick Systems for Laser Control"
Subcontract Number: B652704

Lawrence Livermore National Laboratory

Grant 2021-2024
Title: "Collaborative Research: Enhancing Laser Based Ion Sources with High Data Rate Techniques"
Award Number: DE-SC0022249
Department of Energy Office of Science

Subcontract 2021-2023
Title: "Subcontract: High-Repetition-Rate DAQ Systems"
Subcontract Number: B645313
Lawrence Livermore National Laboratory

Supercomputing Resource Allocation 2021-2022
Title: "Exploratory Scientific Computing Simulations: Laser Experiments and Environmental Sciences"
National Energy Research Scientific Computing Center

Supercomputing Resource Allocation 2020-2021
Title: "Magnetized Plasma Advection from Laser Interactions"
San Diego Supercomputer Center (via HPC@UC program)

Supercomputing Resource Allocation 2020-2021
Title: "Exploratory Scientific Computing Simulations: Laser Experiments and Environmental Sciences"
National Energy Research Scientific Computing Center

Research, Scholarship and Creative Activities Mini-Grant 2018-2019
Title: "Distributed Computing for Laser Laboratories"
California State University Channel Islands

Best Postdoctoral Researcher Poster February 2017
Title: "FLASH Simulations of Magnetic Turbulence Experiments at NIF"
National Ignition Facility and Jupiter Laser Facility User Group Meeting

Best Graduate Student Poster April 2016
Title: "Acquisition and analysis for high repetition rate HEDP (10 Hz to 1 kHz)"
Omega Laser Facility Users Group Workshop

EXPERIENCE

Assistant Professor August 2019 - present
Department of Computer Science, California State University Channel Islands, Camarillo, CA

- Innovating scientific data pipelines for research facilities and national laboratories
- Leading research in scientific computing at a Latinx-serving, 60% first-generation-to-college four-year university
- Teaching COMP 262: Computer Organization & Architecture, COMP 122: Data Structures & Algorithms, EMEC 231: Dynamics, COMP 449: Human-Computer Interaction, and other courses
- Simulating scientific phenomena with massively parallel computer codes
- Developing microcontroller firmware and camera sensor hardware
- Collaborating with international teams on laboratory astrophysics, laser-plasma particle acceleration, and environmental sciences

- Implementing innovative teaching methods in computer science
- Mentoring undergraduate students in research

Visiting Assistant Researcher August 2019 - July 2021
Department of Physics & Astronomy, University of California at Los Angeles, Los Angeles, CA

- Modeling laser-generated Biermann Battery advection using the FLASH MHD code
- Mentoring graduate students in scientific computing and laboratory experiments

Assistant Researcher August 2018 - August 2019
Department of Physics & Astronomy, University of California at Los Angeles, Los Angeles, CA

- Developed computational models of the physical processes of plasma flows to guide experiments
- Mentored two graduate students in scientific computing and laboratory experiments

Postdoctoral Scholar August 2016 - August 2018
Flash Center for Computational Science
Department of Astronomy & Astrophysics, University of Chicago, Chicago, IL

- Utilized scientific computing methods to study laboratory astrophysics
- Designed and interpreted, through computer simulation and data analysis, scientific experiments at National Laboratories and international facilities
- Programmed and executed massively-parallel magnetohydrodynamic simulations of laser-driven magnetic turbulence (FLASH code) and Particle-in-cell simulations of plasma instabilities (OSIRIS code) using high performance computing resources, exhausting millions of CPU-hours at Argonne National Laboratory's 10-petaflop Mira supercomputer
- Contributed to the submission and defense of a multi-institution federal research proposal
- Cultivated multidisciplinary international collaborations
- Mentored two undergraduates and one second-year graduate student in scientific computing
- Led scientific computing educational sessions for undergraduates, graduate students, postdoctoral researchers and professional scientists from varied institutions

Research Scientist May 2014 - August 2016
Air Force Research Laboratory / Innovative Scientific Solutions, Inc., Dayton, OH

- Investigated laser-based acceleration of high-energy particles using scientific computing methods and laboratory experiment methods
- Invented laboratory data acquisition system, resulting in creation and analysis of gigabytes of experiment data per minute, and real-time user-interface feedback
- Designed and tested mechatronic systems, user interface software, and data analysis software
- Modeled the complex dynamics of laser-plasma interactions through scientific computing: 3D hydrodynamic FLASH simulations and 2D Particle-in-cell simulations
- Initiated a collaboration between the Air Force Research Laboratory and the University of Notre Dame Nuclear Physics Group

- Independently wrote our group's monthly and quarterly scientific reports for funding reviews
- Disseminated scientific research through journal publications, conference attendance and presentations
- Mentored first-year through fourth-year graduate students in experimental physics and scientific computing
- Mentored two undergraduates in experimental physics and scientific computing

Graduate Research Assistant August 2010 - May 2014
Department of Physics, The Ohio State University, Columbus, OH

- Extensively planned and built the world-class Scarlet laser system at Ohio State
- Designed and tested mechatronic systems
- Wrote software for laser control and data analysis, including user interfaces
- Diagnosed, maintained, and aligned the entire laser system
- Conducted scientific research
- Delivered frequent summary presentations to the research group, and wrote scientific text for grant applications and reviews
- Disseminated scientific research through journal publications, conference attendance and presentations
- Mentored three Computer Science undergraduates in computational data analysis; mentored two Physics undergraduates in experimental physics

Graduate Teaching Assistant August 2010 - May 2011, Aug. 2012 - Dec. 2012
Department of Physics, The Ohio State University, Columbus, OH

- Instructed university undergraduates in introductory Classical Mechanics, Electromagnetism, and Modern Physics
- Led independent recitations and hands-on laboratories for multiple sections of thirty students

SKILLS

Student Mentorship

- Mentored undergraduates and graduate students one-on-one and in groups
- Incorporated diversity education into everyday classroom experience
- Utilized innovative teaching methods, including zero-cost classes, computer code competitions, and classroom polling with digital cameras

Scientific Computing and Modeling

- Performed plasma fluid simulations (FLASH code), 2D/3D Particle-in-cell (LSP code, OSIRIS code) simulations, and liquid-gas fluid simulations (OpenFOAM)
- Accessed high performance computing resources at Argonne National Laboratory (10-petaflops Mira Supercomputer) and the Ohio Supercomputer Center for FLASH and LSP simulations
- Utilized the Monte Carlo software MCNP and *Geant4* to evaluate electron and x-ray propagation in complex material arrangements
- Computed 3D magnetic fields and charged particle deflection within yoked magnet using *Radia* in Mathematica
- Modeled wavefront aberrations and optical alignment techniques during laser design in FRED optical modeling software
- Programming languages of choice: LabVIEW, Python, MATLAB, C++, Fortran. Competent in or can quickly pick up other languages

Computer Analysis of Large Datasets

- Implemented real-time interferometric analysis of pre-plasma formation (a computationally expensive analysis) by adapting high-performance C++ libraries from an open-source project into LabVIEW

Computational Automation and Data Acquisition

- Interfaced laser and plasma diagnostics with computer control and performed advanced real-time and post-analysis
- Programmed acquisition and analysis of large, multi-instrument datasets (thousands of interferometric images, optical spectra, etc.)
- Extensive automation of data acquisition in physics laboratories, including low-level driver development for triggered oscilloscopes, optical spectrometers, gamma spectrometers, cameras, deformable mirror, and in-vacuum target alignment motors

Digitized Sensor Development

- Designed and built unique digital sensors for use in scientific laboratories
- Interfaced novel sensors with computers

Optical Engineering

- Technically competent in the state of the art of high energy, short-pulse laser systems
- Performed routine maintenance and alignment of multiple state-of-the-art laser systems
- Diagnosed and repaired high voltage circuits, liquid cooling systems

Mechatronics and Mechanical Engineering

- Designed mechatronics control systems for physical components held within high vacuum systems
- Wrote genetic algorithm software to adjust physical membrane of a deformable laser mirror
- Automated motion of motorized linear and rotational translation stages, including low-level computer driver development
- Designed mechatronics mirror mounts and vacuum chambers with SolidWorks CAD software
- Built and modified mechatronics parts for laboratory experiments using mill, saws, and lathe in machine shop, then computer-interfaced mechanical movements in LabVIEW

LEADERSHIP

Faculty Founder and Organizer, Plot-A-Thon Data Science Visualization Festival for Undergraduates at CSU Channel Islands (2021-present)

External Committee Member, Department of Energy LaserNetUS Intense-light USers Engagement (I-USE) (2021-2024)

Faculty Mentor of Undergraduate Teams at the HPC Winter Classic Invitationals (2024, 2023, and 2022), for the IndySCC at SC24 (2024), and for the HPC Student Cluster Competition at SC22 (2022)

Program Committee Member and Presider, *High-Intensity Lasers and High-Field Phenomena (HILAS)* in Vienna, Austria (March 12-14, 2024)

International Workshop Organizer, *Machine Learning and Control Systems* (2022)

Special Topic Editor, *Machine Learning and Control Systems*, High Power Laser Science and Engineering (2022)

Mini-Conference Organizer, *The High Repetition Rate Frontier of High Energy Density Physics*, American Physical Society Division of Plasma Physics (2022)

Special Topic Editor, *The High Repetition Rate Frontier of High Energy Density Physics*, Physics of Plasmas (2022)

PUBLICATIONS

D. A. Mariscal, B. Z. Djordjevic, R. Anirudh, ..., **S. Feister**, E. Ito, K. Valdez-Sereno, ..., B. Spears, P.-T. Bremer, and T. Ma. " Toward machine-learning-assisted PW-class high-repetition-rate experiments with solid targets." Phys. Plasmas, **31 (7):** 073105 (2024).

M. A. Leung, K. Cahill, R. Hartman-Baker, P. Kinsley, ..., **S. Feister**, ..., and A. Vazquez-Mayagoitia. "Intro to HPC Bootcamp: Engaging New Communities Through Energy Justice Projects." The Journal of Computational Science Education **15**, 49–56 (2024).

S. Feister, K. Cassou, S. Dann, A. Döpp, P. Gauron, A.J. Gonsalves, A. Joglekar, V. Marshall, O. Neveu, H.-P. Schlenvoigt, M.J.V. Streeter, and C.A.J. Palmer. "Control systems and data management for high-power laser facilities." High Power Laser Science and Engineering **11**, 56 (2023).

D. A. Mariscal, B. Z. Djordjević, R. Anirudh, T. Bremer, P. C. Campbell, **S. Feister**, E. Folsom, E. S. Grace, ..., and T. Ma. "A flexible proton beam imaging energy spectrometer (PROBIES) for high repetition rate or single-shot high energy density (HED) experiments (invited)." Review of Scientific Instruments **94**, 023507 (2023).

Scott Feister and Elizabeth Blackwood. "HPC Workforce Development of Undergraduates Outside the R1." The Journal of Computational Science Education **13**, 8-11 (2022).

J. Meinecke, P. Tzeferacos, J. S. Ross, A. F. Bott, **S. Feister**, H. S. Park, ... and G. Gregori. "Strong suppression of heat conduction in a laboratory replica of galaxy-cluster turbulent plasmas." Science Advances, 8(10), eabj6799 (2022).

P. V. Heuer, **S. Feister**, D. B. Schaeffer and H. G. Rinderknecht "Preface to special topic: The High Repetition Rate Frontier in High-Energy-Density Physics" Physics of Plasmas **29**, 110401 (2022).

Joseph Snyder, John Morrison, **Scott Feister**, Kyle Frische, Kevin George, Manh Le, Christopher Orban, Gregory Ngirmang, Enam Chowdhury, and William Roquemore. "Background pressure effects on MeV protons accelerated via relativistically intense laser-plasma interactions" Scientific Reports **10**, 18245 (2020).

K. M. George, J. T. Morrison, **S. Feister**, G. Ngirmang, J. R. Smith, A. J. Klim, J. Snyder, D. Austin, W. Erbsen, K. D. Frische, J. Nees, C. Orban, E. A. Chowdhury, and W. M. Roquemore. "High-repetition-rate ($\geq$ kHz) targets and optics from liquid microjets for high-intensity laser-plasma interactions." High Power Laser Science and Engineering, **7**, E50. (2019).

John T. Morrison, **Scott Feister**, Kyle D. Frische, Drake R. Austin, Gregory K.

Ngirmang, Neil R. Murphy, Chris Orban, Enam A. Chowdhury, W. M. Roquemore. "MeV proton acceleration at kHz repetition rate from ultra-intense laser liquid interaction" New J. Phys., **20** 022001 (2018).

Gregory K. Ngirmang, Chris Orban, **Scott Feister**, John T. Morrison, Enam A. Chowdhury, and W. M. Roquemore. "Particle-in-cell simulations of electron acceleration from relativistic interaction of mid-infrared laser interactions with near solid density matter" Phys. Plasmas, **24** 103112 (2017).

Scott Feister, Drake R. Austin, John T. Morrison, Kyle D. Frische, Chris Orban, Gregory Ngirmang, Abraham Handler, Joseph R. H. Smith, Mark Schillaci, Jay A. LaVerne, Enam A. Chowdhury, R. R. Freeman, W. M. Roquemore. "Relativistic electron acceleration by mJ-class kHz lasers normally incident on liquid targets" Opt. Express, **25** 18736-18750 (2017).

P. L. Poole, C. Willis, R. W. Daskalova, K. George, **Scott Feister**, S. Jiang, J. Snyder, J. Marketon, D. W. Schumacher, K. Akli, L. van Woerkom, R. R. Freeman, and E. A. Chowdhury. "Experimental capabilities of 0.4 PW, 1 shot/min Scarlet laser facility for high energy density science" Appl. Opt., **55** 4613-4719 (2016).

Gregory K. Ngirmang, Chris Orban, **Scott Feister**, John T. Morrison, Kyle D. Frische, Enam A. Chowdhury, W.M. Roquemore. "Three dimensional particle-in-cell simulations of electron beams created via reflection of intense laser light from a water target" Phys. Plasmas, **23** 043111 (2016).

J. T. Morrison, E. A. Chowdhury, K. D. Frische, **Scott Feister**, V. M. Ovchinnikov, J. A. Nees, C. Orban, R. R. Freeman and W. M. Roquemore "Backward-propagating MeV electrons from 10^{18} W/cm^2 laser interactions with water" Phys. Plasmas, **22** 043101 (2015).

C. Orban, J. T. Morrison, E. A. Chowdhury, J. A. Nees, K. Frische, **Scott Feister** and W. M. Roquemore. "Backward-propagating MeV electrons in ultra-intense laser interactions: Standing wave acceleration and coupling to the reflected laser pulse" Phys. Plasmas, **22** 023110 (2015).

Scott Feister, J. A. Nees, J. T. Morrison, K. D. Frische, C. Orban, E. A. Chowdhury, and W. M. Roquemore "A Novel Femtosecond-Gated, High-Resolution, Frequency-Shifted Shearing Interferometry Technique for Probing Pre-Plasma Expansion in Ultra-Intense Laser Experiments" Rev. Sci. Instrum., **85** 11D602 (2014).

P. L. Poole, C. D. Andereck, D. W. Schumacher, R. L. Daskalova, **Scott Feister**, K. M. George, C. Willis, K. U. Akli and E. A. Chowdhury "Liquid crystal films as on-demand, variable thickness (50 - 5000 nm) targets for intense lasers" Phys. Plasmas, **21** 063109 (2014).