

Casey D. Foley, PhD

Sensor Integration | Machine Vision & Imaging Systems | Advanced Laser Technologies

Ph.D., Physical Chemistry, University of Missouri (2020) | B.S., Biochemistry, Saginaw Valley State University (2013)

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KEY ACHIEVEMENTS

- **99% Laser Process Yield** through sensor integration and statistical process control
- **3x Manufacturing Takt Time Reduction** via laser system upgrade and parameter optimization
- **\$750K+ System Recovery** - complete instrument restoration including high vacuum and laser system rebuild, and commissioning of instrument control and data analysis programs
- **Root Cause Analysis System** - implemented comprehensive system centered around a Python application, improving yield and enabling data communication company wide
- **Machine Learning Model** - revolutionized QC of tempered glass distortion with 94% accuracy of predictive topology
- **Science and JACS Publications** - breakthrough research using advanced laser, high vacuum, and imaging systems
- **20+ Peer-Reviewed Publications** in top-tier journals
- **15+ Presentations** delivered at major scientific conferences

CORE COMPETENCIES

Manufacturing & Process Optimization

Statistical Process Control • PDCA Cycle • PFMEA • Root Cause Analysis (8D) • KPI Development • Cpk/Ppk Analysis • DOE • Process Capability Studies • AI/ML Process Optimization

Programming & Data Analytics

Python • MATLAB • LabVIEW • Machine Learning • Real-time Control • Data Analytics • Automation Scripting • Data Acquisition Systems

Laser Systems & Optics

Nd:YAG • DPSS • Dye • CO₂ • IR OPO/OPA • Excimer • VUV • Ti:Sapphire • Optical Ray Tracing • High Harmonic Generation • Laser Integration • Ablation • Scribe

Advanced Instrumentation

Ultra-High Vacuum Systems • Particle Imaging • Machine Vision • Spectroscopy (UV/Vis/IR/Microwave) • CAD Design (SolidWorks, LibreCAD, FreeCAD) • High Voltage Test Equipment

PROFESSIONAL EXPERIENCE

Laser Systems Engineer

LuxWall | August 2024 – Present

- **Achieved 99% laser ablation process yield** through working distance sensor integration and statistical process control while cutting takt time in half
- **Reduced takt time by 3x** through strategic laser system upgrades and automation through a Python API
- **Built machine learning model** with 94% accuracy for predictive glass surface topology control
- **SME for all laser and high vacuum processes** - overhauled entire processes to improve yield, reduce takt time, and for automation
- **Implemented sensors and vision systems** for QC process control

Research Excellence Postdoctoral Fellow

University of Missouri | 2022 – July 2024

- Designed custom high vacuum imaging instrument to study hypersonic collisions
- Implemented laser system for novel VUV detection of atoms and molecules
- Mentored and trained research group members as senior postdoc
- Performed MeV-UED experiments at SLAC National Laboratory using advanced instrumentation systems and custom Python data analysis scripts

Postdoctoral Associate

Sandia National Laboratories | 2021 – 2022

- Restored \$750K+ cryogenically-cooled ion instrument including rebuild of high vacuum system, installation of tunable IR OPO/OPA laser system, and commissioning of instrument control and data analysis programs
- Developed automated LabVIEW/MATLAB control systems for multi-instrument coordination
- Developed IR, UV, and double resonance spectroscopy methods for novel molecular detection

Graduate Research Assistant

University of Missouri | 2016 – 2020

- Published breakthrough research in Science on quantum resonances in molecular dynamics
- Programmed comprehensive laser automation systems for high-power pulsed operation
- Designed custom optical detection systems for ultra-high vacuum diagnostics

Summer Journeyman Fellow

Army Research Lab | Summer 2018

- Developed workflow to generate porous silicon particles from initial wafer and fractionate particles for further use as an energetic material
- Gained experience in methods (calorimetry, dynamic pressure measurements, high-speed videography, FTIR, porosimetry) to determine combustion and material properties



HONORS AND AWARDS

- Army Research Lab Journeyman Fellowship (2018)
- WSU Thomas C. Rumble Fellowship (2014 – 2015)
- WSU Chemistry Citation for Excellence in Teaching (2014)
- SVSU President's Scholarship (2009 – 2013)



PROFESSIONAL/VOLUNTEER ACTIVITIES

- Member, American Chemical Society (2013 – present)
- Volunteer/Intern, STEM Forward Program, Athletes for Charity (2014 – 2016)
- Chairman, 17th Annual WSU Chemistry Graduate Research Symposium (2015)



SELECTED PUBLICATIONS (Complete list: 20+ publications at Google Scholar)

- Site-specific Photochemistry along a Protonated Peptide Scaffold - *JACS*, 146: 13282–13295, 2024
- Orbiting Resonances in Formaldehyde Reveal Coupling of Roaming, Radical, and Molecular Channels - *Science*, 374: 1122–1127, 2021
- Molecular Cage Reports on Its Contents: Spectroscopic Signatures of Cryo-Cooled K⁺- and Ba²⁺-Benzocryptand Complexes - *J. Phys. Chem. A*, 127: 6227–6240, 2023
- Mixed Transitions in the UV Photodissociation of Propargyl Chloride - *Phys. Chem. Chem. Phys.*, 20: 27474–27481, 2018
- Ion Mobility Spectrometry-Mass Spectrometry to Elucidate Arm-Dispersity within Star Polymers - *ACS MacroLetters*, 4: 778–782, 2015