# Elliott D. Biondo, Ph.D.

elliott.biondo@gmail.com | elliottbiondo.com | Knoxville, TN


## 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 | High Performance Computing Methods & Applications Team* — *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

**SHINE Medical Technologies** — **Monona, WI**
*Collaborator | University of Wisconsin* — *2011-2013*

- Conducted computational analysis of a medical isotope production reactor to estimate radiological dose rates

**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++11, 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

## Awards

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

## Refereed Journal Articles

**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, 2020.

**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.

**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.

**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.

## Full-Length Topical Papers

**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.

**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.

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.

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

**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.

**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.

**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.

C. Bates, **E. Biondo**, K. Huff, K. Kiesling, A. Scopatz, "PyNE Progress Report," *Transactions of the American Nuclear Society*, Vol. 111, 2014.

A. Scopatz, **E. Biondo**, C. Brachem, J. Xia, P. Wilson, "PyNE Progress Report," *Transactions of the American Nuclear Society*, Vol. 109, pp. 1206-1208, 2013.

## Technical Reports

**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.

**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.

**E. Biondo**, "Multiplier and Driver Mesh-Based Rigorous 2-Step Activation Analysis," Technical Report, Shine Medical Technologies, Monona, WI, 2013.

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.

**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.

**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.

**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.

## Professional Experience

Current Issues in Computational Methods—-Roundtable — Nov. 2019
"Advanced Computing Architectures for Production Nuclear Applications"
*American Nuclear Society Winter Meeting*
Washington, DC

Exnihilo Tutorial Session — Sept. 2018
*20th Topical Meeting of the Radiation Protection & Shielding Division of ANS*
Santa Fe, NM

Exnihilo Tutorial Session — Sept. 2018
*20th Topical Meeting of the Radiation Protection & Shielding Division of ANS*
Santa Fe, NM

Python for Nuclear Engineering (PyNE) Tutorial Session — Mar. 2016
*American Nuclear Society Student Conference*
Madison, WI

"DAGMC Tools for Nuclear Engineering Analysis" — Jan. 2016
*Institute of Plasma Physics Chinese Academy of Sciences (ASIPP)*
Hefei, China

Python for Nuclear Engineering (PyNE) Tutorial Session — Apr. 2015
*Joint International Conference on Mathematics and Computation Supercomputing in Nuclear Applications and the Monte Carlo Method (ANS MC2015)*
Nashville, TN

"LaTeX and Beamer" — Mar. 2015
*The Hacker Within*
Madison, WI

"Command-line Olympics" — Feb. 2015
*The Hacker Within*
Madison, WI

Python for Nuclear Engineering (PyNE) tutorial session — Sept. 2014
*18th Topical Meeting of the Radiation Protection & Shielding Division of ANS*
Knoxville, TN

## Leadership Experience

**UMN American Institute of Chemical Engineers** — 2010–2011
*Co-President*
Organized various professional and social events in order to expose students to topics in chemical engineering, connect

students with potential employers, and encourage camaraderie.

**UMN American Institute of Chemical Engineers** 2009–2010
*Leader of Chem-E-Car Team*
Lead a team of students with the task of designing, building, and calibrating a small scale car powered by a chemical reaction for regional and national competition.