

# William C. Dawn

## Education

## Curriculum Vitae

- May 2022 **Doctor of Philosophy, Nuclear Engineering**, *North Carolina State University*, Raleigh, NC  
Research on unstructured mesh neutron transport methods and multiphysics modeling using GPUs.  
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 finite element 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
- Peacock lead developer.
    - New, continuous energy Monte Carlo code developed entirely from scratch.
    - Developed in C++23 with modern software best-practices (e.g., GitLab version control, unit tests, continuous integration, etc.).
    - Responsible for implementing all neutron physics including thermal scattering, resolved and unresolved resonances, and depletion.
    - Coordinating team of developers for nuclear data processing and development of input/output processing tools.
  - SIMULATE5/SIMULATE5-K developer.
    - Added capabilities for modeling Pellet-Cladding Mechanical Interaction (PCMI) during transients to support NRC Regulatory Guide 1.236.
    - 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 based on MC<sup>2</sup>-3 and ISOTXS file format.
  - 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)
    - “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, 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 (CASL)*, Raleigh, NC
- May 2017
- Reduced computing time by 30 % by improving steam tables in CTF.
  - Performed code comparisons with MCNP to verify energy group structure in 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 -
- August 2015
- LOCA & Containment
    - 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.** “A Benchmark for Neutron Kinetics Methods in Hexagonal Geometry.” In: *Nuclear Science and Engineering* 199 (5 Sept. 2024).
- Dawn, William C.**, Gerardo Grandi, and Tamer Bahadir. “Development and Benchmarking of SIMULATE5-K-VVER.” In: *Annals of Nuclear Energy* 195 (Jan. 2024).
- 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* 197.12 (Feb. 2023).
- Dawn, William C.** and Scott Palmtag. “A Multiphysics Simulation Suite for Liquid Metal-Cooled Fast Reactors.” In: *Annals of Nuclear Energy* 159 (Sept. 2021).

## Conference Papers

- Dawn, William C.** and Charles Wemple. “Peacock: A Monte Carlo Transport Code with Depletion for Reactor Modeling.” In: *Proceedings of Advances in Nuclear Fuel Management (ANFM) 2025*. Clearwater Beach, FL, July 2025.
- Wemple, C. A., R. M Ferrer, T. T. Simeonov, J. M. Hykes, **W. C. Dawn**, and J. D. Rhodes. “Nuclear Data Usage at Studsvik Scandpower and Future Needs from ENDF/B-IX.” In: *Proceedings of Advances in Nuclear Fuel Management (ANFM) 2025*. Clearwater Beach, FL, July 2025.

- Ferrer, Rodolfo, **William C. Dawn**, and Tamer Bahadir. “Verification of CMS5 for Higher Enrichment and High Burnup PWR Core Design.” In: *Proceedings of Advances in Nuclear Fuel Management (ANFM) 2025*. Clearwater Beach, FL, July 2025.
- Dawn, William C.** “Peacock: A Monte Carlo Code with Shared Memory Parallelism for Consumer-Grade Computing Architectures.” In: *Proceedings of M&C 2025*. Denver, CO, Apr. 2025.
- Dawn, William C.**, Charles Wemple, Joshua Hykes, Rodolfo M. Ferrer, and Joel Rhodes III. “Peacock: Development of a New Continuous Energy Monte Carlo Transport Code.” In: *Transactions of the American Nuclear Society*. Vol. 131. Nov. 2024.
- Dawn, William C.**, Gerardo Grandi, and Tamer Bahadir. “Initial Validation of SIMULATE5-K and the CMS5 Reactor Modeling Suite with the SPERT-III Experiments.” In: *Proceedings of ANS PHYSOR 2024*. San Francisco, CA, Apr. 2024.
- 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.
- Kiefer, Timothy M., **William C. Dawn**, Khaldoun Al-Dawood, and Scott Palmtag. “Control Rod Modeling in Liquid Metal-Cooled Fast Reactors.” In: *Proceedings of PHYSOR 2022*. Pittsburgh, PA, 2022.
- 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.
- Al-Dawood, Khaldoun 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.
- Palmtag, Scott, **William C. Dawn**, and Chase Lawing. “Fast Reactor Depletion Methods in LUPINE.” In: *Proceedings of ANS M&C 2021*. Raleigh, NC, 2021.
- 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.

## Technical Reports

- 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.
- 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.

## 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.

- 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”.

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## Technical Skills

Programming Languages	C++, Fortran, C, Python, MATLAB, L <sup>A</sup> T <sub>E</sub> X.	Simulation Packages:	CASMO, SIMULATE, MFEM, DIF3D, MC <sup>2</sup> -3, REBUS, MCNP, Serpent, MPACT, CTF.
General Proficiencies	Bash scripting, Github & GitLab Project Management.		

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## 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.