

SCOTT W. MOSHER

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Reactor and Nuclear Systems Division
Oak Ridge National Laboratory
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EDUCATION

Doctor of Philosophy, Nuclear Engineering, Georgia Institute of Technology **July 2004**

Thesis: “A Variational Transport Theory Method for Two-Dimensional Reactor Core Calculations;”

Developed and implemented original variational and non-variational heterogeneous coarse-mesh transport methods for the calculation of the angular neutron flux distribution in large-scale, two-dimensional models of nuclear reactor cores.

Advisor: Dr. Farzad Rahnema

Major Areas: Reactor Analysis, Transport Theory

Minor: Mathematics

Master of Science, Nuclear Engineering, Georgia Institute of Technology **June 2001**

Thesis: “Implementation of an Adaptive Importance Sampling Technique in MCNP for Monoenergetic Slab Problems;” Demonstrated exponential convergence of tally estimates in stochastic simulations of fixed-source slab transport problems by iteratively estimating the adjoint function on a fixed spatial and angular grid and using the importance information to bias the transport probabilities.

Advisor: Dr. Farzad Rahnema

Bachelor of Nuclear Engineering, Highest Honor, Georgia Institute of Technology **June 1997**

Activities: Cooperative Work Plan

Honor Societies: Tau Beta Pi, Alpha Nu Sigma, Golden Key

EXPERIENCE

R&D Staff Member, Oak Ridge National Laboratory **July 2008 – Present**

Developed radiation transport computational methods, algorithms, and codes in the Reactor and Nuclear Systems Division for ORNL customers. Acted as lead developer of the ADVANTG code for generating variance reduction parameters for Monte Carlo transport simulations of shielding and radiation-detection problems. Contributed to the development and preparation of funding proposals. Currently leading a research project to develop and implement a hybrid deterministic/Monte Carlo approach to k -eigenvalue simulations on massively parallel platforms.

Technical Staff Member, Los Alamos National Laboratory **Sep 2004 – June 2008**

Implemented, evaluated, and refined methods for performing stochastic simulations of radiative transfer problems as part of the Monte Carlo team within the Transport Methods Section of the Computational Physics Group. Contributed to the *Jayenne* project by committing code modifications and unit tests, adding regression test problems, revising and adding to the methods manual, and participating in code reviews. While acting as *Jayenne* point-of-contact for a three month period, worked with colleagues to resolve bugs in a recently implemented parallel domain decomposition capability. Acted as host to a new staff member and assisted in his initial project to characterize the performance of the *Jayenne* project codes.

Graduate Research Assistant, Georgia Institute of Technology

Jan 2002 – Jun 2004

Developed and implemented a heterogeneous coarse mesh transport method as a major part of a Nuclear Energy Research Institute (NERI) project led by Georgia Tech in collaboration with Penn State University and the Idaho National Laboratory.

Co-op Student, Georgia Power Company, Vogtle Nuclear Plant

Sep 1993 – Sep 1996

Performed a wide variety of tasks for the thermal performance engineering, plant modifications, maintenance engineering, and nuclear systems groups. Relevant work included burnup, shutdown margin, reactivity balance, hot channel factor, and axial flux distribution calculations. Also performed cold and hot rod drop and flux map surveillances. Acted as fuel movement coordinator during core offload and as reactivity analyst during core reload. Acted as lead engineer in reviewing plant response to a change in the operation of the chemical volume control system.

HONORS AND AWARDS

Engineering Research and Development Team Award, Oak Ridge National Laboratory, 2010

Defense Programs Award of Excellence, Los Alamos National Laboratory, 2005

Achievement Award, Los Alamos National Laboratory, 2005

Department of Energy Nuclear Engineering Fellowship 1997-2001

Georgia Tech Presidential Fellowship 1997-2001

National Academy for Nuclear Training Scholarship 1993-1997

Joseph R. Dietrich Scholarship (American Nuclear Society) 1996-1997

Member of Tau Beta Pi (National Engineering Honor Society) 1995-1997

Member of Alpha Nu Sigma (Student ANS Honor Society) 1995-2004

Member of Golden Key Honor Society 1995-1997

REFEREED PUBLICATIONS

1. B. Mervin, S.W. Mosher, J.C. Wagner, and I. Maldonado "Under-Prediction of Localized Tally Uncertainties in Monte Carlo Eigenvalue Calculations," *submitted*, 2011 *ANS Annual Meeting*, Hollywood, FL, June 26-30 (2011)
2. B. Mervin, I. Maldonado, S.W. Mosher, and J.C. Wagner "Uncertainty Analyses for Localized Tallies in Monte Carlo Eigenvalue Calculation," *submitted*, *International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering (M&C 2011)*, Rio de Janeiro, Brazil, May 8-12 (2011)
3. A.M. Ibrahim, M.E. Sawan, S.W. Mosher, T.M. Evans, D.E. Peplow, P.P.H. Wilson, and J.C. Wagner, "Global Evaluation of Prompt Dose in ITER Using Hybrid Monte Carlo/Deterministic Technique," *accepted*, *Fusion Science and Technology* (2011)
4. J.C. Wagner, S.W. Mosher, T.M. Evans, D.E. Peplow, and J.A. Turner, "Hybrid and Parallel Domain-Decomposition Methods Development to Enable Monte Carlo for Reactor Analyses," *Joint International Conference on Supercomputing in Nuclear Applications and Monte Carlo 2010 (SNA + MC2010)*, Tokyo, Japan (October 17-21, 2010)
5. J.C. Wagner, D.E. Peplow, S.W. Mosher, T.M. Evans, "Review of Hybrid (Deterministic/Monte Carlo) Radiation Transport Methods, Codes, and Applications at Oak Ridge National Laboratory," *Joint International Conference on Supercomputing in Nuclear Applications and Monte Carlo 2010 (SNA + MC2010)*, Tokyo, Japan (October 17-21, 2010)
6. J.C. Wagner and S.W. Mosher, "Forward-Weighted CADIS Method for Variance Reduction of Monte Carlo Reactor Analyses," *2010 ANS Winter Meeting and Nuclear Technology Expo*, Las Vegas, NV (November 7-11, 2010)

7. A.M. Ibrahim, S.W. Mosher, T.M. Evans, D.E. Peplow, M.E. Sawan, P.P.H. Wilson, and J.C. Wagner, "ITER Neutronics Modeling Using Hybrid Monte Carlo/Deterministic and CAD-based Monte Carlo Methods," *accepted, Nuclear Technology* (2010)
8. R.A. Joseph, III, C.O. Slater, T.M. Evans, S.W. Mosher, and J.O. Johnson, "Sensitivities and Uncertainties Related to Numerics and Building Features in Urban Modeling," *accepted, Nuclear Technology* (2010)
9. D.E. Peplow, S.W. Mosher, and T.M. Evans, "Hybrid Monte Carlo/Deterministic for Streaming/Beam Problems," *Radiation Protection and Shielding Division Topical Meeting*, Las Vegas, NV (April 18-23, 2010)
10. S.W. Mosher, M. Maucec, J. Spanier, A. Badruzzaman, C. Chedester, and M. Evans, "Expected-Value Techniques for Monte Carlo Modeling of Well Logging Problems," *Nuclear Instruments and Methods in Physics Research A*, **613**, 334-341 (2010)
11. S.W. Mosher, T.M. Miller, T.M. Evans, J. Wagner, "Automated Weight-Window Generation for Threat Detection Applications Using ADVANTG," *International Conference on Advances in Mathematics, Computational Methods, and Reactor Physics (M&C 2009)* (2009)
12. J. Pounders, F. Rahnema, S.W. Mosher, D. Serghiuta, and P. Turinsky, "Cross Section Homogenization Analysis for a Simplified CANDU Reactor," *International Conference on the Physics of Reactors, Nuclear Power: A Sustainable Resource (PHYSOR-08)* (2008)
13. S.W. Mosher, T.J. Urbatsch, A.L. Hungerford, R. Hueckstaedt, R. Weaver, and D. Jablonski, "Improved IMC Source Particle Population Algorithm (U)," *Nuclear Explosives Design Physics Conference*, October 22-25, Los Alamos National Laboratory (2007)
14. S.W. Mosher, "Exact Solution of a Nonlinear, Time-Dependent, Infinite-Medium, Grey Radiative Transfer Problem," *Transactions of the American Nuclear Society*, **95**, 744-747 (2006)
15. S.W. Mosher and F. Rahnema, "The Incident Flux Response Expansion Method for Heterogeneous Coarse Mesh Transport Problems," *Transport Theory and Statistical Physics*, **35**, 55-86 (2006)
16. S.W. Mosher and J.D. Densmore, "Stability and Monotonicity Conditions for Linear, Grey, 0-D Implicit Monte Carlo Calculations," *Transactions of the American Nuclear Society*, **93**, 520-522 (2005)
17. S.W. Mosher and F. Rahnema, "A Decoupled Finite Element Heterogeneous Coarse Mesh Transport Method," *Transactions of the American Nuclear Society*, **92**, 731-733 (2005)
18. B. Forget, F. Rahnema, and S.W. Mosher, "Application of a Heterogeneous Coarse Mesh Transport Method to a MOX Benchmark Problem," *PHYSOR 2004 –The Physics of Fuel Cycles and Advanced Nuclear Systems: Global Developments*, Chicago, Illinois (April 25-29, 2004)
19. B. Forget, S.W. Mosher, and F. Rahnema, "A Heterogeneous Coarse Mesh Solution for the 2-D NEA C5G7 MOX Benchmark Problem," *Progress in Nuclear Energy*, **45**, 233-254 (2004)
20. S.W. Mosher, F. Rahnema, and B. Forget, "Monte Carlo Adaptation of a Heterogeneous Coarse Mesh Transport Method," *Transactions of the American Nuclear Society*, **89**, 310-312 (2003)
21. S.W. Mosher and F. Rahnema, "An Intra-Nodal Flux Expansion for a Heterogeneous Coarse Mesh Discrete Ordinates Method," *Proceedings of the Conference on Nuclear Mathematical and Computational Sciences*, Gatlinburg, Tennessee, (April 6-10, 2003)
22. G. Ilas, F. Rahnema, S. Mosher, and R. J. J. Stamm'ler, "A Monte Carlo-Based Estimate of the Diffusion Coefficient in a CANDU Cell," *22nd Nuclear Simulation Symposium*, Ottawa, Ontario, Canada (November 3-5, 2002)
23. F. Rahnema, S.W. Mosher, D. Ilas, C. de Oliveira, M. D. Eaton, and R. J. J. Stamm'ler, "3D Heterogeneous Transport Calculations of CANDU Fuel with EVENT/HELIOS," *22nd Nuclear Simulation Symposium*, Ottawa, Ontario, Canada (November 3-5, 2002)
24. H. N. Sarsour, F. Rahnema, S.W. Mosher, P.J. Turinsky, and D. Serghiuta, "Simulation of Void Reactivity in a CANDU Core," *22nd Nuclear Simulation Symposium*, Ottawa, Ontario, Canada (November 3-5, 2002)
25. S.W. Mosher, M. Maucec, J. Spanier, A. Badruzzaman, C. Chedester, M. Evans, and L. Gadekan, "Expected Value Techniques for Monte Carlo Modeling of Well Logging Problems," *12th Biennial Radiation Protection and Shielding Division Topical Meeting*, Santa Fe, New Mexico, (April 14-18, 2002)

26. F. Rahnema, S.W. Mosher, M. Pitts, P. Akhtar, and D. Serghiuta, "MCNP Simulation of Void Reactivity in a Simplified CANDU Core Sub-region," *Advanced Monte Carlo for Radiation Physics, Particle Transport Simulation and Applications*, Lisbon, Portugal, 767, Springer (October 23-26, 2000)
27. F. Rahnema, S.W. Mosher, M. Pitts, M. S. McKinley, P. Akhtar, D. Serghiuta, and R. J. J. Stamm'ler, "Void Reactivity Calculations in a Typical CANDU Cell Using MCNP and HELIOS," *International Conference on the Physics of Nuclear Science and Technology, Long Island, New York*, **1**, 356, Am. Nucl. Soc. (October 5-8, 1998)

TECHNICAL REPORTS

1. S.W. Mosher, D.E. Peplow, T.M. Evans, and J.O. Johnson, "Final Report on the Development of a Directional Variance Reduction Capability in ADVANTG for Active Interrogation Modeling," Oak Ridge National Laboratory, Letter Report, NMDS-LTR-2010-002 (2010)
2. S.W. Mosher, "A Source Cutoff Capability for Milagro and Wedgehog," Los Alamos National Laboratory, Technical Memorandum, CCS-2:07-47 (2007)
3. T.M. Evans, S.W. Mosher, J.S. Warsa, and T.J. Urbatsch, "A Monte Carlo Synthetic Acceleration Method for Solving the 1T Thermal Radiation Diffusion Equation," Los Alamos National Laboratory, Technical Memorandum CCS-2:07-12(U) (March 21, 2007)
4. T.M. Kelley and S.W. Mosher, "Characterization of Implicit Monte Carlo Projects, Phase 1: Serial Performance of Milagro," Los Alamos National Laboratory, Technical Memorandum CCS-4:06-3(U) (July 18, 2006)
5. S.W. Mosher, "Results of the SMORZ Project," Los Alamos National Laboratory, Technical Memorandum CCS-4:05-46(U) (August 23, 2005)
6. S.W. Mosher, F. Rahnema, and R. J. J. Stamm'ler, "Lattice Database Development for Static and Transient Analyses," Report to the Canadian Nuclear Safety Commission, NAZ-CNCS-0102R (November 25, 2002)
7. S.W. Mosher, "Implementation of an Adaptive Importance Sampling Technique in MCNP for Two-Dimensional Problems," Chapter 1 in "Methods and Monte Carlo Algorithms for Geometric Convergence," Claremont Research Institute of Applied Mathematical Sciences (CRIAMS), LANL-01001 (January 2001)
8. S.W. Mosher and J. Spanier, "Final Report to the Oil Consortium," CRIAMS Report, OC-00009 (September, 2000)
9. S.W. Mosher, M. Maucec, and J. Spanier, "Progress Report to the Oil Consortium: January Through April 2000," CRIAMS Report, OC-00005 (May 2000)
10. F. Rahnema, S.W. Mosher, and M. S. McKinley, "Effects of Uncertainties in Nuclear Data on Void Reactivity," Report to the Atomic Energy Control Board of Canada (AECB), FR1-AECB-0100R (April 25, 2000)
11. F. Rahnema, S.W. Mosher, and M. Pitts, "Void Reactivity Calculations – Phase 2," Report to the AECB, FR2-AECB-0100R (March 15, 2000)
12. J. Jiang, M. Maucec, S.W. Mosher, and J. Spanier, "Addendum to CRIAMS Report OC-99008," CRIAMS Report, OC-99010 (October 1999)
13. J. Jiang, M. Maucec, S.W. Mosher, and J. Spanier, "MCNP-CRIAMS 1.0 for the Oil Consortium," CRIAMS Report, OC-99008 (August 1999)
14. F. Rahnema, S.W. Mosher, M. Pitts, and M. S. McKinley, "Void Reactivity Calculations," Report to the AECB, FR-AECB-0698R (June 30, 1998)
15. S.W. Mosher, S. Niles, M. Roy, and B. Waters, "Design of a Modified GE-9 BWR Fuel Assembly with Lithium Targets for the Production of Tritium," *ANS Western Regional Student Conference*, University of Texas at Austin, unpublished proceedings (March 26-28, 1998)

PRESENTATIONS

S.W. Mosher, T.M. Evans, T.M. Miller, and J.C. Wagner, "Efficient Transport Simulations of Difficult Detection Problems Using ADVANTG," *IEEE Nuclear Science Symposium and Medical Imaging Conference*, Orlando, FL, (October 27, 2009)

S.W. Mosher, "The Implicit Monte Carlo Method for Nonlinear, Time-Dependent, Radiative Transfer Calculations," *invited Colloquium speaker*, Georgia Institute of Technology, (August 31, 2006)

S.W. Mosher and F. Rahnema, "Coarse-Mesh Neutron Transport via Discrete Legendre Polynomials," *18th International Conference on Transport Theory*, Rio de Janeiro, Brazil (July 20-25, 2003)

POSTERS

S.W. Mosher, "A New Version of the ADVANTG Variance Reduction Generator," *Radiation Protection and Shielding Division Topical Meeting* (April 18-23, 2010)

COURSES TAUGHT

F. Rahnema and S.W. Mosher, "Static Computational Methods for Criticality Safety Analysis/Evaluation," Savannah River Site Training Center, Aiken, South Carolina (September 23-26, 2002)

GRANTS

Nuclear Energy Research Initiative, "Innovative Transport Theory Method for Efficient Design, Analysis, and Monitoring of Generation IV Reactor Cores," Project No. 2002-081

PI: Farzad Rahnema, Georgia Institute of Technology

Co PIs: Abderaffi Ougouag, Idaho National Laboratory and Yousry Azmy, Penn State University

STUDENTS MENTORED

Nicholas Sly

M.S. student, University of Tennessee, Advisor: Dr. Ivan Maldonado, February 2011 – present

Brenden Mervin

Ph.D. student, University of Tennessee, Advisor: Dr. Ivan Maldonado, August 2010 – present

Ahmad Ibrahim

Ph.D. student, University of Wisconsin, Advisor: Dr. Paul Wilson, Summer 2010 and 2011

CERTIFICATIONS

DOE Q-Clearance

PROFESSIONAL ACTIVITIES

Member, American Nuclear Society (ANS)

Treasurer, ANS Mathematics and Computation Division, 2007-2008

Treasurer, ANS Radiation Protection and Shielding Division, 2009-2011

Candidate for Secretary, ANS Radiation Protection and Shielding Division, 2011-2012

REFERENCES

Available upon request