

# Daniel C. Sweeney, PhD

R&D Staff

Oak Ridge National Laboratory

sweeneydc@ornl.gov

<https://orcid.org/0000-0002-1289-1627>

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## PROFESSIONAL EXPERIENCE

### **Oak Ridge National Laboratory**

Oak Ridge, TN

*R&D Staff*

Apr 2024 – Present

- Developed optical fiber sensing (OTDR, OFDR, DAS, FBGs, FPCs) and signal processing techniques for energy and national security applications.
- Led design and radiation testing of radiation-hardened photonics/electronics instrumentation to support terrestrial and space reactor development.

*R&D Associate Staff*

Aug 2020 – Apr 2024

- Designed optical fiber sensors and electrical sensing instruments to support nuclear reactor and hot cell irradiation experiments
- Developed mixed analog, digital, and optical signal processing solutions to generate high-speed/high-fidelity measurements of strain, temperature, vibroacoustics
- Designed and fabricated custom front end and data acquisition electronics/photonics to support nuclear measurement and control systems

*Postdoctoral Research Associate*

Jun 2019 – Aug 2020

- Characterized single-phase natural circulation in a cartridge-style flow loop to provide an experimental basis for thermal hydraulic modeling and simulation simulation relevant to molten salt reactors.
- Developed a radiation-tolerant fiber optic-based sensor for remote online corrosion and pressure monitoring at high temperatures in nuclear and petrochemical applications.
- Designed electrical acquisition and PID-based pressure control hardware to support experimental measurements using a multi-modal sensor platform and sensor development.

### **University of North Carolina at Chapel Hill**

Chapel Hill, NC

*Postdoctoral Research Associate*

Jun 2018 – Jun 2019

- Fabricated microfluidic devices in a clean room environment to perform on-chip genetic modification of bacteria for use in fecal microbiota transplant therapy.
- Performed finite element simulations of fluid flow, mass transport, and electric fields to characterize the effects of pulsed electric fields on bacteria within microfluidic devices.

### **Virginia Polytechnic Institute and State University**

Blacksburg, VA

*Graduate Research Assistant*

Aug 2013 – May 2018

- Designed and built high-voltage pulse generation systems to enable experimental quantification of mass transport into electroporated cells using microscope image processing.
- Led project to characterize cell-scale and organ-scale effects of high-voltage electrical pulses using finite element methods to improve predictability and homogeneity of surgical ablations.

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## EDUCATION

### **PhD, Biomedical Engineering**

Aug 2013 – May 2018

Virginia Polytechnic Institute & State University

Blacksburg, VA

Dissertation Title: *Quantitative In Vitro Characterization of Membrane Permeability for Electroporated Mammalian Cells*

### **BS, Biomedical Engineering**

Aug 2009 – May 2013

University of Arizona

Tucson, AZ

Design Project: *Disposable, Low Power Blood Glucose Meter*

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**Programming Languages:** Python, C/C++, Zephyr RTOS, LabVIEW, Unix shell, LaTeX  
**Software Packages:** COMSOL, ANSYS, SPICE, KiCAD/OrCAD, AutoCAD  
**Engineering Competencies:** mixed signal processing, analog/digital circuit design, PCB layout, image processing, finite element analysis, optical instrumentation, optical fiber sensing/communication

40. **DC Sweeney**, CM Petrie. *Uncertainty Minimization of Optical Frequency Domain Reflectometry Measurements*. Journal of Lightwave Technology. 43(6). pp. 2972–2981, (2025).
39. B Conry, MJ Kurley, **DC Sweeney**, CM Petrie. *Glassy carbon formation from pyrolysis of polymeric coatings on fiber-optic sensors*. Materials & Design. 251(1). pp. 113648, (2025).
38. **DC Sweeney**, CM Petrie. *Dopant, Coating, and Grating Effects in Silica Optical Fibers Under Extreme Neutron Radiation*. Journal of Non-Crystalline Solids. Journal of Non-Crystalline Solids. 646(2014). pp. 123228, (2024).
37. **DC Sweeney**, MJ Ridley, SB Bell, NA Capps. *In Situ Cladding Surface Temperature Measurements during Simulated LOCA Transients*. Transactions of the American Nuclear Society. 130(1). pp. 496–498, (2024).
36. **DC Sweeney**, FK Reed, KC Goetz, A Buchalter, NDB Ezell. *Fast Neutron Irradiation of a Multichannel JFET-Based Optical Encoder*. IEEE Transactions on Nuclear Science. 71(6). pp. 1292–1299, (2024).
35. A Birri, JT Gates, **DC Sweeney**, KC Goetz, NDB Ezell. *A simulation study of the ability to detect power distribution perturbations in the texas A&M TRIGA reactor with self-powered neutron detectors*. Progress in Nuclear Energy. 172. pp. 105200, (2024).
34. S Erwin, JR Fletcher, **DC Sweeney**, CM Theriot, C Lanzas. *Distilling Mechanistic Models From Multi-Omics Data*. bioRxiv (2023).
33. JV. Carvajal, SC Stafford, JL Arndt, P Sirianni, CM Petrie, NDB Ezell, **DC Sweeney**, PL Mulligan, S Chapel. *In-Rod Sensor System Overview, Benefits and Recent Irradiation Test Results*. 13th Nuclear Plant Instrumentation, Control, and Human-Machine Interface Technologies Conference. pp. 8–20, (2023).
32. A Birri, **DC Sweeney**, H Hyer, CM Petrie. *Development of Fabry-Prot Cavity Acoustic Sensors for Microreactor Applications*. 13th Nuclear Plant Instrumentation, Control, and Human-Machine Interface Technologies Conference. pp. 130–139, (2023).
31. P. Mulligan, **DC Sweeney**, KM Godsey, NDB Ezell, CM Petrie. *High Flux Isotope Reactor Irradiation of Self-Powered Neutron Detectors*. 13th Nuclear Plant Instrumentation, Control, and Human-Machine Interface Technologies Conference. pp. 1420–1430, (2023).
30. **DC Sweeney**, CM Petrie. *Methods for Continuously Resolving Spectral Shifts in Distributed Optical Fiber Sensors Irradiated to Extreme Neutron Fluence*. 13th Nuclear Plant Instrumentation, Control, and Human-Machine Interface Technologies Conference. pp. 1431–1440, (2023).
29. **DC Sweeney**, FK Reed, KC Goetz, NDB Ezell. *Signal Processing of Multiplexed Optical PWM Signals for Sensor Arrays in Nuclear Environments*. 13th Nuclear Plant Instrumentation, Control, and Human-Machine Interface Technologies Conference. pp. 1642–1650, (2023).
28. CM Petrie, **DC Sweeney**. *Enhanced backscatter and unsaturated blue wavelength shifts in F-doped fused silica optical fibers exposed to extreme neutron radiation damage*. Journal of Non-Crystalline Solids. 615(2023). pp. 122441, (2023).
27. A Birri, **DC Sweeney**, NDB Ezell. *Simulating Self-Powered Neutron Detector Responses to Infer Burnup Induced Power Distribution Perturbations in Next-Generation Light Water Reactors*. Progress in Nuclear Engineering. Progress in Nuclear Energy. 153, pp. 104437, (2022).
26. **DC Sweeney**, A Birri, CM Petrie. *Hybrid Method for Monitoring Large Fabry-Pérot Cavity Displacements with Nanometer Precision*. Optics Express. 30(16). pp. 29148–29160, (2022).

25. JP Gorton, **DC Sweeney**, CM Petrie, JL McDuffee. *Simulation of natural circulation cartridge loop experiments and application to molten salt reactors*. Nuclear Engineering and Design. 392(1). pp. 111767, (2022).
24. J McDuffee, R Christensen, D Eichel, M Simpson, S Phongikaroon, X Sun, J Baird, J Burak, S Chapel, J Choi, J Gorton, DE Hamilton, D Killinger, S Miller, J Palmer, C Petrie, **D Sweeney**, A Schrell, J Vollmer. *Design and Control of a Fueled Molten Salt Cartridge Experiment for the Versatile Test Reactor*. Nuclear Science and Engineering. pp. 1–26, (2022).
23. HC Hyer, **DC Sweeney**, CM Petrie. *Functional fiber-optic sensors embedded in stainless steel components using ultrasonic additive manufacturing for distributed temperature and strain measurements*. Additive Manufacturing. 52(1). pp. 102681, (2022).
22. JT Jones, **DC Sweeney**, A Birri, CM Petrie, TE Blue. *Calibration of Commercially Available SMF-28 Optical Fiber Sensors from 22 °C to 1000 °C*. IEEE Sensors Journal. 22(5). pp. 4144–4151, (2022).
21. **DC Sweeney**, CM Petrie. *Expanding the range of resolvable strain from distributed fiber optic sensors using a local adaptive reference approach*. Optics Letters. 47(2). pp. 269–272, (2022).
20. **DC Sweeney**, AM Schrell, CM Petrie. *Adaptive Signal Processing of Optical Fiber Sensors for Monitoring Temperature During Chemical Vapor Infiltration*. Transactions of the American Nuclear Society. 125(1) pp.358–361, (2021).
19. **DC Sweeney**, DM Sweeney, CM Petrie. *Graphical Optimization of Spectral Shift Reconstructions for Optical Backscatter Reflectometry*. Sensors. 21(18). pp. 6154, (2021).
18. P Mulligan, NDB Ezell, K Smith, K Godsey, **DC Sweeney**, J Carvajal, C Petrie. *In-core Neutron Flux and Temperature Instrumentation Planned for the WIRE-21 Experiment in the High Flux Isotope Reactor*. 12th Nuclear Plant Instrumentation, Control, and Human-Machine Interface Technologies Conference. pp. 564–574, (2021).
17. **DC Sweeney**, AM Schrell, CM Petrie. *The transient thermal response of a pressure-driven Fabry-Pérot cavity*. 12th Nuclear Plant Instrumentation, Control, and Human-Machine Interface Technologies Conference. pp. 544–554, (2021).
16. **DC Sweeney**, AM Schrell, CM Petrie. *Pressure-driven fiber optic sensor for online corrosion monitoring*. IEEE Transactions on Instrumentation and Measurement. 70. pp. 1–10, (2021).
15. **DC Sweeney**, AM Schrell, CM Petrie. *An adaptive reference scheme to extend the functional range of optical backscatter reflectometry in extreme environments*. IEEE Sensors Journal. 21(1). pp. 498–509, (2021).
14. **DC Sweeney**, CM Petrie, RH Howard, DK Felde, JL McDuffee. *Transient testing of natural circulation flow in cartridge experiments*. Transactions of the American Nuclear Society. 123(1). pp. 1829–1832, (2020).
13. CM Petrie, **DC Sweeney**, RH Howard, DK Felde, JL McDuffee. *Single-phase, natural circulation annular flow for cartridge loop irradiation experiments*. Nuclear Engineering and Design. 307(1). pp. 110900, (2020).
12. **DC Sweeney**, AM Schrell, CM Petrie. *Compensation scheme for radiation-induced attenuation in optical fibers interrogated using low-coherence interferometry*. Transactions of the American Nuclear Society. 122(1), (2020).
11. **DC Sweeney**, AM Schrell, Y Liu, CM Petrie. *Metal-embedded fiber optic sensor packaging and signal demodulation scheme towards high-frequency dynamic measurements in harsh environments*. Sensors and Actuators A: Physical. 312(1), pp. 112075, (2020).
10. CI Trainito, **DC Sweeney**, J Čemažar, EM Schmelz, O Français, B Le Pioufle, RV Davalos. *Characterization of sequentially-staged cancer cells using electrorotation*. PLOS ONE. 14(9), pp. 1–18, (2019).
9. **DC Sweeney**, RV Davalos. *Discontinuous Galerkin model of cellular electroporation*. 2018 40th International Engineering in Medicine and Biology Conference, Jul 18–21, pp.5850–5853, (2018).

8. **DC Sweeney**, JC Weaver, RV Davalos. *Characterization of cell membrane permeability in vitro part I: transport behavior induced by single-pulse electric fields*. Technology in Cancer Research and Therapy. 17, pp. 1–13, (2018).
7. **DC Sweeney**, TA Douglas, RV Davalos. *Characterization of cell membrane permeability in vitro part II: computational model of electroporation-mediated membrane transport*. Technology in Cancer Research and Therapy. 17, pp. 1–13, (2018).
6. TA Douglas, Čemažar, N Balani, **DC Sweeney**, EM Schmelz, RV Davalos. *A feasibility study for enrichment of highly-aggressive cancer subpopulations by their biophysical properties via dielectrophoresis enhanced with synergistic fluid flow*. Electrophoresis. (27 Mar 2017) [[Back Cover](#)].
5. T Murovec, **DC Sweeney**, E Latouche, RV Davalos, C Brosseau. *Modeling of transmembrane potential in realistic multicellular structures before electroporation*. Biophysical Journal. 111(10), pp. 2286–2295, (2016). [[Cover](#)]
4. MS Painter, JA Blanco, EP Malkemper, CR Anderson, V Hart, Václav Topinka, **DC Sweeney**, C Hewgley, J Červený, E Belotti, H Burda, JB Phillips. *The use of bio-loggers to characterize red fox behavior with implications for studies of magnetic alignment responses in free-roaming animals*. Animal Biotelemetry. 4(20), pp. 1–19, (2016).
3. **DC Sweeney**, M Reberšek, J Dermol, L Rems, D Miklavčič, RV Davalos. *Quantification of cell membrane permeability induced by monopolar and high frequency bipolar bursts of electrical pulses*. BBA-Biomembranes. 1858(11), pp. 2689–2698, (2016).
2. SP Bhonsle, CB Arena, **DC Sweeney**, RV Davalos. *Mitigation of impedance changes due to electroporation therapy using bursts of high-frequency bipolar pulses*. Biomedical Engineering Online. 14(3), pp. 1–14, (2015).
1. KM Habegger, H Kirchner, CX Yi, KM Heppner, **D Sweeney**, N Ottaway, J Holland, A Amburgy, C Raver, R Krishna, TD Muller, 2013. *GLP-1R agonism enhances adjustable gastric banding in diet-induced obese rats*. Diabetes. 62(9), pp. 3261–3267, (2013).

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#### TECHNICAL REPORTS

21. B Conry, YR Lin, JM Kurley, CM Parish, S Calzada, E Lopez-Honorato, **DC Sweeney**, CM Petrie. *Testing and characterization to develop a mechanistic explanation for unsaturated drift of fiber optic sensors during high-dose irradiation*. ORNL/TM-2024/3582. (2024).
20. A Birri, **DC Sweeney**, HC Hyer, B Schreiber, E Cakmak, CM Petrie. *Quantifying the Operational Envelope for Single-Point and Distributed Acoustic Sensors for Microreactor Applications*. ORNL/TM-2024/3524. (2024).
19. A Birri, KC Goetz, **DC Sweeney**, ND Ezell. *Assessment of the Impact of Realistic Sensor Physics and the Integration of Ex-Core Sensors on Reactor Power Synthesis*. ORNL/TM-2024/3567. (2024).
18. HC Hyer, BJ Schreiber, **DC Sweeney**, CM Petrie. *Evaluation of In-Situ AM Process Monitoring Techniques and Potential for Detecting Process Anomalies and Undesirable Microstructures*. ORNL/TM-2024/3465. (2024).
17. KC Goetz, FK Reed, **DC Sweeney**, AP Buchalter, ND Ezell. *Front-End Digitizer Fiscal Year 2023 Milestone Report*. ORNL/SPR-2023/3102. (2023).
16. M Ridley, S Bell, **DC Sweeney**, D Schappel, N Capps. *Summary of In Situ Strain Analysis of Cr-coated Zircaloy-4 Cladding via Digital Image Correlation*. ORNL/SPR-2023/3131. (2023)
15. S Bell, N Capps, M Ridley, **D Sweeney**, J Harp, A Willoughby, Y Yan, K Linton. *SATS Enhanced Capabilities and Demonstration of Improved Ramp Rates for In-Cell Testing*. ORNL/TM-2023/3127. (2023).
14. A Birri, **DC Sweeney**, N Russell, K Stiefel, MW Crowell, M Fuller, E Triplett Jr, CM Petrie. *Testing of an Optical Fiber-Based Gamma Thermometer in the High Flux Isotope Reactor Gamma Irradiation Facility*. ORNL/TM-2023/3029. (2023)

13. **DC Sweeney**, PL Mulligan, CM Petrie. *Analysis of WIRE-21 SPND and Optical Fiber Sensor Measurements*. ORNL/TM-2023/3024. (2023)
12. A Birri, KC Goetz, **DC Sweeney**, NDB Ezell. *Towards Realistic and High Fidelity Models for Nuclear Reactor Power Synthesis Simulation with Self-Powered Neutron Detectors*. ORNL/TM-2023/3009. (2023)
11. A Birri, **DC Sweeney**, HC Hyer, B Schrieber, CM Petrie. *Development of Optical Fiber-Based Sensors for Nuclear Microreactor Structural Health Monitoring*. ORNL/TM-2023/2984. (2023)
10. HC Hyer, **DC Sweeney**, CM Petrie. *Summary of Methodology for Mitigating Risks Associated with Licensing and Qualifying AM Nuclear Materials*. ORNL/TM-2023/2851. (2023).
9. CM Petrie, **DC Sweeney**, PL Mulligan, K Godsey, ND Ezell, P Sirianni, S Stafford, J Arndt, J Carvajal. *WIRE-21 Experiment Irradiation Conditions and In-Situ Data Collection*. ORNL/TM-2023/2879. (2023).
8. **DC Sweeney**, KC Goetz, FK Reed, ND Ezell. *Development of a Radiation-Tolerant Front End Digitizer*. ORNL/TM-2022/2739. (2022).
7. A Birri, **DC Sweeney**, HC Hyer, CM Petrie. *Status Update on the Development of Transducers and Bonding Techniques for Enabling Acoustic Measurements of Damage in Microreactor Components*. ORNL/TM-2022/2629. (2022).
6. HC Hyer, **DC Sweeney**, CM Petrie, JL Hartvigsen, ZD Sellers, TC Unruh, TL Phero. *Performance of Microreactor Test Article with Embedded Sensors During Testing in The Single Primary Heat Extraction and Removal Emulator*. ORNL/TM-2022/2619. (2022).
5. FK Reed, KC Goetz, MN Ericson, **DC Sweeney**, NDB Ezell. *Wide Bandgap Semiconductors for Extreme Temperature and Radiation Environments*. ORNL/TM-2021/2274. (2022).
4. CM Petrie, AS Chapel, PL Mulligan, D Bryant, **DC Sweeney**, A James, NDB Ezell, K Smith, K Godsey, M Searles, S Stafford, J Arndt, J Carvajal *WIRE-21 Sensor Irradiation Experiment Ready for HFIR Insertion*. ORNL/TM-2022/2354. (2022).
3. HC Hyer, **DC Sweeney**, CM Petrie. *Characterization of Embedded Sensors in Stainless Steel Test Articles and Design/Planning for MAGNET Testing*. ORNL/TM-2021/2099. (2021)
2. **DC Sweeney**, CM Petrie, AS Chapel, RH Howard, AM Schrell, DK Felde, JL McDuffee. *Versatile Test Reactor Project: 2020 ORNL MSR Experiments Summary Report*. ORNL/SPR-2020/1587. (2020).
1. PL Mulligan, K Smith, NDB Ezell, **DC Sweeney**, K Godsey, A James, A Le Coq, J McDuffee, S Stafford, J Arndt, J Carvajal, CM Petrie. *Wireless Instrumented RB Experiment Preliminary Design and Analysis*. ORNL/TM-2020/1879. (2020).

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## BOOK CHAPTERS

1. **DC Sweeney**, RE Neal III, RV Davalos. *Multi-scale biophysical principles in clinical irreversible electroporation*. Irreversible Electroporation in Clinical Practice. Ed. R Meijerink, HJ Scheffer, G Narayanan. Springer International Publishing. pp.41-66. (2018).

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## PATENTS

5. **DC Sweeney**, CM Petrie, KR Smith, ND Ezell. *Mineral Insulated Cable Adaptor to Interface with Printed Circuit Boards*. US Provisional Application 63404676.
4. **DC Sweeney**, A Birri, CM Petrie. *Hybrid Method for Monitoring Large Fabry-Perot Cavity Displacements with Nanometer Precision*. US Provisional Application 63388156.
3. **DC Sweeney**, CM Petrie, AM Schrell. *A Post-Processing Method to Extend the Functional Range of Optical Backscatter Reflectometry in Extreme Environments*. US 2021/0348971 A1.
2. CM Petrie, **DC Sweeney**, Y Liu. *Metal-Embedded Optical Fibers for Monitoring of Pressure or Corrosion at High Temperatures*. US 11,525,750. (2022).

1. JC Weaver, RS Son, TR Growishankar, **DC Sweeney**, RV Davalos. *Methods for Inducing Electroporation and Tissue Ablation*. US Application 20160361109.

#### CONFERENCE PRESENTATIONS

12. ANS Annual Meeting 2024, Las Vegas, NV, USA	16–19 Jun 2024
11. 13th NPIC & HMIT 2023, Knoxville, TN, USA	15–21 Jun 2023
10. ANS 2021 Winter Meeting & Expo, Virtual Meeting	30–3 Nov 2021
9. 12th NPIC & HMIT, Virtual Meeting	14–17 Jun 2021
8. ANS 2020 Winter Meeting & Expo, Virtual Meeting	16–19 Nov 2020
7. ANS Annual Meeting 2020, Virtual Meeting	8–11 Jun 2020
6. 40th International Conference of the IEEE EMBS, Honolulu, Hawaii, USA	17–21 Jun 2018
5. BMES Annual Meeting 2017, Phoenix, Arizona, USA	11–15 Oct 2017
4. 2nd World Congress on Electroporation, Norfolk, Virginia, USA	24–29 Sep 2017
3. BMES Annual Meeting 2016, Minneapolis, Minnesota, USA	5–8 Oct 2016
2. 1st World Congress on Electroporation 2015, Potorož, Slovenia	6–10 Sep 2015
1. BMES Annual Meeting 2014, San Antonio, Texas, USA	22–25 Oct 2014

#### TEACHING & MENTORSHIP

##### **Science Undergraduate Laboratory Internships (SULI)**

1. Mikaela Atkinson (Electrical Engineering)

ORNL  
Summer 2022

##### **Graduate Teaching Assistant**

1. Engineering Mathematics (CHE/BSE/BMES 5044, Virginia Tech)
2. Introduction to Biomedical Engineering (BMES 2104, Virginia Tech)

Virginia Tech  
Fall 2014, Fall 2017  
Spring 2018

##### **Research Mentor**

1. Kathryn Hall (Biochemistry and Chemistry)
2. Shelby Keyes (Human Nutrition, Foods, and Exercise)
3. Mark Hurley (High School Teacher, NSF 1301037)

Virginia Tech  
Jan 2017 – May 2018  
Aug 2015 – May 2016  
May 2016 – Aug 2016

#### SHORT COURSES

FranklinCovey Project Management Essentials, Tennessee, USA	Aug 2022
FranklinCovey 7 Habits of Highly Effective People, Tennessee, USA	Jun 2022
FranklinCovey Unconscious Bias, Tennessee, USA	Sep 2021
Workshop on Digital Twin Applications for Advanced Nuclear Technologies, Virtual	Dec 2020
Shipley Proposal Writing Course, Oak Ridge, Tennessee, USA	May 2020
LabVIEW Core I/II Training, Oak Ridge, Tennessee, USA	Jul 2019
Fundamental & Applied Bioelectrics Workshop, Norfolk, Virginia, USA	Jul 2016

#### HONORS, AWARDS, & CERTIFICATES

IEEE Senior Membership	May 2024
Postdoc Development Path (ORNL)	Oct 2022
MultiSTEPS Biotransport Traineeship (NSF IGERT)	Aug 2013 – May 2016
Texas Instruments Analog Design Contest Finalist (Team Glucose)	May 2013
1st Place Fish Out of Water Award (University of Arizona Senior Design Day)	May 2013
Most Innovate Systems Integration (University of Arizona Senior Design Day)	May 2013
Best Team Leadership (University of Arizona Senior Design Day)	May 2013

#### PROFESSIONAL SOCIETIES

Senior Member, Institute of Electrical and Electronics Engineers (IEEE)	2020 – present
Member, American Nuclear Society (ANS)	2019 – present

TECHNICAL REVIEWER	Sensors	
	IEEE Sensors	
	IEEE Transactions on Instrumentation and Measurement	
	Optics Express	
	Optics Communications	
	Optics Letters	
	Small Business Innovation Research (SBIR) Grant Reviewer	
	ORNL Seed Award Reviewer	
SERVICE	ORNL Lab Directed R&D (LDRD) Award Reviewer	
	DOE Consolidated Innovative Nuclear Research (CINR) Reviewer	
	ORNL Seed Review Committee (Oak Ridge National Laboratory)	Apr 2024 – present
	FIRST Robotics Competition Mentor (Team 4504)	Jan 2021 – present
	External Reviewer, CEACSE Grant Competition (UT-Chattanooga)	Feb 2023
	ORNL WINGS Virtual STEM Outreach	Jul 2021
	Science Judge, 2020 Tennessee Science Bowl	Feb 2020