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"

Publications

Dawn, William C. and Scott Palmtag. "A Multiphysics Simulation Sutie for Liquid Metal-Cooled Fast Reactors." In: *Annals of Nuclear Energy* 159 (Sept. 2021). DOI: 10.1016/j.anucene.2021.108213.

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. DOI: dx.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. DOI: dx.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. DOI: dx.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. DOI: 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.

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.

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.

(540) 645-2576 • *wcdawn@ncsu.edu* • *wcdawn*
https://wcdawn.github.io/

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." 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." 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." 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. 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. Oak Ridge, TN.

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.

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.

- Awarded Sigma Xi Best Undergraduate Engineering Poster for "A Thermal Test Location in a Sodium Cooled Fast Reactor".

Professional Experience

May 2019 - August 2019 **NEUP Intern**, *Idaho National Laboratory*, Idaho Falls, ID

- 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 - August 2019 **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 - August 2017 **NESLS Engineering Intern**, *Oak Ridge National Laboratory*, Oak Ridge, TN

- 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 - May 2017 **CASL Undergraduate Research Scholar**, *Consortium for Advanced Simulation of LWRs* (*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 - August 2016 **Edison Engineering Intern**, *GE Hitachi Nuclear Energy LLC*, Wilmington, NC
- 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 - May 2017 **Licensed Reactor Operator**, *NCSU PULSTAR Research Nuclear Reactor*, Raleigh, NC
- Licensed by NRC to operate all controls at NCSU reactor facility.
- Experienced in startup, operation, and troubleshooting on 1 MW research reactor.

Technical Skills

Programming Languages: Fortran, C++, C, Python, MATLAB, LaTeX.

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.