Adam Dix

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Education

Ph.D.	**Nuclear Engineering, Purdue University**	**GPA: 3.93**	**May 2025**
M.S.	**Nuclear Engineering, Purdue University**	**GPA: 3.93**	**December 2022**
B.S.	**Nuclear Engineering, Purdue University**	**GPA: 3.94**	**May 2020**

Research Interests

Nuclear reactor thermal-hydraulics, reactor safety, liquid metal thermal-hydraulics, two-phase flow hydrodynamics, experimental thermal-hydraulics, computational thermal-hydraulics

Research Projects

Purdue Inclined Two-phase Adiabatic Test Facility, Thermal-hydraulics and Reactor Safety Laboratory, Purdue University | 2018-present

- Investigated the basic hydrodynamics of two-phase flow, especially the effects of various body forces on bubble behavior.
- Aided in the scaling, design and construction of an adiabatic air-water inclinable two-phase flow test facility, including technical drawings, interfacing with machinists, and physically assembling the facility.
- Utilized advanced instrumentation, including local conductivity probes, an impedance meter, and pressure transducers to measure two-phase parameters such as void fraction, bubble velocity, interfacial area concentration, etc. Benchmarked, troubleshot, and when required fabricated these instruments.
- Developed novel models for bubble relative motion in horizontal orientations, clarifying previously unexplained physics.
- Validated the multiphase computational fluid dynamics code ANSYS CFX against experimental data and implemented custom model improvements to greatly improve performance.
- Created a comprehensive and extensible Python framework for data analysis, and implemented modern software practices for maintaining it, including source control.
- Coordinated and mentored other graduate and undergraduate students, teaching the basic skills required to perform quality research in the laboratory as well as offering guidance on their research projects.

Nek-2P Benchmarking, Nuclear Science and Engineering Division, Argonne National Laboratory | Summer, 2022

- Benchmarked the two-phase fluid CFD code Nek-2P currently being developed at Argonne with experimental data available in literature.
- Developed new test cases and documented results for a code that had no previous documentation.

Experimental Study and CFD Design Tool Development for the Cartridge Loop in the Versatile Test Reactor, Thermal-hydraulics and Reactor Safety Laboratory, Purdue University | 2020-2022

- Performed scaling and CFD analysis of the sodium cartridge loop of the Versatile Test Reactor in ANSYS Fluent.
- Designed and constructed a scaled 7-pin wire-wrapped rod bundle facility for hydrodynamic similarity.

- Utilized flow instrumentation and computerized data acquisition systems to measure pressure drop and local velocity in the scaled test facility.
- Developed a novel friction factor model for wire-wrapped rod bundles, which is able to predict the bundle pressure drop with similar accuracy to existing models with significantly fewer empirical coefficients.

CARLITA-SAM Code to Code Comparisons for LBE Natural Circulation, Nuclear Science and Engineering Division, Argonne National Laboratory | Summer, 2020

- Created models for an experimental system from literature in the 1-D system analysis codes CARLITA and SAM.
- Compared simulation results from CARLITA and SAM against the experimental data.
- Recommended improvements to the CARLITA code.

Mechanistic Source Term Analysis Toolkit, Nuclear Science and Engineering Division, Argonne National Laboratory | Summer, 2019

- Developed a graphical user interface for mechanistic source term analysis of liquid metal cooled reactors.
- Integrated safety and systems analysis codes such as SAS4A/SASSYS-1 and SRT to trace accident situations from fuel failure to radionuclide release and potential dose to the public.
- Produced documentation for graphical user interface for eventual industry use or licensing efforts.

SAS4A/SASSYS-1 Software Quality Assurance Support, Nuclear Science and Engineering Division, Argonne National Laboratory | Summer, 2018

- Performed several Software Quality Assurance (SQA) based tasks for the fast reactor safety analysis code SAS4A/SASSYS-1.
- Developed a Python script to process code coverage statistics from the Intel Fortran compiler.
- Upon completion of initial Python script project, reviewed analytical solutions to unit test cases, developed training information for unique code modules, and started the development of a continuous integration tool for automated compiling and testing of new changes.

Magnetohydrodynamic Generator Design, Nuclear Energy Operations, and Nonproliferation Lab, Purdue University | 2017-2018

- Team member analyzing the possibility of using a magnetohydrodynamic (MHD) generator system in a liquid metal cooled reactor with no moving parts.
- Work won first place at the Exelon Innovation Competition at the 2017 ANS Student Conference.
- Gained valuable experience by attempting to model an MHD generator in ANSYS FLUENT.

Professional Experience

Research Assistant, Purdue University | 2023-2025

Graduate Student Grader, Purdue University | 2024

UNLP Fellow, Purdue University | 2020-2023

UNLP Fellow, Argonne National Laboratory | Summer 2022

Research Aide, Argonne National Laboratory | Summer 2020

Undergraduate Student Grader, Purdue University | 2019-2020

SULI Intern, Argonne National Laboratory | Summers 2018, 2019

Undergraduate Research Assistant | 2017-2020

Professional Memberships

Nuclear Engineering Graduate Organization 2020-present

Women in Nuclear, 2019-present

American Nuclear Society, 2016-present

Awards

- University Nuclear Leadership Program (UNLP) Graduate Fellowship, US Department of Energy (2020)
- Innovations in Nuclear Energy Research and Development Student Competition (INSC), First Place Open Competition (2023)
- Graduate Student Recognition Seminar, Purdue University School of Nuclear Engineering (2025)
- Early Career Graduate Research Award, Purdue University School of Nuclear Engineering (2023)
- Outstanding Student Service Award, Purdue University Graduate School (2023)
- Exelon Outstanding Senior, Purdue University School of Nuclear Engineering (2020)
- NRC Scholarship, Purdue University (2017)
- Presidential Scholarship, Purdue University (2016)
- CNH Industrial Scholarship (2016)
- Boy Scouts of America Eagle Scout (2016)

Volunteering

Nuclear Engineering Graduate Organization, Purdue University | 2020-present

- Served as treasurer and secretary (2022-present), entrusted with the financial well-being of the club and interfacing with college officials
- Engaged in event planning, including a research fair, social events, and qualifying exam support.

American Nuclear Society Purdue University Student Section | 2016-present

- Former president of the Purdue University Student Section (2019-2020), vice-president (2018-2019), secretary (2017-2018), and sophomore class representative (2017-2018). Currently serving as graduate representative.
- Planned events for an organization of up to 50 members, including the Atoms for Humanity Summit at Purdue University, a career fair, research fair, ANS Student Conference trips, and various social events.
- Planned and volunteered at on-campus “Nuke Week” booth to spread a positive message about nuclear power to the public, as well as assisted with nuclear reactor tours.

Purdue University School of Nuclear Engineering Student Ambassador | 2018-2020

- Represented the School of Nuclear Engineering by interfacing with prospective students, parents, and high-level guests of the school.
- Entrusted with being the face of the department for guests such as an NRC commissioner, ABET accreditor, and Department of Energy officials.

Peer Reviewed Journal Publications

Ryan, D., Kang, D., **Dix, A.**, Quan, Z., & Kim S. (2024) “Interfacial area transport modeling of air–water bubbly two-phase flows in inclined orientations,” *Nuclear Engineering and Design,* vol. 428. https://doi.org/10.1016/j.nucengdes.2024.113530.

Dix, A. & Kim, S., (2023) "Novel Friction factor Model for Wire-wrapped Rod Bundles," *Nuclear Engineering and Design*, vol. 401. https://doi.org/10.1016/j.nucengdes.2022.112104.

Ryan, D., Kong, R., Kang, D., **Dix, A.**, Bian, J., & Kim, S. (2022). "Effects of Pipe Inclination on Global Two-phase Flow Parameters," *Nuclear Technology*, vol. 209, pg. 1485-1494. https://doi.org/10.1080/00295450.2022.2160172.

Quan, Z., **Dix, A.**, Kong, R., Kim, S., Ishii, M., & Farmer M., (2022) "Pressure Drop in 7-pin Wire-wrapped Rod Bundle for the Sodium Cartridge Loop in Versatile Test Reactor," *Nuclear Science and Engineering*. https://doi.org/10.1080/00295639.2022.2082232.

Farmer, M., Weathered, M., Lisowski, D., Bremer, N., Kilsdonk, D., Stack, T., Tomlin, C., Plucker, C., Moreno, E., Kong, R., Quan, Z., **Dix, A.**, Kim, S., Ishii, M., Anderson, M., and Napora, A., (2022) "Development of a Sodium Fast Reactor Cartridge Loop Testing Capability for the Versatile Test Reactor," *Nuclear Science and Engineering*, vol. 196, pp. 148-164. https://doi.org/10.1080/00295639.2022.2052552.

Ryan, D., Loescher, C., Hamilton, I., Bean, R., & **Dix, A.** (2018). "Magnetic variation and power density of gravity driven liquid metal magnetohydrodynamic generators," *Annals of Nuclear Energy*, *114*, 325-328. https://doi.org/10.1016/j.anucene.2017.12.047.

Conference Publications

Dix, A., & Kim, S., (2025). "Implementing Improved Relative Velocity Models for Horizontal Bubbly Flow in Computational Multiphase Fluid Dynamics Simulations," *The 21st International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-21)*. Busan, Republic of Korea. *(Accepted)*.

Dix, A., & Kim, S., (2024). "Relative Velocity in Horizontal Bubbly Two-phase Flow: Experiments and Modeling," *Transactions of the American Nuclear Society, Advancements in Thermal-Hydraulics (ATH 2024)*. Orlando, Florida, USA.

Zhengting Quan, Alicja Stoppel, **Dix, A.**, & Kim, S., (2024). "Experimental Study of Air-water Two-phase Flow Across a Vertical U-bend," *Transactions of the American Nuclear Society, Advancements in Thermal-Hydraulics (ATH 2024)*. Orlando, Florida, USA.

Coppo Leite, V., Merzari, E., **Dix, A.**, & Zou, L., (2023). "Code Validation of SAM Using Forced and Natural-Circulation Data from NACIE-UP Benchmark," *The 20th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-20)*. Washington, DC, USA.

Ryan, D., **Dix, A.**, Buchanan, J., & Kim, S., (2023). "Improving Multiphase CFD Closure Models for Horizontal Bubbly Two-phase Flow. *Transactions of the American Nuclear Society, 2023 Annual Meeting*. Indianapolis, Indiana, USA.

Dix, A., Quan, Z., & Kim, S., (2022). "Evaluation of Pressure Drop Models for 7-Pin Wire-wrapped Rod Bundles," *Transactions of the American Nuclear Society, 2022 Winter Meeting*. Phoenix, Arizona, USA.

Kong, R., Quan, Z., **Dix, A.**, Kim, S., Ishii, M., & Farmer, M. (2022). "Scaling of the Sodium Cartridge Loop in Versatile Test Reactor," *The 19th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-19)*. Brussels, Belgium (Online).

Quan, Z., Kong, R., **Dix, A.**, Kim, S., Ishii, M., & Farmer, M. (2022). "CFD Simulations of the Versatile Test Reactor Sodium Cartridge Loop and Scaled Water Loop," *The 19th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-19)*. Brussels, Belgium (Online).

Ryan, D., Kong, R., Kang, D., **Dix, A.**, Bian, J., & Kim, S. (2022). "Effects of Pipe Inclination on Global Two-phase Flow Parameters," *The 19th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-19)*. Brussels, Belgium (Online).

Ryan, D., Kong, R., Kang, D., **Dix, A.**, & Kim, S. (2022). "Effects of Pipe Inclination on Local Two-phase Flow Parameters," *The 19th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-19)*. Brussels, Belgium (Online).

Dix, A., O'Grady, D., Brunett, A., & Farmer M. (2020). "CARLITA Code Benchmarking with SAM for LBE Natural Circulation Flow," *Transactions of the American Nuclear Society, 2020 Winter Meeting*, 123, 1, 1651-1653. https://dx.doi.org/10.13182/T123-33348.

Bucknor, M. Brunett, A., Jerden, J., Grabaskas, D., O'Grady, D., & **Dix, A** (2020). "Development of Integrated Mechanistic Source Term Assessment Software for Liquid Metal Reactors," *Transactions of the American Nuclear Society, 2020 Virtual Conference*, 122, 1, 1651-1653. https://dx.doi.org/10.13182/T122-32339.

Quan, Z., Kong, R., **Dix, A.**, Kim, S., Ishii, M., & Farmer, M. (2020). "CFD Simulations of the Sodium Cartridge Loop of the Versatile Test Reactor," *Transactions of the American Nuclear Society, 2020 Winter Meeting*, 123, 1, 1798-1800. https://dx.doi.org/10.13182/T123-33176.

Reports

Kim, S., Ishii, M., Kong, R., Quan, Z., & **Dix, A.**, (2021) "Final Report on the Experimental Study and CFD Design Tool Development for the Sodium Cartridge Loop in the Versatile Test Reactor," Purdue University, West Lafayette, IN, PU/NE-21-04.

Ishii, M., Kim, S., Kong, R., Quan, Z., & **Dix, A.,** (2021) "Design Report of the Scaled Test Facility for Hydrodynamic Similarity to the Versatile Test Reactor Sodium Cartridge Loop," Purdue University, West Lafayette, IN, PU/NE-19-04.

Dix, A., Bucknor, M. Brunett, A., Jerden, J., Grabaskas, D., O'Grady, D., (2019) "Liquid Metal Reactor Mechanistic Source Term Analysis Toolkit User's Guide," Argonne National Laboratory, ANL/NSE-20/1.

Fanning, T. H., Brunett, A. J., **Dix, A.**, Gonzalez, E., Knecht, K., Subrick, J., & Wallace, E. (2018). "Status of SAS4A/SASSYS Code Developments (FY2018)," Argonne National Laboratory, ANL-ART-159. https://doi.org/10.2172/1483841.