

# RACHEL N. SLAYBAUGH

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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 as well as data science
- 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

**University of Wisconsin–Madison***Research Assistant / Rickover Fellow*

Sept. 2006 - Nov. 2011

*Madison, WI*

- 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 250, Nuclear Reactor Theory (graduate-level): Fall 2015, 2017
- NE 255, Numerical Simulations for Radiation Transport (graduate-level): Fall 2016
- NE 155, Introduction to Numerical Simulations for Radiation Transport (senior-level elective): Spring 2014, 2015, 2016, 2017
- NE 198, Faculty sponsor for class in which Berkeley students do hands-on science experiments with students in under-served elementary schools in Oakland: each semester since Fall 2015
- NE 24, Putting the Science in Computational Science (Freshman seminar), Spring 2015, 2016, 2017

**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

- Co-taught Introduction to Nuclear Engineering (ENGR 1700), which covers theory / basic nuclear engineering, basics of nuclear power reactors, and nuclear power reactor operations Fall 2012
- Co-taught *new* course Nuclear Chemistry and Radiochemistry (ENGR 2112), responsible for nuclear astrophysics and migration of radionuclides through the environment Spring 2013

## SELECTED PRESENTATIONS

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- R.N. Slaybaugh. "Computing in Nuclear Engineering: Moving Beyond Today's Limitations." MIT Nuclear Science & Engineering Colloquium. Cambridge, MA. 29 April 2019.
- 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." 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. “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, T.M. Evans, G.G. Davidson. “Parallel Algorithms for Fixed-Source and Eigenvalue Problems.” 2010 SIAM Annual Meeting. Pittsburgh, PA. 12-16 July 2010.

## 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

## AWARDED FUNDING

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### Current

- Anomaly Detection in Proprietary Data using Multi-Party Computation  
 PI: Rachel Slaybaugh (University of California, Berkeley)  
 Agency: Sandia National Laboratory  
 Amount awarded: \$332,600  
 Period of performance: Oct 1 2018 – Sept 30, 2021

- Training the Next Generation of Nuclear Engineers: Graduate Fellowships at the University of California, Berkeley  
 PI: Massimiliano Fraton (University of California, Berkeley)  
 co-PI: Peter Hosemann, *Rachel Slaybaugh* (University of California, Berkeley)  
 Agency: Nuclear Regulatory Commission  
 Amount awarded: \$400,000  
 Period of performance: June 30, 2018 – June 29, 2022
- Methods for Process Monitoring to Accurately Detect and Quantify Material Holdup in Advanced Recycle Facilities  
 PI: Rachel Slaybaugh (University of California, Berkeley)  
 co-PIs: Per Peterson, Kai Vetter, Karl van Bibber (University of California, Berkeley)  
 Agency: Department of Energy, Office of Nuclear Energy  
 Amount awarded: \$800,000  
 Period of performance: Oct 1 2017 – Sept 30, 2020
- Department of Energy, Nuclear Science and Security Consortium (NSSC)  
 Lead PI: Jasmina Vujic (University of California, Berkeley)  
 co-PIs: Karl van Bibber, Kai Vetter, Barbara Jacak, Max Fraton, Lee Bernstein, *Rachel Slaybaugh*, Michael Nacht, Bethany Goldblum (University of California, Berkeley), Ken Czervinski (University of Nevada, Las Vegas), Michael Thoennessen (Michigan State University), Jason Hayward (University of Tennessee, Knoxville), Allison Macfarlane (George Washington University), Mani Tripathi (University of California, Davis), Mikael Nilsson (University of California, Irvine), Ralf Sudowe (University of Nevada, Las Vegas), Cody Folden (Texas A&M University)  
 Agency: Department of Energy, National Nuclear Security Administration  
 Amount awarded: \$25,000,000  
 Period of performance: 2016 – 2021
- Training the Next Generation of Nuclear Engineers: Graduate Fellowships at the University of California, Berkeley  
 PI: Peter Hosemann (University of California, Berkeley)  
 co-PI: Massimiliano Fraton, *Rachel Slaybaugh* (University of California, Berkeley)  
 Agency: Nuclear Regulatory Commission  
 Amount awarded: \$400,000  
 Period of performance: June 30, 2016 – June 29, 2020
- Nuclear Engineer Scholarships at the University of California, Berkeley to Support the Expansion and Diversity of the Undergraduate Program  
 PI: Massimiliano Fraton (University of California, Berkeley)  
 co-PI: Peter Hosemann, *Rachel Slaybaugh* (University of California, Berkeley)  
 Agency: Nuclear Regulatory Commission  
 Amount awarded: \$400,000  
 Period of performance: June 30, 2016 – June 29, 2019

## Completed

- Nuclear Engineering and Computational Methods  
 PI: Rachel Slaybaugh (University of California, Berkeley)  
 Agency: Lawrence Livermore National Laboratory  
 Amount awarded: \$8,728  
 Period of performance: Sept 8, 2016 – Sept 30, 2018
- Improved Hybrid Modeling of Used Fuel Storage Facilities  
 PI: Rachel Slaybaugh (University of California, Berkeley)  
 Collaborators: T. M. Evans, S. W. Mosher, and D. E. Peplow (Oak Ridge National Laboratory)  
 Agency: Department of Energy, Office of Nuclear Energy

Amount awarded: \$524,336

Period of performance: Jan 1 2015 – Dec 31, 2017

- MOOSE Application Collaboration Specifically Pronghorn and RELAP-7  
PI: Rachel Slaybaugh (University of California, Berkeley)  
Agency: Idaho National Laboratory  
Amount awarded: \$12,000  
Period of performance: Feb 1 2016 – Jan 31, 2017
- University of California, Berkeley Department of Nuclear Engineering Graduate Fellowship Program  
PI: Rachel Slaybaugh (University of California, Berkeley)  
co-PIs: Massimiliano Fratoni, Jasmina Vujic (University of California, Berkeley)  
Agency: Nuclear Regulatory Commission  
Amount awarded: \$400,000  
Period of performance: Aug 1 2014 – July 31, 2018
- Department of Energy, Nuclear Science and Security Consortium (NSSC)  
Lead PI: Jasmina Vujic (University of California, Berkeley)  
co-PIs: Micheal Nacht, Heino Nitsche, Rick Norman, *Rachel Slaybaugh*, and Kai Vetter (University of California, Berkeley), B. Sherrill (Michigan State University), M. Tripathi (University of California, Davis), G. Miller (University of California, Irvine), S. Shirk (UC/IGCC), K. Czerwinski (University of Nevada, Las Vegas), S. Lapi (Washington University of St. Louis)  
Agency: Department of Energy, National Nuclear Security Administration  
Amount awarded: \$26,500,000  
Period of performance: 2011 – 2016  
Role: Per Peterson was the original Nuclear Engineering co-PI; I replaced him when I started in 2014

## 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 and Data Carpentry ( <a href="http://software-carpentry.org/">http://software-carpentry.org/</a> )	Instructor since 2013
Berkeley Computing and Computer Science Education Committee	2014-present

### *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

## PUBLICATIONS

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Italicized names indicate my students or researchers

*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.” *Annals of Nuclear Energy*. (Submitted 2019)

<https://github.com/kellyrowland/ldo-mc-vr>

Nicholas J. Quartemont, *James E. Bevins*, Lee Bernstein, Rachel Slaybaugh. “Analysis of an Energy Tuning Assembly for Simulating Nuclear Weapon Environments at the National Ignition Facility.” *Journal of Radiation Effects*. (Submitted 2019)

*Marissa Ramirez de Chanlette*, *Weixiong Zheng*, R. N. Slaybaugh. “A Two-Grid and Nonlinear Diffusion Acceleration Method for the SN Equations with Neutron Upscattering.” *Journal of Computational Transport Theory*. (Submitted 2019)

*Mario Ortega*, Rachel N Slaybaugh, Peter N Brown, Teresa S Bailey, Britton Chang. “A Rayleigh Quotient Method for Criticality Eigenvalue Problems in Neutron Transport.” *Annals of Nuclear Energy*. (Submitted 2019)

*A. J. Novak*, J. W. Peterson, L. Zou, D. Andrš, R. N. Slaybaugh, R. C. Martineau, “Validation of Pronghorn Friction-Dominated Porous Media Thermal-Hydraulics Model with the SANA Experiments.” *Nuclear Engineering and Design*. (Accepted 2019)

*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*. (Accepted 2019)

<https://www.tandfonline.com/doi/full/10.1080/00295639.2019.1586273>

*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://arxiv.org/abs/1802.02237>

*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.” *Nuclear Inst. and Methods in Physics Research, A*. **923** (2019) 79-87.

<https://www.sciencedirect.com/science/article/pii/S0168900219300968>

*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*. **193** 3 (2019) 233-252.

<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*. **205** 4 (2019) 542-562.

<http://arxiv.org/abs/1804.05429>

*I. Makine*, *R. Vasques*, R.N. Slaybaugh. “Exact Transport Representation of the Classical and Nonclassical Simplified  $P_N$  Equations.” *Journal of Computational and Theoretical Transport*. **47** 4-6 (2018) 326-349.

<https://www.tandfonline.com/doi/abs/10.1080/23324309.2018.1496938>



- 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** (2017) 289-316.  
<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.  
<https://www.sciencedirect.com/science/article/pii/S0306454916309902>
- 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.  
<https://onlinelibrary.wiley.com/doi/full/10.1111/ggr.12170>
- R. Vasques, K. Krycki, R. N. Slaybaugh. "Nonclassical Particle Transport in One-Dimensional Random Periodic Media," *Nuclear Science and Engineering*. **185**:1 (2017) 78-106.  
<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**:1 (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**:2 (2014) 111-125.  
<https://www.tandfonline.com/doi/abs/10.13182/NSE12-101>
- 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**:2 (2010) 171-200.  
<https://www.tandfonline.com/doi/abs/10.13182/NT171-171>
- 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.  
<https://www.sciencedirect.com/science/article/pii/S0920379609000076>

## Refereed Conference Proceedings

- A.J. Novak, R.N. Slaybaugh, and R.C. Martineau. "Multiscale Core Thermal-Hydraulics Analysis of the Pebble Bed Fluoride-Salt-Cooled High-Temperature Reactor (PB-FHR)." Proceedings of the The International Conference on Mathematics and Computational Methods applied to Nuclear Science and Engineering in Portland, OR, Aug. 2019. (Accepted)
- R. Martineau, D. Andrs, R. Carlsen, D. Gaston, J. Hansel, F. Kong, C. Permann, E. Mezari, Rui Hu, A. Novak, R. Slaybaugh. "Multiphysics for Nuclear Energy Applications Using a Cohesive Computational Framework." 18th International Topical Meeting on Nuclear Reactor Thermal Hydraulics NURETH in Portland, OR, August 18-23, 2019. (Accepted)

- April Novak*, Josh Peterson, Ling Zou, Rachel Slaybaugh, Rich Martineau. “Porous Media Thermal Hydraulics Simulations of Pebble Bed Nuclear Reactors using Pronghorn.” SIAM Conference on Computational Science and Engineering in Spokane, WA, Feb 25–Mar 1, 2019. [invited]  
[https://meetings.siam.org/sess/dsp\\_programsess.cfm?SESSIONCODE=66138](https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=66138)
- Kelly L. Rowland*, Cory Ahrens, Steven Hamilton, Rachel Slaybaugh. “Assessment of the Lagrange Discrete Ordinates Equations for Three-dimensional Neutral Particle Transport.” 2019 SIAM Conference on Computational Science and Engineering in Spokane, WA, Feb 25–Mar 1, 2019. [invited]  
[https://meetings.siam.org/sess/dsp\\_talk.cfm?p=96180](https://meetings.siam.org/sess/dsp_talk.cfm?p=96180)
- April J. Novak*, Ling Zou, John W. Peterson, Richard C. Martineau, and Rachel N. Slaybaugh. “Pronghorn: Porous Media Thermal-Hydraulics for Reactor Applications.” Proceedings of the 2018 ANS Winter Meeting in Orlando, FL, Nov. 2018. Transactions vol. 119. [invited]
- 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. [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.
- 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.
- 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.
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