Selected Publications

Rachel N. Slaybaugh

March 11, 2021

Italicized names indicate my students or researchers

A. J. Novak, Sebastian Schunert, Robert Carlsen, Paolo Balestra, Rachel Slaybaugh, Richard Martineau. "Multiscale Thermal-Hydraulic Modeling of the Pebble Bed Fluoride-Salt-Cooled High-Temperature Reactor." *Annals of Nuclear Energy.* (submitted 2020)

A. J. Novak, R. W. Carlsen, S. Schunert, P. Balestra, R. N. Slaybaugh, and R. C. Martineau. "Pronghorn: A Multidimensional Coarse Mesh Application for Advanced Reactor Thermal-Hydraulics." *Nuclear Technology.* (accepted 2020)

R. Martineau, D. Andrs, R. Carlsen, D. Gaston, J. Hansel, F. Kong, A. Lindsay, C. Permann, A. Slaughter, E. Merzari, R. Hu, *A. Novak*, R. Slaybaugh. "Multiphysics for Nuclear Energy Applications Using a Cohesive Computational Framework." *Nuclear Engineering and Design/* **367** (2020) 1107512.
`https://doi.org/10.1016/j.nucengdes.2020.110751`
Best research award from ScienceDirect

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.* **350** (2019) 182-194.
`https://www.sciencedirect.com/science/article/pii/S0029549319301037`

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.* (Accepted 2020)

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.* **49** 1 (2020) 1-14.
`https://doi.org/10.1080/23324309.2019.1695631`

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.* **138** (2020) 107120.
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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.* **402** (2020) 109078.
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Madicken Munk, Rachel Slaybaugh, "Review of Hybrid Methods for Deep-Penetration Neutron Transport." *Nuclear Science and Engineering.* **193** 10 (2019) 1055-1089.
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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.
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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.
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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.
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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 $^{40}Ar/^{39}Ar$ geochronology," *Geostandards and Geoanalytical Research.* **41**:3 (2017) 381-396.
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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.
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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.
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Refereed Conference Proceedings

Grey Batie, *Vanessa Goss*, Laura Shi, Christopher Poresky, Lucian Mihalescu, Per Peterson, Rachel Slaybaugh, and Kai Vetter. "Fault Detection Methods To Accurately Detect And Quantify Holdup In Advanced Nuclear Material Recycle Facilities." Proceedings of Institute of Nuclear Materials Management 61st Annual Meeting in Baltimore, MD, July 2020.

Mitch Negus, Rachel Slaybaugh, and David Farley. "Garbled circuits for enabling privacy preserving safeguards." Proceedings of Institute of Nuclear Materials Management 61st Annual Meeting in Baltimore, MD, July 2020.

J. S. Rehak, R. N. Slaybaugh. "Assessing the Effectiveness of Acceleration Methods for Deterministic Neutron Transport Solvers." Proceedings of the 2020 ANS Annual Meeting in Pheonix, AZ (online), June 2020. Transactions vol. 122.

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." Proceedings of Joint International Conference on Supercomputing in Nuclear Applications + Monte Carlo 2020 in Tokyo, Japan, May 2020.

N. J. Quartemont, *J. E. Bevins*, R. Slaybaugh, and L. Bernstein, "Analysis of an Energy Tuning Assembly for Simulating Nuclear Weapon Environments at the National Ignition Facility." in Proceedings of the Hardened Electronics and Radiation Technology Conferencei in Melbourne, FL, Nov 2019. [winner Best Student Paper Award]

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.

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, Aug 18-23, 2019.

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]
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Nicholas J. Quartemont, James E. Bevins, Rachel Slaybaugh, Lee Bernstein. "Development of a Novel National Ignition Facility Platform for Simulating Nuclear Relevant Neutron Environments." IEEE Nuclear Science Symposium and Medical Imaging Conference in Sydney, Australia, Nov 2018.

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, Sept 17-19, 2018. [invited]

Sandra Bogetic, *James E. Bevins*, Lee A. Bernstein, Rachel Slaybaugh, and Jasmina Vujić. "Metaheuristic 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, Apr 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, Apr 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 Oct 2017.

M. I. Ortega, P.N. Brown, T. S. Bailey, R. N. Slaybaugh, and B. Chang. "A Raiyleigh Quotient Method for Solving the Alpha-Eignevalue Problem in Neutron Transport." 25th International Conference on Transport Theory, Monterey, CA, 16-20 Oct 2017.

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 Oct 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 Oct 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 Fansicso, CA, June 2017. Transactions vol. 116.

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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, Apr 2017. [invited]

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, Apr 2017. [invited]
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M. Munk, R.N. Slaybaugh, Tara M. Pandya, Seth R. Johnson, T. M. Evans, "FW/CADIS-Ω: 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`

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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, Apr 2015.
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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.

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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

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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.

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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.
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Book Chapters

Slaybaugh, Rachel; Lovering, Jessica; Baker, Suzanne. "How Innovative New Reactors Could Improve Public Acceptance." *Encyclopedia of Nuclear Energy*, edited by Andrew Kadak and Ehud Greenspan, Elsevier, 2021. (in typesetting)

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 : Software

Josh Rehak, Weixiong Zheng, Alexander Blank, Ramirez de Chanlette, R. N. Slaybaugh. BART. Software (released 2019)
`https://github.com/SlaybaughLab/BART`

James Bevins, *Youdong Zhang*, and Rachel Slaybaugh. "Coeus." Software. (released 2017) `https://github.com/SlaybaughLab/Coeus`

James Bevins, *Youdong Zhang*, and Rachel Slaybaugh. "Gnowee." Software. (released 2017) `https://github.com/SlaybaughLab/Gnowee`

Ryan M. Bergmann, *Kelly L. Rowland*, *Nikola Radnović*, Rachel N. Slaybaugh, Jasmina L. Vujić. "WARP." Software (released 2017) https://github.com/SlaybaughLab/warp

PyNE: The Nuclear Engineering Toolkit. Software. (periodic contributions 2014-2017) https://github.com/pyne/pyne

Other Works : Funding Opportunity Announcements

Rachel Slaybaugh, Joel Fetter, Curt Nehrkorn, Geoffrey Short. "Generating Electricity Managed by Intelligent Nuclear Assets (GEMINA)." Funding Opportunity No. DE-FOA-002174. (released Oct 2, 2019) https://arpa-e-foa.energy.gov/#FoaId4f8d5ac3-267d-4849-ad63-80f858761a74

Rachel Slaybaugh, Joel Fetter, Geoffrey Short. "Request for Information (RFI) on Intelligent Analytics, Algorithms, and Maintenance to Optimize Operations in Advanced Nuclear Reactors." Request for Information (RFI) DE-FOA-0002115. (released March 26, 2019) https://arpa-e-foa.energy.gov/#FoaIdad3db639-ff92-447b-8b59-cde43defa55a

Rachel Slaybaugh. "Leveraging Innovations Supporting nuclear Energy." Funding Opportunity No. DE-FOA-0001953, Initial Announcement. (released Dec 20, 2018) https://arpa-e-foa.energy.gov/#FoaIde8647d89-1cac-4b58-8622-1b04de8958c4

Rachel Slaybaugh, JC Zhao. "Modeling Enhance Innovations Trailblazing Nuclear Energy Reinvigoration (MEITNER)." Funding Opportunity No. DE-FOA-0001798. (released Oct 20, 2017) https://arpa-e-foa.energy.gov/Default.aspx?Archive=1#FoaId9688fafc-3b63-42af-9786-77d930987b4a

Other Works : Other Writings

Suzanne Baker, Jessica Lovering, and Rachel Slaybaugh. "Our Progressive Policy Agenda for Advanced Nuclear Energy." Policy Report for Good Energy Collective. August 2, 2020. https://www.goodenergycollective.org/policy/progressive-policy-agenda-for-advanced-nuclear-energy