

Londrea Garrett

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EDUCATION

Doctor of Philosophy, Candidate <i>Department of Nuclear Engineering and Radiological Sciences, University of Michigan</i>	September 2020 – March 2025 3.65/4.00
Bachelor of Science <i>Department of Chemical Engineering, University of Rochester</i>	August 2015 - May 2020 3.16/4.00

HONORS AND AWARDS

Hoffman Postdoctoral Fellowship <i>Lawrence Berkeley National Laboratory</i>	April 2025
Nuclear Nonproliferation International Safeguards Fellowship <i>South Carolina Universities Research and Education Foundation</i>	April 2022
GEM Fellowship <i>GEM Consortium</i>	August 2020
Bausch and Lomb Scholarship <i>University of Rochester</i>	Fall 2016

EXPERIENCE

Graduate Research Assistant <i>Applied Nuclear Sciences Group, University of Michigan</i>	September 2020 – March 2025
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Examining the use of double-pulse laser-induced breakdown spectroscopy (LIBS) for trace xenon detection in gas cooled reactors

- Designed and performed laser experiments involving a nanosecond Q-switched Nd:YAG laser and a femtosecond Ti:sapphire laser
- Familiar with the operation of ICCD detectors, delay generators, and Czerny-Turner spectrometers
- Analyzed spectral data using image reconstruction and data smoothing techniques
- Wrote scripts to automate the collection of LIBS optimization data
- Assisted in the design of an experimental chamber capable of housing high temperature and pressure conditions
- Applied plasma diagnostic techniques including Boltzman equations to identify plasma temperatures and chemical properties
- Wrote, reviewed, and edited proposals and journal articles

Performed analysis to predict the effects of glass irradiation on observed LIBS spectra

- Used previously measured linear absorption data to predict changes in signal detectability and spectral properties
- Analyzed plasma properties such as density and temperature across delay times

Constructed setup for the combined use of laser-induced fluorescence (LIF) and LIBS on aerosols for applications in molten salt reactor safeguards

- Performed trouble-shooting and initialization procedure for optical parametric oscillator system
- Performed preliminary LIF measurements of sodium in preparation for future neodymium measurements.
- Constructed nebulizer and optical cell configuration for the production of aerosols

Student Affiliate <i>Laser Technologies Group, Lawrence Berkeley National Laboratory</i>	May 2023 – August 2023
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Performed studies on the fundamental plasma behavior of uranium hexafluoride

- Measured the emission spectra of gaseous uranium hexafluoride using laser-induced breakdown spectroscopy under various laser energies and pressures
- Designed experiments to study the effect of laser wavelength and pulse duration on resultant emission spectra

- Became familiar with the operation of Echelle-type spectrometers, optical parametric oscillator systems, and various continuous emission light sources

Graduate Student Instructor

August 2021 – April 2022

Department of Nuclear Engineering and Radiological Sciences, University of Michigan

Managed weekly laboratory sessions, office hours, review sessions, and assignment grading for NERS 515, a graduate course detailing the fundamentals of nuclear measurement techniques

- Set up and ran laboratory sessions designed to introduce students to common instrumentation related to radiation detection including high purity germanium (HPGe) detectors, scintillation detectors, ionization chambers, and oscilloscope usage
- Presented lectures on introductory course material such as the mechanisms for radiation interactions in matter
- Helped write exam questions to test the students' understanding of material covered in the lectures and in the laboratory experiments
- Managed the process of updating laboratory equipment

Graduate Intern

May 2021 – August 2021

Nuclear Science Summer Internship, Idaho National Laboratory

Participated in an twelve-week remote internship, investigating methods for the detection of coolant stream impurities in advanced reactors.

- Performed Monte Carlo simulations to model the expected HPGe, cadmium zinc telluride (CZT), and lanthanum bromide (LaBr₃) response to the gamma-emitting constituents of the contaminated coolant sensing line of a helium-cooled fast reactor
- Determined the trade-off between detector efficiency and resolution for the modeled systems

President

August 2022 – October 2023

Institute of Nuclear Materials Management, University of Michigan Student Section

Served as a peer-elected board member for the University of Michigan chapter of this student professional society

- Organized board meetings, planned the chapter agenda, and communicated with University officials
- Planned educational workshops and social events for students involved in the field of nuclear measurements
- Connected with leaders within the field of radiation detection to present research talks

President

August 2022 – May 2023

IEEE-NPSS, University of Michigan Student Section

Served as a peer-elected board member for the University of Michigan chapter of this student professional society

- Revived previously inactive chapter
- Organized research talks from experts in the field
- Determined meeting agenda and chapter priorities

Graduate Student Council

March 2022 – May 2023

Department of Nuclear Engineering and Radiological Sciences

- Assisted in creation of budgets for Grad Student Council activities
- Organized social events with goal of fostering positive and supportive department culture

Undergraduate Research Assistant

April 2018 – May 2020

Optical Materials Group

Laboratory for Laser Energetics

Managed sample preparation and material analysis of glassy liquid crystal (GLC) samples to determine the feasibility of using GLCs for high intensity laser polarizers.

- Performed UV absorption spectroscopy on samples post continuous wave UV exposure to track material property changes
- Analyzed samples using microscopy to look for surface defects on optical coatings
- Designed and performed continuous wavelength light exposure using a high intensity light source
- Used chemical purification processes to eliminate contaminants from GLC-based optical coatings
- Created standard operating procedure and project closing documentation

Instructor

May 2025 – August 2025

Harper Academy 4 Future Nuclear Engineers, University of Michigan

Lectured high school students on fundamental tenants of nuclear engineering ranging from radioactive to decay to basic plasma behavior

- * Developed lectures and practice problems on lecture topics covered
- * Lead tours of nuclear facilities such as the Applied Nuclear Science Instrumentation Laboratory
- * Designed hands-on experiments on radiation detection using Geiger counters

Assistant Instructor

Fall 2021 – Spring 2022

Detroit Area Pre-College Engineering Program

Introduced middle and high school students in the Detroit area to basic principles of nuclear engineering such as the types of radiation and the basics of reactor operation.

- * Participated in monthly planning meetings to design interactive activities to clarify nuclear engineering topics
- * Presented lectures on radiation detection and led the construction of a bubble chamber
- * Assisted in the preparation of poster presentations which covered the material covered within the course

Secretary

Fall 2022 – Fall 2024

Women in Nuclear Engineering, University of Michigan

Helped organize meetings for the female students within the Nuclear Engineering and Radiological Sciences Department and tracked meeting minutes

Mentor

Fall 2015 – Fall 2019

Department of Chemical Engineering, University of Rochester

Helped first and second year students navigate their introductory engineering courses

PRESENTATIONS

G. Sun, **L. Garrett**, A. Williams, and I. Jovanovic, "Toward the Development of Molten Salt Reactor Diagnostics based on Resonantly Enhanced Laser Spectroscopy," ANS Annual Conference, Chicago, IL, June 15 - 18, 2025.

L.J. Garrett, M. Burger, A. Williams, and I. Jovanovic, "Detection of Neodymium and Surrogate Materials *via* Laser-Induced Fluorescence," ANS Winter Meeting, Orlando, FL, November 12–21, 2024.

L.J. Garrett, G.C.-Y. Chan, and I. Jovanovic, "Laser-Based Diagnostics for Nuclear Safeguards on Uranium Enrichment," Princeton School for Science and Global Security, Princeton, NJ, October 10 - 16, 2024.

L.J. Garrett, G.C.-Y. Chan, and I. Jovanovic, "On the Behavior of the Laser-Induced Plasma in Gaseous UF₆," LIBSXIII Meeting, Puerto Iguazú, Argentina, September 1 - 6, 2024.

L.J. Garrett, G. C.-Y. Chan, and I. Jovanovic, "The Effect of Laser-Pulse Duration on the Behavior of UF₆ Plasma in LISA-UE," University Program Review, College Station, TX, June 4 - 6, 2024.

L.J. Garrett, M. Burger, Y. Lee, H. Kim, P. Sabharwall, S. Choi, and I. Jovanovic, "Xenon Detection Using Double-Pulse Laser-Induced Breakdown Spectroscopy," ANS Winter Meeting, Washington DC, November 12 - 15, 2023.

A. Williams, R. Gakhar, Q. Yang, J. Avila, I. Jovanovic, M. Burger, and **L. Garrett**, "Online Laser and Optical Spectroscopy Techniques in Aerosol for Molten Salt Reactor Sampling," Advances in Nuclear Nonproliferation Technology and Policy, Washington DC, November 12 - 15, 2023.

L.J. Garrett, B. Morgan, M. Burger, Y. Lee, H. Kim, P. Sabharwall, S. Choi, and I. Jovanovic, "Impact of Glass Radiation Damage on Optical Spectroscopy Analysis," 2022 ANS Winter Meeting, Phoenix, AZ, November 13 - 16, 2022.

L.J. Garrett, M. Burger, P. Sabharwall, and I. Jovanovic, "Trace Xenon Detection Using DP-LIBS for Advanced Reactor Monitoring," LIBS2022, Bari, Italy, September 5 - 9, 2022.

L.J. Garrett, M. Burger, A.J. Burak, V. Petrov, A. Manera, X. Sun, P. Sabharwall, and I. Jovanovic, “Monte Carlo Simulation of Coolant Stream Impurities Gamma Emissions in Gas-Cooled Fast Reactors,” 2021 ANS Winter Meeting, Washington D.C., November 30 - December 3, 2021.

PUBLICATIONS¹

L.J. Garrett, I. Jovanovic, and G.C.-Y. Chan, “Spectral emission characteristics near 646 nm and plasma properties of laser-induced plasma of gaseous uranium hexafluoride,” *Spectrochimica Acta Part B: Atomic Spectroscopy*, *under review*, (2025).

L. Garrett, M. Burger, Y. Lee, H. Kim, P. Sabharwall, S. Choi, and I. Jovanovic, “Trace xenon detection in ambient helium by double-pulse laser-induced breakdown spectroscopy,” *Journal of Analytical Atomic Spectrometry*, 40(1), 122–129 (2025). *Citations: 1* [Link](#)

Y. Lee, R.I. Foster, H. Kim, **L. Garrett**, B.W. Morgan, M. Burger, I. Jovanovic, and S. Choi, “Data fusion of simultaneous acoustic and laser-induced breakdown spectroscopy for in-situ measurement of rare earth elements in molten LiCl-KCl,” *Analytical Chemistry*, 96(28), 11255–11262 (2024). *Citations: 7* [Link](#)

L.J. Garrett, B.W. Morgan, M. Burger, Y. Lee, H. Kim, P. Sabharwall, S. Choi, and I. Jovanovic, “Impact of Glass Irradiation on Laser-Induced Breakdown Spectroscopy Data Analysis,” *Sensors* 23(2), 691–707 (2023). [Link](#)
Citations: 6

L. Garrett, M. Burger, A.J. Burak, X. Sun, P. Sabharwall, and I. Jovanovic, “Monte Carlo analysis of coolant stream impurity gamma emissions in gas-cooled fast reactors,” *Nuclear Technology* 209(8), 1189–1196 (2023). [Link](#)

P. Sabharwall, K. Weaver, N.K. Anand, C. Ellis, X. Sun, D. Chen, H. Choi, R. Christensen, B.M. Fronk, J. Gess, Y. Hassan, I. Jovanovic, A. Manera, V. Petrov, R. Vaghetto, S. Balderrama-Prieto, A.J. Burak, M. Burger, A. Cardenas-Melgar, **L. Garrett**, G.L. Gaudin, D. Orea, R. Chavez, B. Choi, N. Sutton, K.W. Ssenyimba, J. Young, “Preconceptual Design of Multifunctional Gas-Cooled Cartridge Loop for the Versatile Test Reactor-Part I,” *Nuclear Science and Engineering* 196, S183–S214 (2022). *Citations: 4* [Link](#)

P. Sabharwall, K. Weaver, N.K. Anand, C. Ellis, X. Sun, D. Chen, H. Choi, R. Christensen, B.M. Fronk, J. Gess, Y. Hassan, I. Jovanovic, A. Manera, V. Petrov, R. Vaghetto, S. Balderrama-Prieto, A.J. Burak, M. Burger, A. Cardenas-Melgar, **L. Garrett**, G.L. Gaudin, D. Orea, R. Chavez, B. Choi, N. Sutton, K.W. Ssenyimba, J. Young, “Preconceptual Design of Multifunctional Gas-Cooled Cartridge Loop for the Versatile Test Reactor-Part II,” *Nuclear Science and Engineering* 196, S215–S233 (2022). *Citations: 5* [Link](#)

M. Burger, **L. Garrett**, A.J. Burak, V. Petrov, A. Manera, P. Sabharwall, X. Sun, and I. Jovanovic, “Trace xenon detection in helium environment *via* laser-induced breakdown spectroscopy,” *Journal of Analytical Atomic Spectroscopy* 36, 824–828 (2021). *Citations: 27* [Link](#)

M. Burger, L.A. Finney, **L. Garrett**, S.S. Harilal, K.C. Hartig, J. Nees, P.J. Skrodzki, X. Xiao, and I. Jovanovic, “Laser ablation spectrometry for studies of uranium plasmas, reactor monitoring, and spent fuel safety,” *Spectrochimica Acta Part B: Atomic Spectroscopy* 179, 106095 (2021). *Citations: 39* [Link](#)

J.U. Wallace, K.L. Marshall, D.J. Batesky, T.Z. Kosc, B.N. Hoffman, S. Papernov, **L. Garrett**, J. Shojaie, and S.G. Demos, “Highly Saturated Glassy Liquid Crystal Films Having Nano- and Microscale Thicknesses for High Power Laser Applications,” *ACS Applied Nano Materials* 4, 13–17 (2021). *Citations: 3* [Link](#)

TECHNICAL SKILLS

Languages/Programs: Python, Matlab, MCNP, MCNP PoliMi, COMSOL, LaTeX, Igor, LabView, SOLIDWORKS

¹Citation engine–Google Scholar; Total citations–92; h-index–5; i10-index–2

Skills: Laser-induced breakdown spectroscopy, laser-induced fluorescence, gamma spectroscopy, clean room operation, chemical wetlab operation, optical spectroscopy, optical microscopy