Daniel C. Sweeney, PhD

R&D Associate Staff Member
Oak Ridge National Laboratory
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Professional Experience

Oak Ridge National Laboratory — Oak Ridge, TN

R&D Associate Staff Member — Aug 2020 – Present

- Created digital and front-end analog electronics for novel sensors and controllers for data acquisition in irradiated environments.
- Developed prototype sensors and data acquisition systems for sensor validation and calibration at high temperatures and under irradiation.
- Established network-based signal processing methods to improve data processing from embedded distributed optical fiber sensors resulting in a $>$ 10-fold increase in analysis speed and 2-fold increase in dynamic range.

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.

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*

Journal Articles

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).

Technical Reports

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).

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).

Patents

6. KC Goetz, **DC Sweeney**, FK Reed, PL Mulligan. *Radiation-Tolerant Front End Digitizer*. US Provisional Application 63420884.
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 2021/0033479 A1.
1. JC Weaver, RS Son, TR Growishankar, **DC Sweeney**, RV Davalos. *Methods for Inducing Electroporation and Tissue Ablation*. US Application 20160361109.

Conference Presentations

10.	ANS 2021 Winter Meeting & Expo,Virtual Meeting	30–3 Nov 2021
9.	ANS Annual Meeting 2021 (NPIC&HMIT 2021), 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, 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) — ORNL

1. Mikaela Atkinson (Electrical Engineering) — Summer 2022

Graduate Teaching Assistant — Virginia Tech

1. Engineering Mathematics (CHE/BSE/BMES 5044, Virginia Tech) — Fall 2014, Fall 2017
2. Introduction to Biomedical Engineering (BMES 2104, Virginia Tech) — Spring 2018

Research Mentor — Virginia Tech

1. Kathryn Hall (Biochemistry and Chemistry) — Jan 2017 – May 2018
2. Shelby Keyes (Human Nutrition, Foods, and Exercise) — Aug 2015 – May 2016
3. Mark Hurley (High School Teacher, NSF 1301037) — 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

Technical Competencies

Programming Languages: Python, C/C++, LabVIEW, Unix shell, LaTeX
Software Packages: COMSOL, ANSYS, SPICE, KiCAD, OrCAD, AutoCAD, Creo
Laboratory Techniques: thermal testing, optical microscopy, experimental design, hardware-software integration, data acquisition, electrified experiments
Engineering Competencies: mixed signal processing, analog/digital circuit design, PCB layout, image processing, microfluidics, finite element analysis, fiber optic sensors

Honors, Awards, & Certificates

ORNL Postdoc Development Path	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

American Nuclear Society (ANS)	2019 – present
Institute of Electrical and Electronics Engineers (EEE)	2020 – present

Reviewer

Nature Scientific Reports, Sensors, IEEE Sensors, IEEE Transactions on Instrumentation and Measurement, Optics Express, Optics Communications, Optics Letters, Small Business Innovation, Research (SBIR) Grant Reviewer, ORNL SEED Reviewer

Service

FIRST Robotics Competition Mentor (BC Robotics)	2021 – present
ORNL WINGS Virtual STEM Outreach	Jul 2021
Science Judge, 2020 Tennessee Science Bowl	Feb 2020