

# RACHEL N. SLAYBAUGH

slaybaugh@berkeley.edu ◊ (570) · 850 · 3385

Department of Nuclear Engineering ◊ University of California, Berkeley  
4173 Etcheverry Hall MC 1730 ◊ Berkeley, CA 94720

## EDUCATION

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Ph.D.	<b>University of Wisconsin–Madison</b> Nuclear Engineering and Engineering Physics, with a certificate in Energy Analysis and Policy	2011
M.S.	<b>University of Wisconsin–Madison</b> Nuclear Engineering and Engineering Physics	2008
B.S.	<b>Pennsylvania State University</b> Nuclear Engineering	2006

## RESEARCH EXPERIENCE

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<b>University of California, Berkeley</b> <i>Assistant Professor of Nuclear Engineering</i>	Jan. 2014 - Present <i>Berkeley, CA</i>
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- Researching numerical methods for neutral particle transport with an emphasis on supercomputing and advanced architectures
- Specialization in deterministic, Monte Carlo, and Hybrid methods
- Applications in reactor design, shielding, and nuclear security and nonproliferation
- Design Emphasis in Computational Science and Engineering Affiliated Faculty member
- Applied Science & Technology Faculty member

<b>Advanced Research Projects Agency – Energy</b> <i>Program Director</i>	Oct. 2017 – present <i>Washington, DC</i>
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- Program creation and management
- Director for MEITNER Program, supporting research for enabling technologies for advanced nuclear fission reactors
- Director for TERRA and ROOTS Programs, supporting research for sensing and data analytics for above- and below-ground plant outcomes
- Director for FOCUS Program, supporting research for solar technologies that combine photovoltaic and concentrated solar power technologies

<b>Bettis Laboratory</b> <i>Senior Engineer in the Shield Design and Development group</i>	Mar. 2012 - Aug. 2014 <i>West Mifflin, PA</i>
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- Implemented the Forward-Weighted Consistent Adjoint Driven Importance Sampling (FW-CADIS) method for variance reduction in Monte Carlo; accredited method for use in shield design
- Developed new Resonance Factor variance reduction method for streaming through materials with space and energy self-shielding
- Built two software tools in support of using FW-CADIS for shield design
- Scientific Software Development Committee: leader in developing internal website for sharing software carpentry tools and resources

<b>University of Wisconsin–Madison</b> <i>Research Assistant / Rickover Fellow</i>	Sept. 2006 - Nov. 2011 <i>Madison, WI</i>
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- Researched “Acceleration Methods for Massively Parallel Deterministic Transport”: added parallelization in the energy domain, an advanced eigenvalue solver, and a new multigrid in energy preconditioner to Denovo, developed at Oak Ridge National Lab
- Developed two Monte Carlo source sampling methods for arbitrarily shaped plasma sources; the sources are generated directly from plasma physics data

### **Forschungszentrum Karlsruhe (KIT)**

*Visiting Researcher*

May 2008 - Dec. 2008

*Karlsruhe, Germany*

- Learned about the Rigorous 2 Step method for Monte Carlo geometry conversion while working in the Reactor Safety group
- Helped group incorporate the Direct Accelerated Geometry Monte Carlo (DAGMC) library into MCNP workflow

### **Penn State Breazeale Reactor**

*Reactor Operator*

Aug. 2003 - Apr. 2006

*University Park, PA*

- NRC licensed Reactor Operator for TRIGA Mark III reactor
- Analyzed core burn-up anomaly; calibrated gamma irradiation facilities

## **TEACHING EXPERIENCE**

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### **University of California, Berkeley**

*Assistant Professor of Nuclear Engineering*

Jan. 2014 - Present

*Berkeley, CA*

- Founder Nuclear Innovation Bootcamp, summers 2016, 2017, and 2018
- NE 255, Numerical Simulations for Radiation Transport (graduate-level)
- NE 250, Nuclear Reactor Theory (graduate-level)
- NE 155, Introduction to Numerical Simulations for Radiation Transport (senior-level elective)
- NE 198, Faculty sponsor for class in which Berkeley students do hands-on science experiments with students in under-served elementary schools in Oakland
- NE 24, Putting the Science in Computational Science (Freshman seminar)

### **Software Carpentry Scientific Computing Workshops**

*Instructor*

- Jan. 14-15, 2016: git; Berkeley Institute for Data Science
- July 16, 2015: shell; École Polytechnique Fédérale Lausanne
- July 1-2, 2015: shell and Python; for underrepresented minority students; UC, Berkeley
- June 11, 2015: Python; Oak Ridge National Laboratory
- Jan. 5-6, 2015: version control; for women only; University of Colorado, Boulder
- Apr. 14-15, 2014: introductory material, version control, object oriented concepts in Python; for women only; Lawrence Berkeley National Laboratory

### **Bettis Laboratory**

*Senior Engineer in the Shield Design and Development group*

Mar. 2012 - Aug. 2014

*West Mifflin, PA*

- Qualified instructor for Bettis Reactor Engineering School (BRES), an internal school for new DOE-Naval Reactors employees
- Co-taught BRES Shielding course Fall 2012, 2013, and Spring 2013

### **University of Pittsburgh**

*Adjunct Professor*

Fall 2012, Spring 2013

*Pittsburgh, PA*

- Co-taught Introduction to Nuclear Engineering (ENGR 1700), which covers theory / basic nuclear engineering, basics of nuclear power reactors, and nuclear power reactor operations
- Co-taught *new* course Nuclear Chemistry and Radiochemistry (ENGR 2112): responsible for nuclear astrophysics and migration of radionuclides through the environment

## SELECTED PRESENTATIONS

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- R.N. Slaybaugh. "Creating the Future of Nuclear Energy." CITRIS Research Exchange Seminar Series. Berkeley, CA. 28 Nov 2018. (invited)
- R.N. Slaybaugh. Panelist for "Ethics in Nuclear Engineering and Design ." American Nuclear Society. Orlando, FL. 13 Nov 2018. (invited)
- R.N. Slaybaugh. "U.S. Nuclear Innovation System." Commercialisation of Small Nuclear in the UK. Coventry, UK. 6 Nov 2018. (invited)
- R.N. Slaybaugh. "MEITNER: The Newest ARPA-E Program." NASA iTech. New York, NY. 14 June 2018. (invited)
- R.N. Slaybaugh. "Deep decarbonization: financing the rapid deployment of innovations after R&D." 2050 Today Panel. San Francisco, CA. 15 June 2018. (invited)
- R.N. Slaybaugh. "Discussion of Future Technology Development." Nuclear R&D Summit Panel. Washington, DC. 7 Mar. 2018. (invited)
- R.N. Slaybaugh. "Advanced Solver for Radiation Transport." North Carolina State University Dept. Graduate Colloquium. Raleigh, NC. 1 Feb. 2018. (invited)
- R.N. Slaybaugh. "Advanced Solver for Radiation Transport." University of Illinois Urbana Champaign NPPE Dept. Graduate Colloquium. Champaign, IL. 5 Dec. 2017. (invited)
- R.N. Slaybaugh. "Commercialization of Nuclear Fusion Summit" Moderator, Nuclear Fusion: Reacting To Commercialization by VLAB. Palo Alto, CA. 14 Nov. 2017. (invited)
- R.N. Slaybaugh. "Nuclear Energy: What Can Analytics Do for Economics and Safety?" Keynote Speaker, Industrial Machine Learning Workshop 17. San Francisco, CA. 24 Oct. 2017. (invited)
- R.N. Slaybaugh. "Alternative energy, nuclear and CCS: What are the prospects?" Panelist, Low-Emissions Solution Conference at the 5th International Conference on Sustainable Development. New York, NY. 21 Sept. 2017. (invited)
- R.N. Slaybaugh. "The Case for Nuclear: Communications and Analyzing Risks and Benefits" Panelist, Aspen Institute Future of Nuclear Energy Roundtable. Aspen, CO. 12 Sept. 2017. (invited)
- R.N. Slaybaugh. "Advanced Solvers and Innovation for Penetrating Radiation" Keynote Speaker, SPIE Penetrating Radiation Technical Event. San Diego, CA. 8 Aug. 2017. (invited)
- R.N. Slaybaugh. "Challenges & Opportunities in Developing an Innovation Culture in Nuclear." Second Annual Third Way Advanced Nuclear Summit Panel. Washington, DC. 21 Feb. 2017. (invited)
- R.N. Slaybaugh. "Advancing Reactors with Advanced Solvers and Innovative Programs." Electric Power Research Institute. Research Meeting. Palo Alto, CA. 13 Feb 2017. (invited)
- R.N. Slaybaugh. "Exploring the Advanced Nuclear Ecosystem." SxSW Eco Panel. Austin, TX. 12 Oct. 2016. (invited)
- R.N. Slaybaugh. "Nuclear Innovation: Concept to Execution." PHYSOR 2016. Sun Valley, ID. 2 May 2016. (invited)
- R.N. Slaybaugh. "The Opportunity of Global Nuclear Innovation." 49th Japan Atomic Industrial Forum (JAIF) Annual Conference. Tokyo, Japan. 12 April 2016. (invited)

- R.N. Slaybaugh. “Exascaling Nuclear Innovation.” Keynote speaker, Conference on Data Analysis 2016. Santa Fe, NM. 4 March 2016. (invited)
- R.N. Slaybaugh. “Exascaling Nuclear Innovation.” BIDS Distinguished Lecture Series. 19 Feb. 2016. (invited)
- R.N. Slaybaugh. “Lets Get Real: When can we expect commercial advanced reactors?.” The Advanced Nuclear Summit and Showcase Panel. Washington, DC. 27 Jan. 2016. (invited)
- R.N. Slaybaugh. “Hybrid Transport Methods for Shielding Challenges.” Idaho National Laboratory seminar. Idaho Falls, ID. 20 Nov. 2015. (invited)
- K.L. Rowland, R.N. Slaybaugh. “Developments in the GPU-accelerated WARP Monte Carlo Neutron Transport Code.” Workshop sur l’utilisation des accélérateurs (GPUs, MICs) pour les simulations Monte-Carlo. École Polytechnique, Saclay, France. 10 July 2015.
- R.N. Slaybaugh. “Hybrid Methods for Shielding Challenges: Self-Shielding and Strong Anisotropies.” Colorado School of Mines NSE Program Graduate Colloquium. Golden, Colorado. 7 Jan. 2015. (invited)
- R.N. Slaybaugh. “PyNE and Nuclear Data: A Next Generation Tool.” Sather Next Generation Nuclear Science Meeting. Lawrence Berkeley National Laboratory. 9 Dec. 2014. (invited)
- R.N. Slaybaugh. “The PyNE Software Library: A Framework for ENSDF?” Nuclear Data Week Meeting. Brookhaven National Laboratory. 6 Nov. 2014.
- R.N. Slaybaugh. “The Resonance Factor Method: Accelerating Monte Carlo in the Presence of Space and Energy Self-Shielding.” CEA-Saclay Colloquium. Saclay, France. 26 June 2014.
- R.N. Slaybaugh, T.M. Evans, P.P.H. Wilson, S.C. Wilson. “Radiation Transport: Computational Methods and Real-World Use.” NC State Univ. NE Dept. Graduate Colloquium. Raleigh, NC. 8 Nov. 2012. (invited)
- R. Slaybaugh, M. Arbidze, S. Lamichhane, D. O’Connor. “An Evaluation of European Union Energy Policies.” UW–Madison Center for World Affairs and the Global Economy Seminar. Madison, WI. 11 May 2011.
- R.N. Slaybaugh. “Krylov Methods and JFNK.” UW—Madison Radiation Hydrodynamics Meeting. Madison, WI. 16 Dec. 2010. (invited)
- R.N. Slaybaugh, T.M. Evans, G.G. Davidson. “Parallel Algorithms for Fixed-Source and Eigenvalue Problems.” 2010 SIAM Annual Meeting. Pittsburgh, PA. 12-16 July 2010.
- R.N. Slaybaugh. “MC21—Jaguar Coupling for Variance Reduction.” KAPL Physics Forum. Niskayuna, NY. July 2009.

## COMPUTER SKILLS

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<b>Languages</b>	C++, Python, Fortran 90/95/2003
<b>Versioning and Testing</b>	git, svn, cvs, CTest, GoogleTest, nose, TravisCI
<b>Tools</b>	EC2, Doxygen, L <sup>A</sup> T <sub>E</sub> X, MathCAD, Mathematica, shell, vim, bash, Emacs, Jupyter, Trilinos, LAPACK, MPI, Valgrind, cmake
<b>Nuclear Software</b>	Exnihilo, ADVANTG, MCNP, Serpent, SCALE, PyNE, MOOSE

## HONORS AND AWARDS

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American Nuclear Society (ANS) Young Member Excellence Award	2014
ANS Presidential Citation	2014
Rickover Fellowship	2008-2011
Second Place, 2011 ANS Winter Meeting Poster Session	2011
Selected participant, Modeling Experimentation and Validation Reactor Physics School	Jul. 2011
Selected participant, Energy Hub conference Poster Session	2011
Everitt P. Blizard Memorial Scholarship, ANS	2010-2011
ANS Mathematics and Computation Division Best Summary + Presentation Award	Nov. 2010
Graduate Scholarship, ANS	2009-2010
Selected participant, Lindau Meeting of Nobel Laureates in Physics	2008
Second Place, 2007 ANS Winter Meeting Poster Session	Nov. 2007
Best Paper, Health Physics Track, 2007 ANS Student Conference	2007
Tau Beta Pi Honor Society	2006
Alpha Nu Sigma Honor Society	2005

## PROFESSIONAL SERVICE

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*Nuclear Innovation Alliance*, Advisory Committee, 2018-present

*Nuclear Energy Advisory Committee*, Appointed Member, 2016-2017

*Special Government Employee*, Advanced Research Projects Agency Energy, 01/2017-10/2017

*Senior Fellow* of the Breakthrough Institute, 2017-present

*American Nuclear Society*, National Level

Math and Comp. Division	Chair Rotation 2016-2019; Exec. Comm. 2013-2016
Rad. Protection and Shielding Div.	Exec. Comm. 2015-2018
Young Members Group	Exec. Comm. 2014-2017
NEED Comm.	Chair 2013-2015, Vice Chair 2010-2013
Professional Divisions Comm.	Vice Chair 2012-2016
Student Sections Comm.	Chair 2010-2013, Vice Chair 2009-2010
Professional Women in ANS	Chair 2008-2010, Vice Chair 2006-2008
Board of Directors	Student Member 2007-2009
Other committee service	Membership, Bylaws and Rules, Public Info., 2013 Nominating Comm., 2014 Special Selection Comm. for Nominating Comm. Candidates

### *Software and Computing*

Berkeley Institute for Data Science ( <a href="http://bids.berkeley.edu/">http://bids.berkeley.edu/</a> )	Senior Fellow; Advisory Board Member
The Hacker Within, UCB and UW ( <a href="http://thehackerwithin.github.io/berkeley/">http://thehackerwithin.github.io/berkeley/</a> )	Faculty Advisor 2014-present; Co-founder 2009
Berkeley Research Computing ( <a href="http://research-it.berkeley.edu/programs/berkeley-research-computing">http://research-it.berkeley.edu/programs/berkeley-research-computing</a> )	User Advisory Group 2016-present
Python for Nuclear Engineering ( <a href="http://pyne.io/">http://pyne.io/</a> )	Contributor
Software Carpentry ( <a href="http://software-carpentry.org/">http://software-carpentry.org/</a> )	Instructor since 2013
Data Carpentry ( <a href="http://www.datacarpentry.org/">http://www.datacarpentry.org/</a> )	Instructor since 2016
Berkeley Computing and Computer Science	2014-present

## Education Committee

### *Energy and Science*

SIAM	Member 2009-present
Berkeley Energy and Resources Collaborative (BERC)	Advisory Board Member 2017-present
UCB-ANS	Faculty Advisor 2014-present
Nuclear Engineering Student Delegation	Co-Vice Chair 2010, Selected participant 2009
UW-Energy Hub	Conference Speaker Chair 2009, Founding Member 2007, liaison to Collegiate Energy Association 2008-2010

## SELECTED PUBLICATIONS

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- Richard Vasques, Leonardo R. C Moraes, Ricardo C Barros, Rachel N Slaybaugh, “A Spectral Approach for Solving the Nonclassical Transport Equation.” *Journal Of Computational Physics*. (Submitted 2018)  
<http://arxiv.org/abs/1812.04811>
- Madicken Munk, Rachel Slaybaugh, “Review of Hybrid Methods for Deep-Penetration Neutron Transport.” *Nuclear Science and Engineering*. (Submitted 2018)
- James Bevins, Zachary Sweger, Ninad Munshi, Bethany Goldblum, Josh Brown, Darren Bleuel, Lee Bernstein, Rachel Slaybaugh. “Performance Evaluation of an Energy Tuning Assembly for Neutron Spectral Shaping.” *Inst. and Methods in Physics Research, A*. (Submitted 2018)
- Kelly L. Rowland, Cory D. Ahrens, Steven Hamilton, and R.N. Slaybaugh. “Assessment of the Lagrange Discrete Ordinates Equations for Monte Carlo Variance Reduction Parameter Generation.” *Nuclear Science and Engineering*. (Submitted 2018)  
<https://github.com/kellyrowland/ldo-mc-vr>
- J. S. Rehak, L. M. Kerby, M. D. DeHart, R. N. Slaybaugh. “Weighted Delta-Tracking with Scattering,” *Nuclear Engineering and Design*. **342** (2019) 231-239. <https://doi.org/10.1016/j.nucengdes.2018.12.006>  
<https://arxiv.org/abs/1802.02237>
- Kelly L. Rowland, Cory D. Ahrens, Steven Hamilton, and R.N. Slaybaugh. “Assessment of the Lagrange Discrete Ordinates Equations for Three-Dimensional Neutron Transport” *Nuclear Science and Engineering*. (Accepted 2018)  
<https://github.com/kellyrowland/ldo-deterministic>
- James E. Bevins, R.N. Slaybaugh. “Gnowee: A Metaheuristic Optimization Algorithm for Solving Engineering Problems Containing Continuous and Discrete Design Parameters.” *Nuclear Technology*. (Accepted 2018)  
<http://arxiv.org/abs/1804.05429>
- I. Makine, R. Vasques, R.N. Slaybaugh. “Exact Transport Representation of the Classical and Non-classical Simplified  $P_N$  Equations.” *Journal of Computational and Theoretical Transport*. (Accepted 2018).
- R.N. Slaybaugh, M. Ramirez-Zweiger, Tara Pandya, Steven Hamilton, T.M. Evans. “Eigenvalue Solvers for Modeling Nuclear Reactors on Leadership Class Machines,” *Nuclear Science and Engineering*. **190** (2017) 31-44.  
<https://arxiv.org/abs/1708.04928>
- Jeffery B. Greenblatt, Nicholas R. Brown, Rachel Slaybaugh, Theresa Wilks, Emma Stewart, and Sean T. McCoy. “The Future of Low-Carbon Electricity,” *Annual Review of Environment and Resources*.

42 (Nov 2017).

<http://www.annualreviews.org/doi/10.1146/annurev-environ-102016-061138>

- Ryan M. Bergmann, Kelly L. Rowland, Nikola Radnović, Rachel N. Slaybaugh, Jasmina L. Vujić. “Performance and Accuracy of Criticality Calculations Performed Using WARP, A Framework for Continuous Energy Monte Carlo Neutron Transport in General 3D Geometries on GPUs,” *Annals of Nuclear Energy*. **103** (2017) 334-349.
- Leah E. Morgan, Madicken Munk, Brett Davidheiser-Kroll, Nicholas H. Warner, Sanjeev Gupta, Rachel Slaybaugh, Patrick Harkness, Darren F. Mark. “Instrumentation development for planetary in situ  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology,” *Geostandards and Geoanalytical Research*. **41** 3 (2017) 381-396.
- R. Vasques and K. Krycki and R. N. Slaybaugh. “Nonclassical Particle Transport in 1-D Random Periodic Media,” *Nuclear Science and Engineering*. **185** (2017) 16-35.  
<https://arxiv.org/abs/1602.00825>
- S.C. Wilson and R.N. Slaybaugh. “Improved Monte Carlo Variance Reduction for Space and Energy Self-Shielding,” *Nuclear Science and Engineering*. **179** (2015) 22-41.  
<https://arxiv.org/abs/1502.04749>
- G.G. Davidson, T.M. Evans, J.J. Jarrell, S.P. Hamilton, T.M. Pandya, and R.N. Slaybaugh, “Massively Parallel, Three-Dimensional Transport Solutions for the k-Eigenvalue Problem,” *Nuclear Science and Engineering*. **177** (2014) 111-125.
- R.N. Slaybaugh, T.M. Evans, G.G. Davidson, and P.P.H. Wilson. “Multigrid in energy preconditioner for Krylov solvers,” *Journal of Computational Physics*. **242** (2013) 405-419.  
<https://arxiv.org/abs/1612.00907>
- T.M. Evans, A.S. Stafford, R.N. Slaybaugh, and K.T. Clarno. “Denovo—A new three-dimensional parallel discrete ordinates code in SCALE.” *Nuc. Tech.* **171** (2010) 171-200.
- R.N. Slaybaugh, P.P.H. Wilson, L.A. El-Guebaly, and E.P. Marriott. “Three-Dimensional Neutron Source Models for Toroidal Fusion Energy Systems.” *Fusion Engineering and Design*. **84** (2009) 1774-1778.

### Refereed Conference Proceedings

- M. I. Ortega, P. N. Brown, T. S. Bailey, and B. Chang, and R. N. Slaybaugh, “A Rayleigh Quotient Method for Criticality Eigenvalue Problems in Neutron Transport.” Proceedings of PHYTRA4 - The Fourth International Conference on Physics and Technology of Reactors and Applications in Marrakech, Morocco, September 17-19, 2018. (Accepted) [invited]
- James E. Bevins, Sandra Bogetic, Lee A. Bernstein, Rachel Slaybaugh, and Jasmina Vujić, “Meta-heuristic Optimization Method for Neutron Spectra Shaping.” Proceedings of the 2018 ANS June Meeting in Philadelphia, PA, June 2018. Transactions vol. 118.
- A.J. Novak, L. Zou, J.W. Peterson, R.C. Martineau, and R.N. Slaybaugh, “Pronghorn: A Porous Media Thermal-Hydraulics Core Simulator and its Validation with the SANA Experiments.” Proceedings of the International Congress on Advances in Nuclear Power Plants in Charlotte, NC, April 2018.
- A. Novak, P. Romano, B. Wendt, R. Rahaman, E. Merzari, L. Kerby, C. Permann, R. Martineau, and R.N. Slaybaugh. “Preliminary Coupling of OpenMC and Nek5000 Within The MOOSE Framework.” Proceedings of the PHYSOR 2018 Meeting in Cancun, Mexico, April 2018.
- Marissa Ramirez Zweiger, Weixiong Zheng, and R.N. Slaybaugh. “Two-Grid and Nonlinear Diffusion Acceleration Method for the Multigroup  $S_N$  Equations with Neutron Upscattering.” 25th International Conference on Transport Theory, Monterey, CA, 16-20 October 2017.

- M. I. Ortega, P.N. Brown, T. S. Bailey, R. N. Slaybaugh, and B. Chang. “A Rayleigh Quotient Method for Solving the Alpha-Eigenvalue Problem in Neutron Transport.” 25th International Conference on Transport Theory, Monterey, CA, 16-20 October 2017.
- M. Wrenninge, R. Vasques, R.N. Slaybaugh. “A Generalized Volume Rendering Approach for Computer Graphics.” 25th International Conference on Transport Theory, Monterey, CA, 16-20 October 2017.
- I. Makine, R. Vasques, and R.N. Slaybaugh. “Exact Transport Representations of the Classical and Nonclassical Simplified  $P_N$  Equations.” 25th International Conference on Transport Theory, Monterey, CA, 16-20 October 2017.
- J.S. Rehak, L.M. Kerby, M.D. DeHart, R.N. Slaybaugh, J. Leppänen. “Implementation of Weighted Delta-Tracking with Scattering in the Serpent 2 Monte Carlo Code.” Proceedings of the 2017 ANS June Meeting in San Francisco, CA, June 2017. Transactions vol. 116.
- Weixiong Zheng, Ryan McClarren, Rachel Slaybaugh. “A Continuous-Discontinuous Hybrid Finite Element Method for Solving Radiation Transport.” Proceedings of the 2017 ANS June Meeting in San Francisco, CA, June 2017. Transactions vol. 116.
- R. Vasques and R. N. Slaybaugh. “Simplified  $P_N$  Equations For Nonclassical Transport With Isotropic Scattering.” International Conference on Mathematics & Computational Methods Applied to Nuclear Science & Engineering, Jeju, South Korea, April 2017. [invited]  
<https://arxiv.org/abs/1610.04314>
- Kelly L. Rowland, Ryan M. Bergmann, Rachel N. Slaybaugh, Jasmina L. Vujić. “Delta-tracking in the GPU-accelerated WARP Monte Carlo Neutron Transport Code.” International Conference on Mathematics & Computational Methods Applied to Nuclear Science & Engineering, Jeju, South Korea, April 2017. [invited]
- Richard Vasques, Rachel Slaybaugh, Kai Krycki, “Nonclassical Particle Transport in the 1-D Diffusive Limit.” Proceedings of the 2016 ANS June Meeting in New Orleans, LA, June 2016. Transactions vol. 114.  
<https://arxiv.org/abs/1601.02495>
- M. Munk, R.N. Slaybaugh, Tara M. Pandya, Seth R. Johnson, T. M. Evans, “FW/CADIS- $\Omega$ : An Angle-Informed Hybrid Method for Deep-Penetration Radiation Transport.” Proceedings of the PHYSOR 2016 Meeting in Sun Valley, ID, May 2016.  
<https://arxiv.org/abs/1612.00793>
- J. Bevins, R. Slaybaugh, L. Bernstein, E. Henry, W. Dunlop, “Targeted Modification of Neutron Energy Spectra for National Security Applications.” Proceedings of the 2016 Hardened Electronics And Radiation Technology Technical Interchange Meeting in Monterey, CA, April 2016.
- J. Bevins, R. Slaybaugh, L. Bernstein, W. Dunlop, E. Henry, “Application of Metaheuristic Optimization Methods for Neutron Spectral Shaping Applications.” Proceedings of the Conference on Data Analysis 2016 in Santa Fe, NM, March 2016.
- K.L. Rowland, R.N. Slaybaugh, R.M. Bergmann, and J. Vujić, “Implementing delta-tracking in a GPU-accelerated Monte Carlo neutron transport,” Proceedings of Frontiers in Computational Physics: Energy Sciences in Zurich, Switzerland, June 2015.
- R.N. Slaybaugh, T.M. Evans, G.G. Davidson, and P.P.H. Wilson, “Rayleigh Quotient Iteration with a Multigrid in Energy Preconditioner for Massively Parallel Neutron Transport,” Proceedings of Joint International Conference on Mathematics and Computation, Supercomputing in Nuclear Applications, and the Monte Carlo Method in Nashville, TN, April 2015.  
<https://arxiv.org/abs/1702.02111>
- M. Munk, L. Morgan, R. Slaybaugh, B. Davidheiser-Kroll, K. van Bibber, and D. Mark, “Design and



Feasibility Study of a Compact Neutron Source for Extraterrestrial Geochronology Applications,” Proceedings of Joint International Conference on Mathematics and Computation, Supercomputing in Nuclear Applications, and the Monte Carlo Method in Nashville, TN, April 2015.

Elliott Biondo, Anthony Scopatz, Matthew Gidden, Rachel Slaybaugh, and Cameron Bates. “Quality Assurance within the PyNE Open Source Toolkit,” Proceedings of the 2014 ANS Winter Meeting in Anaheim, CA, November 2014. Transactions vol. 111.

Cameron Bates, Elliott Biondo, Kathryn Huff, and et al. “PyNE Progress Report,” Proceedings of the 2014 ANS Winter Meeting in Anaheim, CA, November 2014. Transactions vol. 111.

S.C. Wilson and R.N. Slaybaugh. “Monte Carlo Importances in the Presence of Space and Energy Self-Shielding,” Proceedings of the 2013 ANS Winter Meeting in Washington, DC, Nov 2013. Transactions vol. 109.

R.N. Slaybaugh and S.C. Wilson. “Deterministic Parameter Study for Fixed-Source Calculations Using FW-CADIS,” Proceedings of the 2013 ANS Annual Meeting in Atlanta, GA, June 2013. Transactions vol. 108.

R.N. Slaybaugh, T.M. Evans, G.G. Davidson, and P.P.H. Wilson. “Rayleigh Quotient Iteration in 3D, Deterministic Neutron Transport,” Proceedings of the PHYSOR 2012 Meeting in Knoxville, TN, April 2012.

P.J. Snuffer, R.N. Slaybaugh, and P.P.H. Wilson. “Criticality Benchmark Comparisons for DAGMC,” Proceedings of the 2011 ANS Annual Meeting in Hollywood, FL, June 2011. Transactions vol. 104.

G.G. Davidson, T.M. Evans, J.J. Jarrell, and R.N. Slaybaugh, “Massively Parallel, Three-Dimensional Transport Solutions for the k-Eigenvalue Problem,” Proceedings of the International Conferences on Mathematics and Computational Methods Applied to Nuclear Science and Engineering in Rio de Janeiro, RJ, Brazil, May 2011.

G.G. Davidson, T.M. Evans, R.N. Slaybaugh, and C.G. Baker. “Massively Parallel Solutions to the k-Eigenvalue Problem,” Proceedings of the 2010 ANS Winter Meeting in Las Vegas, NV, Nov 2010. Transactions vol. 103. [winner of Mathematics and Computation Division “Best Summary + Presentation” award]

T.M. Evans, G.G. Davidson, and R.N. Slaybaugh. “Three-Dimensional Full Core Power Calculations for Pressurized Water Reactors,” Proceedings of the 2010 Scientific Discovery through Advanced Computing (SciDAC) Conference. Chattanooga, TN, 11-15 July, 2010. Oak Ridge National Laboratory.

R.N. Slaybaugh, “Scouting Programs for Educational Outreach,” Proceedings of the 2009 ANS Winter Meeting in Washington, DC, Nov 2009. Transactions vol. 101.

R.N. Slaybaugh, E.P. Marriott, P.P.H. Wilson, and L. El-Guebal, “A Study of the Effects of Source Sampling Methods on ARIES-RS NWL Profiles,” Proceedings of the ARIES-Pathways Project Meeting, 28-29 May 2008, Madison WI.

R.N. Slaybaugh, M.L. Williams, D. Ilas, D.E. Peplow, B.L. Kirk, T.L. Nichols, Y.Y. Azmy, and M.P. Langer, “Radiation Treatment Planning Using Discrete Ordinates Codes,” Proceedings of the 2007 ANS Annual Meeting in Boston, MA, June 2007. Transactions vol. 96.

R. Slaybaugh. “Strengths and Weaknesses of Nuclear Engineering Education,” presented at 2007 ANS Annual Meeting in Boston, MA, June 2007. Transactions vol. 96.

## Technical Reports

David R. Farley, Mitch G. Negus, Rachel N. Slaybaugh. “Industrial Internet-of-Things & Data Analytics for Nuclear Power & Safeguards.” Sandia National Laboratories, SAND2018-12807, November 2018.

A.J. Novak, L. Zou, J.W. Peterson, D. Andrs, J. Kelly, R.N. Slaybaugh, R.C. Martineau, and H.D. Gougar. Pronghorn Theory Manual. Idaho National Laboratory, INL/EXT-18-44453, January 2018.

L. Bernstein, D. Brown, et al. “Nuclear Data Needs and Capabilities for Applications.” White Paper. Lawrence Berkeley National Laboratory, May 27-29 2015.  
<https://arxiv.org/abs/1511.07772>

### **Book Chapters**

Slaybaugh, Rachel. “Reproducible Computational Science on High Performance Computers.” *The Practice of Reproducible Research, Case Studies and Lessons from the Data-Intensive Sciences*, edited by Justin Kitzes, Daniel Turek, and Fatma Deniz, UC Press, 2017.  
<https://www.practicereproducibleresearch.org/case-studies/slaybaugh.html>

### **Other Works**

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