

William C. Dawn

Curriculum Vitae

Education

- May 2022 **Doctor of Philosophy, Nuclear Engineering**, *North Carolina State University*, Raleigh, NC
Research related to unstructured mesh neutron transport methods and multiphysics modeling.
Developed MEZCAL computer program using scalable finite element methods and exascale computing.
Dissertation: *Multiphysics Modeling of Microreactors with Unstructured Mesh Neutron Transport and Exascale Computing Architectures*.
Advisor: Scott Palmtag.
- May 2019 **Master of Science, Nuclear Engineering**, *North Carolina State University*, Raleigh, NC
Nuclear Engineering University Program (NEUP) Fellow.
Developed LUPINE simulation suite to model Sodium-cooled Fast Reactors (SFRs).
Thesis: *Simulation of Fast Reactors with the Finite Element Method and Multiphysics Models*.
Advisor: Scott Palmtag.
- May 2017 **Bachelor of Science, Nuclear Engineering**, *North Carolina State University*, Raleigh, NC
Graduated as Valedictorian and Summa Cum Laude.
Led senior design team. Responsible for project management and interfacing with corporate sponsor.
Senior Design Project: “A Thermal Test Location in a Sodium Cooled Fast Reactor”

Professional Experience

- June 2022 - **Senior Nuclear Engineer**,
Present *Studsvik Scandpower Inc.*, Idaho Falls, ID
- SIMULATE5/SIMULATE5-K developer.
 - Implemented and benchmarked SIMULATE5-K-VVER for modeling transients in VVER-1000s and VVER-440s.
 - Developed internal tools for software testing and project management.
- May 2019 - **NEUP Intern**, *Idaho National Laboratory*, Idaho Falls, ID
- August 2019
- Added fast neutron cross section library capabilities to Rattlesnake neutron transport code.
 - Used Rattlesnake to investigate effects of higher-order neutron scattering in fast reactor systems.
 - Implemented isotopic fission spectrum mixture into Rattlesnake.
 - Authored two technical reports related to work: “Comparison of Higher-Order Neutron Scattering Cross Sections” (INL/EXT-19-54899) and “An Analytic Benchmark for the Solution to the Isotopic Fission Spectrum Mixture Problem” (INL/EXT-19-54998).
- May 2018 - **CASL Graduate Assistant**, *Consortium for Advanced Simulation of LWRs (CASL)*, Raleigh,
August 2019 NC
- Developed lesson and lectured on CTF-MPACT coupling and use for practical reactor designs.
 - Provided technical experience and IT support for student reactor design simulations.
 - Contributed to logistical planning for CASL Institute.
- May 2017 - **NESLS Engineering Intern**, *Oak Ridge National Laboratory*, Oak Ridge, TN
- August 2017
- Added fast neutron cross section library capabilities to MPACT neutron transport code via ISOTXS file reader.
 - Simulated fast neutron chloride molten salt reactor in steady-state and depletion simulations.
 - Developed molten salt reactor models in MPACT, MCNP, and Serpent.
 - Proficient in large project coding and source control with `git`.

- August 2015 - **CASL Undergraduate Research Scholar**, *Consortium for Advanced Simulation of LWRs*
 May 2017 (CASL), Raleigh, NC
- Reduced computing time by 30% by improving steam tables in CTF.
 - Performed code comparisons to verify simulation results in MCNP and MPACT.
- May 2016 - **Edison Engineering Intern**, *GE Hitachi Nuclear Energy LLC*, Wilmington, NC
- August 2016 ○ PRISM
- Drafted and submitted journal article “PRISM Reference Fuel Design.”
 - Awarded two patents relating to ESBWR and one patent related to PRISM.
 - Developed PRISM General Description Book and prepared public-facing documents describing PRISM for a general audience.
- May 2015 - ○ LOCA & Containment
- August 2015
- Analyzed reactor transients using TRACG to support 10% power uprate.
 - Created automated data visualization and animation packages using MATLAB.
- August 2014 - **Licensed Reactor Operator**, *NCSU PULSTAR Research Nuclear Reactor*, Raleigh, NC
- May 2017 ○ Licensed by NRC to operate all controls at NCSU reactor facility.
- Experienced in startup, operation, and troubleshooting on 1 MW research reactor.

Publications

- Dawn, William C.**, Gerardo Grandi, and Tamer Bahadir. “Development and Benchmarking of SIMULATE5-K-VVER.” In: *Annals of Nuclear Energy* (2023). Accepted for Publication.
- Dawn, William C.** and Scott Palmtag. “Solving the Neutron Transport Equation for Microreactor Modeling Using Unstructured Meshes and Exascale Computing Architectures.” In: *Nuclear Science and Engineering* (Feb. 2023). DOI: [10.1080/00295639.2023.2189510](https://doi.org/10.1080/00295639.2023.2189510).
- Dawn, William C.** and Scott Palmtag. “A Multiphysics Simulation Suite for Liquid Metal-Cooled Fast Reactors.” In: *Annals of Nuclear Energy* 159 (Sept. 2021). DOI: [10.1016/j.anucene.2021.108213](https://doi.org/10.1016/j.anucene.2021.108213).
- Dawn, William C.** and Tamer Bahadir. “Development and Benchmarking of Transient Nodal Code SIMULATE5-K Neutron Kinetics Solver for VVERs and Hexagonal Geometries.” In: *Proceedings of ANS M&C 2023*. Niagara Falls, Ontario, Aug. 2023.
- Dawn, William C.** and Scott Palmtag. “Simplified Thermal Expansion Modeling for Liquid Metal-Cooled Fast Reactors.” In: *Proceedings of ANS M&C 2021*. Raleigh, NC, Oct. 2021. DOI: [dx.doi.org/10.13182/M&C21-33702](https://doi.org/10.13182/M&C21-33702).
- Al-Dawood, Khaldoon A., **William C. Dawn**, and Scott Palmtag. “Multiphysics Simulation of Uranium-Nitride Fueled Lead-Cooled Fast Reactor.” In: *Proceedings of ANS M&C 2021*. Raleigh, NC, 2021. DOI: [dx.doi.org/10.13182/M&C21-33708](https://doi.org/10.13182/M&C21-33708).
- Palmtag, Scott, **William C. Dawn**, and Chase Lawing. “Fast Reactor Depletion Methods in LUPINE.” In: *Proceedings of ANS M&C 2021*. Raleigh, NC, 2021. DOI: [dx.doi.org/10.13182/M&C21-33880](https://doi.org/10.13182/M&C21-33880).
- Dawn, William C.** and Scott Palmtag. “A Multiphysics Simulation Suite for Sodium Cooled Fast Reactors.” In: *Proceedings of PHYSOR 2020* (Mar. 27–Apr. 6, 2020). Cambridge, UK, Apr. 2020. DOI: [10.1051/epjconf/202124706019](https://doi.org/10.1051/epjconf/202124706019).
- Dawn, William C.**, Javier Ortensi, Mark D. Dehart, and Scott P. Palmtag. *Comparison of Higher-Order Neutron Scattering Cross Sections*. Tech. rep. INL/EXT-19-54899. Idaho National Laboratory, 2019. DOI: [10.2172/1593864](https://doi.org/10.2172/1593864).
- Dawn, William C.** *An Analytic Benchmark for the Solution to the Isotopic Fission Spectrum Mixture Problem*. Tech. rep. INL/EXT-19-54998. Idaho National Laboratory, 2019. DOI: [10.2172/1593873](https://doi.org/10.2172/1593873).
- Loewen, Eric, Sarah DeSilva, and Russell Stachowski. “PRISM Reference Fuel Design.” In: *Nuclear Engineering and Design* 340 (2018). Acknowledged Contributor, pp. 40–53. DOI: [10.1016/j.nucengdes.2018.09.016](https://doi.org/10.1016/j.nucengdes.2018.09.016).

Patents

- Loewen, Eric P., James P. Sineath, Dean D. Molinaro, **William C. Dawn**, Robin D. Sprague, Theron D. Marshall, and Joel P. Melito. “Intermixing Feedwater Sparger Nozzles and Methods for Using the Same in Nuclear Reactors.” Pat. 20180277265 (Wilmington, NC). Feb. 2020.
- Loewen, Eric P., James P. Sineath, Dean D. Molinaro, **William C. Dawn**, William J. Garcia, Oscar L. Meek, and Patrick K. Day. “Acoustic Flowmeter and Methods of Using Same.” Pat. 20180277267 (Wilmington, NC). May 2020.
- Sineath, James P., Dean D. Molinaro, **William C. Dawn**, and Eric P. Loewen. “Systems and Methods for Airflow Control in Reactor Passive Decay Heat Removal.” Pat. US10937557B2 (Wilmington, NC). Mar. 2021.

Poster Presentations

- Dawn, William C.** and Scott Palmtag. “Multiphysics Modeling of Microreactors with Unstructured Mesh Neutron Transport and Exascale Computing Architectures.” In: NEDAC Poster Session (Apr. 29, 2022). Raleigh, NC, 2017. doi: 10.13140/RG.2.2.29283.22567.
- Dawn, William C.** “MC2 for High Energy Neutron Cross Sections in MPACT for Molten Salt Fueled Reactors.” In: ORNL Intern Poster Session (Aug. 8, 2017). Oak Ridge, TN, 2017.
- Dawn, William C.** and Scott P. Palmtag. “Increasing Computational Efficiency of Fluid Property Calculations in CTF.” In: Office of Undergraduate Research Symposium (Apr. 12, 2017). Raleigh, NC, 2017.
- Dawn, William C.**, Rebeka S. Gottfried, Matthew T. Ingram, Zachary D. Morey, and Charles W. Tait. “A Thermal Test Location in a Sodium Cooled Fast Reactor.” In: Office of Undergraduate Research Symposium (Apr. 12, 2017). Awarded Sigma Xi Best Undergraduate Engineering Poster. Raleigh, NC, 2017.
- Awarded Sigma Xi Best Undergraduate Engineering Poster for “A Thermal Test Location in a Sodium Cooled Fast Reactor”.

Technical Skills

Programming Languages	Fortran, C++, C, Python, MATLAB, L ^A T _E X.	Simulation Packages:	MFEM, DIF3D, MC ² -3, REBUS, MCNP, Serpent, MPACT, CTF.
General Proficiencies	Bash scripting, Github & GitLab Project Management.		

Professional Development and Achievements

- 2021 Alan F. Henry/Paul A. Greebler – American Nuclear Scholarship.
- 2021 American Nuclear Society Mathematics & Computation Conference – Student Program Committee Co-Chair.
- 2019 College of Engineering Master’s Scholar of the Year.
- 2017-2020 Nuclear Engineering University Program (NEUP) Fellowship.
 - Full funding for three years of graduate school.
 - Nationally recognized Department of Energy (DOE) fellowship.
- 2014-2017 Nuclear Engineering University Program (NEUP) Undergraduate Scholarship.
- 2017 College of Engineering Outstanding Senior Award for Scholarly Achievement Nominee.
- 2017 Awarded Sigma Xi Best Undergraduate Engineering Poster for “A Thermal Test Location in a Sodium Cooled Fast Reactor”.

2014-2018 American Nuclear Society Scholarship.

2012 Eagle Scout.

Conference Planning

2021 Student Program Co-Chair at ANS M&C 2021 conference.

2022 Planning committee for upcoming fuel management conference.