

Elliott D. Biondo, Ph.D.

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Education

University of Wisconsin **Madison, WI**
Ph.D., Nuclear Engineering and Engineering Physics *Aug. 2016*

University of Wisconsin **Madison, WI**
M.S., Nuclear Engineering and Engineering Physics *May 2013*

University of Minnesota **Minneapolis, MN**
B.ChE., Chemical Engineering; B.S., Chemistry *May 2011*

Experience

Oak Ridge National Laboratory **Oak Ridge, TN**
R&D Associate Staff | HPC Methods for Nuclear Applications Group *2019–present*

Postdoctoral Research Associate | High Performance Computing Methods & Applications Team *2016–2019*

- Added support for on-the-fly Doppler broadening to **Shift** as a component of the ExaSMR project, with CPU and GPU implementations
- Added support for Cartesian mesh surface tallies to **Shift** to facilitate coupling with nodal codes
- Explored the use of Singular Value Decomposition (SVD) to compress variance reduction parameters in **Shift**
- Assessed the efficacy of Sourcerer fission source convergence technique implemented in **Shift**

University of Wisconsin **Madison, WI**
Nuclear Regulatory Commission Graduate Fellow | Computational Nuclear Engineering Research Group *2011–2016*

- Dissertation: “Hybrid Monte Carlo/Deterministic Neutron Transport for Shutdown Dose Rate Analysis”
- Methods development, computational implementation, and nuclear systems analysis with a focus on radiation transport, CAD geometry, and neutron activation
- 15,000+ lines of code/tests/documentation added to the Python for Nuclear Engineering open source toolkit

Oak Ridge National Laboratory **Oak Ridge, TN**
Graduate Student Intern | Radiation Transport Group *Summer 2014*

- Added CAD geometry support to the ADVANTG Monte Carlo variance reduction parameter generator code

Polar Semiconductor Inc. **Bloomington, MN**
Process Engineering Intern | Manufacturing Group *Summer 2010*

- Collected/analyzed scanning electron microscope data to improve QA processes for silicon wafer production

University of Minnesota **Minneapolis, MN**
Undergraduate Research Assistant II | Dept. of Chemistry *2009–2010*

- Synthesized and characterized novel heterocyclic organic compounds with potential tuberculostatic activity

Naval Surface Warfare Center **West Bethesda, MD**
Battery Research Intern | Power & Protective Systems Branch *Summers of 2005 & 2006*

- Conducted safety and performance tests of Li-ion batteries for use in an unmanned underwater vehicle

Skills

- Extensive experience developing UNIX-based, scientific software on a collaborative team
- Expert in C/C++, Python (including NumPy, Matplotlib), MATLAB, familiarity with Fortran
- Experience with parallel programming with CUDA, OpenMP, and MPI
- Experience with industry-standard software development tools including **git**, **cmake**, **gdb**, and **gprof**
- Graduate-level coursework in mathematics, including linear algebra, differential equations, complex analysis, and numerical methods

Funded Proposals

ORNL Seed Proposal **\$190K**
Principle Investigator *2021–2023*

“Layered Geometry for Flexible Monte Carlo Radiation Transport”

Refereed Journal Articles

1. **E. Biondo**, T. Evans, G. Davidson, S. Hamilton, “Singular Value Decomposition of Adjoint Flux Distributions for Monte Carlo Variance Reduction”, *Annals of Nuclear Energy*, Vol. 141, pp. 107327, 2020.
2. **E. Biondo**, G. Davidson, T. Pandya, S. Hamilton, T. Evans, “Deterministically Estimated Fission Source Distributions for Monte Carlo k -Eigenvalue Problems”, *Annals of Nuclear Energy*, Vol. 119, pp. 7–22, 2018.
3. **E. Biondo**, P. Wilson, “Transmutation Approximations for the Application of Hybrid Monte Carlo/Deterministic Neutron Transport to Shutdown Dose Rate Analysis”, *Nuclear Science and Engineering*, Vol. 187, Issue 1, pp. 27–48, 2017.
4. **E. Biondo**, A. Davis, P. Wilson, “Shutdown Dose Rate Analysis with CAD Geometry, Cartesian/Tetrahedral Mesh, and Advanced Variance Reduction”, *Fusion Engineering and Design*, Vol. 106, pp. 77–84, 2016.
5. S. Hamilton, T. Evans, K. Royston, **E. Biondo**, “Domain decomposition in the GPU-accelerated Shift Monte Carlo code”, *Annals of Nuclear Energy*, Submitted 5/2021.
6. D. Peplow, G. Davidson, C. Celik, **E. Biondo**, A. Hackett, W. Ray, D. Archer, J. Ghawaly, A. Nicholson, M. Willis, B. Quiter, M. Bandstra, R. Meyer, C. Chow, I. Stewart, J. Johnson, “Monte Carlo Simulation of Background and Source Measurements with CSG and CAD Geometries”, *Nuclear Technology*, Submitted 2/2021.

Full-Length Topical Papers

1. **E. Biondo**, V. Sobes, A. Holcomb, S. Hamilton, T. Evans, “Algorithm for Free Gas Elastic Scattering without Rejection Sampling”, *ANS M&C 2021 - The International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering*, Raleigh, North Carolina, 2021.
2. **E. Biondo**, P. Wilson, “Application of the Multi-Step CADIS Method to Fusion Energy Systems Analysis”, *International Conference on Mathematics & Computational Methods Applied to Nuclear Science & Engineering*, Jeju, South Korea, 2017.
3. **E. Biondo**, A. Ibrahim, S. Mosher, R. Grove, “Accelerating Fusion Reactor Neutronics Modeling by Automatic Coupling of Hybrid Monte Carlo/Deterministic Transport on CAD Geometry”, *Joint International Conference on Mathematics and Computation (M&C), Supercomputing in Nuclear Applications (SNA) and the Monte Carlo (MC) Method (ANS MC2015)*, Nashville, TN, 2015.
4. E. Relson, P. Wilson, **E. Biondo**, “Improved Mesh Based Photon Sampling Techniques for Neutron Activation Analysis”, *International Conference of Mathematics and Computational Methods Applied to Nuclear Science and Engineering (M&C 2013)*, Sun Valley, ID, 2013.
5. B. Ade, G. Davidson, K. Bekar, and **E. Biondo** “Integration of Shift Monte Carlo Framework into SCALE for Criticality Safety, Depletion, and Few-Group Cross Section Generation”, *PHYSOR 2018: Reactor Physics paving the way towards more efficient systems*, Cancun, Mexico, 2018.

Conference Summaries

1. **E. Biondo**, A. Davis, A. Scopatz, P. Wilson, “Rigorous Two-Step Activation for Fusion Systems with PyNE,” *Proc. of the 18th Topical Meeting of the Radiation Protection & Shielding Division of ANS*, 2014.
2. **E. Biondo**, E. Relson, A. Davis, P. Wilson, “Implementation, Benchmarking, and Application of R2S-ACT: an Open-Source, Mesh-Based, Rigorous 2-Step Activation Workflow,” *Transactions of the American Nuclear Society*, Vol. 109, pp. 1180-1183, 2013.
3. **E. Biondo**, A. Scopatz, M. Gidden, R. Slaybaugh, C. Bates, P. P.H. Wilson, “Quality Assurance within the PyNE Open Source Toolkit,” *Transactions of the American Nuclear Society*, Vol. 111, 2014.
4. C. Bates, **E. Biondo**, K. Huff, K. Kiesling, A. Scopatz, “PyNE Progress Report,” *Transactions of the American Nuclear Society*, Vol. 111, 2014.
5. A. Scopatz, **E. Biondo**, C. Brachem, J. Xia, P. Wilson, “PyNE Progress Report,” *Transactions of the American*

Technical Reports

1. S. Johnson, T. Evans, G. Davidson, S. Hamilton, T. Pandya, K. Royston, and **E. Biondo**, "Omnibus User Manual," Technical Report ORNL/TM-2018/1073, Oak Ridge National Laboratory, Oak Ridge, TN, 2020
2. **E. Biondo**, G. Davidson, T. Evans, "Monte Carlo Fission Source Convergence Acceleration with Deterministically Estimated Fission Source Distributions," Technical Report ORNL/SR-2017/101, Oak Ridge National Laboratory, Oak Ridge, TN, 2017.
3. **E. Biondo**, "Hybrid Monte Carlo Variance Reduction with CAD Geometry for Fusion Energy Systems," Technical Report RNSD-TN-14-002, Oak Ridge National Laboratory, Oak Ridge, TN, 2014.
4. G. Davidson, S. Bhatt, M. Swinney, **E. Biondo**, J. Salcedo Perez, K. Banerjee, A. Perry, E. Asano, E. Gonzalez, B. Kiedrowski, "Initial Coupled Simulations of a Critical Dual-Purpose Canister in a Saturated Repository," Technical Report ORNL/SPR-2020/1723, Oak Ridge National Laboratory, Oak Ridge, TN, 2020.
5. B. Ade, K. Bekar, G. Davidson, **E. Biondo**, "Integration of the Shift Monte Carlo Framework into SCALE/TRITON and Addition of Few-Group Cross Section Tallies to Shift," Technical Report ORNL/SPR-2017/523, Oak Ridge National Laboratory, Oak Ridge, TN, 2017.
6. A. Davis, M. Sawan, P. Wilson, **E. Biondo**, A. Ibrahim, P. Shriwise, E. Marriott, "Report on the ITER CLITE Shutdown Dose Rate Calculations," Technical Report, US ITER, Oak Ridge, TN, 2016.
7. **E. Biondo**, "Multiplier and Driver Mesh-Based Rigorous 2-Step Activation Analysis," Technical Report, Shine Medical Technologies, Monona, WI, 2013.
8. **E. Biondo**, W. Noland, "Steps Toward the Synthesis of Diels-Alder Adducts of Vinylidene Bis-Heterocycles with Potential Biological Activity," Technical Report, University of Minnesota Department of Chemistry, Minneapolis, MN, 2009.
9. **E. Biondo**, J. Banner, "The Effects of Overcharge on the Performance and Safety of Lithium Ion Pouch Batteries," Technical Report, Caderock Division of the Naval Surface Warfare Center, West Bethesda, MD, 2006.
10. **E. Biondo**, J. Banner, D. Fuentevilla, "Environmental Performance Testing of Mark 141 Batteries," Technical Report, Caderock Division of the Naval Surface Warfare Center, West Bethesda, MD, 2005.

Awards

Graduate Fellowship , Nuclear Regulatory Commission, full tuition and \$26,000/year stipend	<i>2013–2016</i>
Best of RPSD 2014 , special session for top presenters at American Nuclear Society RPSD meeting	<i>Sept. 2014</i>
Student Paper Award , American Nuclear Society Winter 2013 Meeting, \$100 award	<i>Nov. 2013</i>
Chancellor's Opportunity Award , University of Wisconsin, \$5,000 award for new graduate students	<i>Aug. 2011</i>
National Gold Scholarship , University of Minnesota, in-state tuition for out-of-state residents	<i>2007–2011</i>

Professional Experience

Current Issues in Computational Methods—Roundtable "Advanced Computing Architectures for Production Nuclear Applications" <i>American Nuclear Society Winter Meeting</i> Washington, DC	Nov. 2019
Exnihilo Tutorial Session <i>20th Topical Meeting of the Radiation Protection & Shielding Division of ANS</i> Santa Fe, NM	Sept. 2018
Python for Nuclear Engineering (PyNE) Tutorial Session <i>American Nuclear Society Student Conference</i> Madison, WI	Mar. 2016

“DAGMC Tools for Nuclear Engineering Analysis” <i>Institute of Plasma Physics Chinese Academy of Sciences (ASIPP)</i> Hefei, China	Jan. 2016
Python for Nuclear Engineering (PyNE) Tutorial Session <i>Joint International Conference on Mathematics and Computation Supercomputing in Nuclear Applications and the Monte Carlo Method (ANS MC2015)</i> Nashville, TN	Apr. 2015
“LaTeX and Beamer” <i>The Hacker Within</i> Madison, WI	Mar. 2015
“Command-line Olympics” <i>The Hacker Within</i> Madison, WI	Feb. 2015
Python for Nuclear Engineering (PyNE) tutorial session <i>18th Topical Meeting of the Radiation Protection & Shielding Division of ANS</i> Knoxville, TN	Sept. 2014