

Jessica S. Rehak

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INFORMATION github: <https://github.com/JessicaRehak>

PHD **University of California, Berkeley**, NUCLEAR ENGINEERING **Summer 2021**
A Novel Tool for the Assessment and Validation of Acceleration Methods for Solving the Neutron Transport Equation
Advisor: Professor Rachel N. Slaybaugh

MS **University of California, Berkeley**, NUCLEAR ENGINEERING **Spring 2017**
Implementation of Weighted Delta-tracking with scattering in Serpent 2

MEM **Old Dominion University – Norfolk VA**, ENGINEERING MANAGEMENT

BS **University of Maryland, College Park**, PHYSICS, ASTRONOMY **Spring 2007**

WORK & **Kairos Energy**, Alameda, CA **September 2021 – October 2023**
RESEARCH *Reactor Analyst (Engineer III)*
EXPERIENCE Supervisor: Nader Satvat – satvat@kairospower.com

Developed a series of Python 3-based deployable libraries designed to work in concert to support the rapid iterative design and evaluation of novel pebble bed reactors. Some of the features included:

- conversion of material specifications provided in various formats into a standardized and shared elemental format,
- generation of a full pebble bed core model from a collection of user-defined yaml files, stored in a comprehensive Python 3 object complete with materials assigned to a polygon-based cross-sectional geometry,
- and generation of a core input file for the Serpent 2 Monte Carlo code, converting arbitrary rectangular and triangular polygons, as well as other features, into appropriate Serpent surfaces and cell definitions; evaluation of complex multi-point surfaces into a series of polygons to describe highly-detailed features or core regions; automatic determination and elimination of overlapping surfaces; and handling of regions with multiple layered universes, and distributed pebble-bed fuel materials.

University of California, Berkeley, Berkeley, CA **Fall 2015 – Summer 2021**
Graduate Student Researcher
Advisor: Professor Rachel N. Slaybaugh – slaybaugh@berkeley.edu

Developed a novel finite-element-based code for the implementation and assessment of acceleration methods for deterministic solves of the transport equation that leveraged modern C++ features, documentation systems, and testing frameworks.

The Idaho National Laboratory, Idaho Falls, ID **Summer 2016**
Student Intern - Reactor physics group
Advisor: Dr. Mark DeHart – mark.dehart@inl.gov
Implemented a novel delta-tracking algorithm for the Serpent 2 Monte Carlo code.

United States Navy **2008 – Fall 2015**
Submarine Officer – Honorably discharged as a lieutenant (O-3)

- Coordinated submarine operations and international participation for the Rim of the Pacific 2014 naval exercise involving 23 nations, 46 ships and six submarines.
- Supported two six-month deployments while qualified Officer of the Deck and Engineering Officer of the Watch on Los Angeles class submarines.
- Certified for assignment as Engineer Officer in charge of a Naval Nuclear Propulsion Plant.
- Led divisions responsible for the maintenance and operation of reactor plant instrumentation, radiological controls, and water chemical analysis.
- TS/SCI security clearance (single scope background investigation).

PUBLICATIONS & PROCEEDINGS	Rehak, J.S. , Slaybaugh, R.N. “Assessing the Effectiveness of Acceleration Methods for Deterministic Neutron Transport Solvers” Transactions of the American Nuclear Society Volume 122. https://doi.org/10.13182/T122-32383 June 2020. [†]	
	Rehak, J.S. , Kerby, L.M., DeHart, M.D., Slaybaugh, R.N. “Weighted delta-tracking in scattering media” Nuclear Engineering and Design Volume 342. https://doi.org/10.1016/j.nucengdes.2018.12.006 . December 2018. [†]	
	Rehak, J.S. , Kerby, L.M., DeHart, M.D., Slaybaugh, R.N., Leppänen, J. “Implementation of Weighted Delta-Tracking with Scattering in the Serpent 2 Monte Carlo Code” Transactions of the American Nuclear Society Volume 116. https://escholarship.org/uc/item/6bg1s71k June 2017. [†]	
HONORS AND AWARDS	Department of Nuclear Engineering Graduate Fellowship	2015 – 2018
	Navy and Marine Corps Commendation Medal	August 2015
	For exceptional service as Submarine Force Exercise Officer and Submarine Watch Officer at Commander Submarine Forces Pacific	
	Navy and Marine Corps Achievement Medal	August 2015
	For coordination and execution of submarine operations for the Rim of the Pacific 2014 exercise	
	Navy and Marine Corps Achievement Medal	June 2013
CODE DEVELOPMENT	For service as a division officer on USS JACKSONVILLE (SSN-699) and successful completion of two six-month deployments and an extended dry-dock maintenance period.	
	Navy and Marine Corps Achievement Medal	April 2013
	For service as Chemistry/Radiological Assistant during an eight month dry-dock period.	
	Navy and Marine Corps Achievement Medal	January 2011
SCIENTIFIC COMPUTING SKILLS	For service as Reactor Control Assistant during a six-month deployment and Operational Reactor Safeguards Exam	
	Bay Area Radiation Transport (BART)	https://github.com/SlaybaughLab/BART
	A finite-element-based transport solver that supports 1/2/3D and MPI, based on the deal.II finite element library.	
	<ul style="list-style-type: none"> • Designed for developer end-users for maximum modification and support of methods analysis and implementation. • Designed to support reproducibility, portability, and testing in codes. utilizes continuous integration, code coverage, and Docker containers. • Uses a novel protocol-buffer format for materials. 	
	Languages	Python 3, C++20, bash
	Build Systems	setuptools, make, CMake
	Testing	pytest, GoogleTest, GoogleMock, continuous integration, code coverage
	Version Control	git, github
	Other	sphinx, Doxygen, L ^A T _E X, Protocol Buffers, Jupyter, Docker