

Curriculum Vitae of Douglas E. Peplow
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Education:

Doctor of Philosophy

North Carolina State University, Raleigh, NC March 1999
Major: Nuclear Engineering Minor: Mathematics GPA: 3.863/4.000
Dissertation Title: Monte Carlo Mammography Image Simulation with Measured Coherent Scattering Form Factors and Differential Sampling
Advisor: Professor Kuruvilla Verghese

Master of Science

North Carolina State University, Raleigh, NC December 1993
Major: Nuclear Engineering Minor: Mathematics GPA: 3.680/4.000
Thesis Title: Sodium Iodide Detector Response Functions Using Simplified Monte Carlo Simulation and Principal Components
Advisor: Professors Robin P. Gardner and Kuruvilla Verghese

Bachelor of Science

Western Illinois University, Macomb, IL May 1991
Major: Physics Minor: Mathematics GPA: 3.94/4.00

Areas of Expertise:

Monte Carlo methods: neutral particle transport, variance reduction and differential sampling
Java programming: object-oriented programming, file handling, calculations, GUI development, 3D visualization

Professional Experience:

- 1999- Present: Nuclear Engineer, Radiation Transport and Criticality Group of the Nuclear Science and Technology Division at the Oak Ridge National Laboratory. Currently developing the new sequence for the [SCALE](#) (Standardized Computer Analyses for Licensing Evaluation) computer code package called MAVRIC (Monaco with Automated Variance Reduction using Importance Calculations), which is designed to calculate doses with low uncertainties in reasonable times outside of thick shields that are too challenging for standard Monte Carlo codes.
- 1999: Postdoctoral Research Associate, Department of Nuclear Engineering, North Carolina State University, Raleigh, NC.

Refereed publications:

23. F. C. DiFilippo, L. S. Papiez, V. P. Moskvina, D. E. Peplow, C. M. DesRosiers, J. O. Johnson, R. D. Timmerman, M. E. Randall, and R. A. Lillie "Contamination dose from photoneutron processes in bodily during therapeutic radiation delivery" *Medical Physics* **30**, No. 10, 2849-2854 (2003).
22. D. E. Peplow, C. D. Sulfredge, R. L. Sanders, R. H. Morris, and T. A. Hann "Calculating Nuclear Power Plant Vulnerability Using Integrated Geometry and Event/Fault Tree Models" *Nuclear Science and Engineering* **146**, No. 1, 71-87 (2004).
18. C. D. Sulfredge, R. L. Sanders, D. E. Peplow, R. H. Morris and T. A. Hann "Graphical Expert System for Analyzing Nuclear Facility Vulnerability" *Transactions of IITSEC 2002* (Interservice/Industry Training, Simulation and Education Conference).
15. D. E. Peplow and K. Verghese "Digital Mammography Image Simulation Using Monte Carlo" *Medical Physics* **27**, No. 3, 568-579 (2000).
14. D. E. Peplow and K. Verghese "Differential Sampling for the Monte Carlo Practitioner" An invited paper in *Progress in Nuclear Energy* **36**, No. 1, 39-75 (2000).
13. D. E. Peplow and K. Verghese "Differential Sampling Applied to Mammography Image Simulation" *Nuclear Science and Engineering* **135**, No. 2, 103-122 (2000). This paper won the 1999 ANS Mark Mills Award.
9. D. E. Peplow "Fiestaware Radiography" *The Physics Teacher* **37**, No. 5, 316-318 (1999).
7. D. E. Peplow "Direction Cosines and Polarization Vectors for Monte Carlo Photon Scattering" *Nuclear Science and Engineering* **131**, No. 1, 132-136 (1999).
6. D. E. Peplow and K. Verghese "Measured Molecular Coherent Scattering Form Factors of Animal Tissues, Plastics and Human Breast Tissue" *Physics in Medicine & Biology* **43**, No. 9, 2431-2452 (1998).
4. R. P. Gardner, C. L. Barrett, W. Haq and D. E. Peplow "Efficient Monte Carlo Simulation of O-16 Neutron Activation and N-16 Decay Gamma-Ray Detection in a Flowing Fluid for On-Line Oxygen Analysis or Flow Rate Measurement" *Nuclear Science and Engineering* **122**, No. 3, 326-343 (1995).
3. P. Guo, D. E. Peplow and R. P. Gardner "Natural Gamma-Ray Log Interpretation: Semi-Empirical, Principal Components Analysis and Monte Carlo Multiply Scattered Components Approaches" *Nuclear Geophysics* **9**, No. 4, 305-318 (1995).
1. D. E. Peplow, R. P. Gardner and K. Verghese "Sodium Iodide Detector Response Functions Using Simplified Monte Carlo Simulation and Principal Components" *Nuclear Geophysics* **8**, No. 3, 243-259 (1994).

Meeting proceedings, posters, technical memos:

34. D. Ilas, M. L. Williams, D. E. Peplow, and B. L. Kirk "Multidimensional Coupled Photon-Electron Transport Simulations using Neutral Particle S_N Codes," in the CD-ROM proceedings of the American Nuclear Society's Computational Medical Physics Working Group Workshop II

University of Florida, Gainesville, FL, September 30 -October 3, 2007.

33. D. E. Peplow and J. C. Wagner “Simultaneous Optimization of Tallies in Difficult Shielding Problems,” Transactions of the 11th International Conference on Radiation Shielding (ICRS-11) and the 15th Topical Meeting of the Radiation Protection and Shielding Division (RPSD-2008) of the American Nuclear Society, p. YYY-YYY, Callaway Gardens, GA, April, 2008.
32. J. C. Wagner, E. D. Blakeman, D. E. Peplow, J. C. Wagner, B. D. Murphy, and D. E. Mueller “PWR Facility Dose Modeling Using MCNP5 and the CADIS/ADVANTG Variance-Reduction Methodology,” ORNL/TM-2007/133, September 2007
31. J. C. Wagner, E. D. Blakeman, and D. E. Peplow “Forward-Weighted CADIS Method for Global Variance Reduction” *Transactions of the American Nuclear Society* **97**, 630-633 (2007).
30. D. E. Peplow, E. D. Blakeman, and J. C. Wagner “Advanced Variance Reduction Strategies for Optimizing Mesh Tallies in MAVRIC” *Transactions of the American Nuclear Society* **97**, 595-597 (2007).
29. 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” *Transactions of the American Nuclear Society* **96**, 343-345 (2007).
28. D. E. Peplow, S. M. Bowman, J. E. Horwedel, and J. C. Wagner “Monaco/MAVRIC: Computational Resources for Radiation Protection and Shielding in SCALE” *Transactions of the American Nuclear Society* **95**, 669-671 (2006).
27. D. E. Peplow and J. C. Wagner “Automated Variance Reduction for SCALE Shielding Calculations” In the proceedings of *The American Nuclear Society’s 14th Biennial Topical Meeting of the Radiation Protection and Shielding Division*, p. 391-393, Carlsbad, NM, April 2-6, 2006.
26. R. A. Lillie, D. E. Peplow, M. L. Williams, B. L. Kirk, M. P. Langer, T. L. Nichols, and Y. Y. Azmy “Photon Beam Transport in a Voxelized Human Phantom Model: Discrete Ordinates vs Monte Carlo” In the proceedings of *The American Nuclear Society’s 14th Biennial Topical Meeting of the Radiation Protection and Shielding Division*, p. 40-43, Carlsbad, NM, April 2-6, 2006.
25. D. E. Peplow “A Computational Model of the High Flux Isotope Reactor for the Calculation of Cold Source, Beam Tube, and Guide Hall Nuclear Parameters” ORNL/TM-2004/237, Nov. 2004.
24. C. D. Sulfredge, R. L. Sanders, R. H. Morris , and D. E. Peplow “Detailed Reactor Models for the Visual Interactive Site Analysis Code (VISAC)” (ORNL/NRC/LTR-04/16), U.S. Nuclear Regulatory Commission, Oak Ridge National Laboratory, February 7, 2005.
21. D. E. Peplow and Y. Y. Azmy “GipGui: A GUI for the GIP Cross Section Preparation Code” Poster/presentation at the ANS M&C 2003, the Nuclear Mathematical and Computational Sciences Conference, *A Century in Review - A Century Anew* April 6-10, 2003, Gatlinburg, TN.
20. D. E. Peplow, C. D. Sulfredge, R. L. Sanders, R. H. Morris, T. A. Hahn “Calculating Nuclear Power Plant Vulnerability Using Integrated Geometry and Event/Fault Tree Models” *Transactions of the American Nuclear Society* **87**, 559-561 (2002).

19. F. C. Difilippo, R. A. Lillie, D. E. Peplow, J. O. Johnson, L. S. Papiez, V. P. Moskvina, R. D. Timmerman, C. M. DesRosiers and M. E. Randall “Photoneutron doses in radiotherapy treatments simulated with MCNPX code version 2.2.6” Works in Progress Poster Presentation at the 44th Ann. Meeting of the American Association of Physicists in Medicine, July 2002, Montreal, Quebec.
17. B. T. Rearden and D. E. Peplow “Comparison of Sensitivity Analysis Techniques in Monte Carlo Codes for Multi-Region Criticality Calculations” *Transactions of the American Nuclear Society* **85**, 163-165 (2001).
16. G. B. Zeigler, D. E. Peplow and K. Verghese “Simulation of Microcalcification Clusters in Digital Mammography” *Transactions of the American Nuclear Society* **83**, 514-516 (2000).
12. D. E. Peplow and K. Verghese “Differential Sampling Applied to Mammography Image Simulation” *Transactions of the American Nuclear Society* **81**, 145-147 (1999). This is a summary of the paper that won the 1999 ANS Mark Mills Award.
11. D. E. Peplow and K. Verghese “Differential Sampling for Monte Carlo Mammographic Image Simulation” *Proceedings of SPIE* **3771**, 98-111 (1999).
10. K. Verghese and D. E. Peplow “Collaborative Learning in Small Groups in a Mathematics Intensive NE Course” *Proceedings of the ASEE Annual Conf & Expo*, Charlotte, NC, June 1999.
8. D. E. Peplow and K. Verghese “Monte Carlo Modeling of Mammographic Images” *Transactions of the American Nuclear Society* **79**, 163-164 (1998).
5. D. E. Peplow and K. Verghese “Monte Carlo Image Simulation in Support of Improvements in Mammography” *Transactions of the American Nuclear Society* **77**, 358-359 (1997).
2. R. P. Gardner and D. E. Peplow “Use of N-16 for Measuring Cooling Water Flow Rate in the NCSU PULSTAR Reactor” *Transactions of the American Nuclear Society* **70**, 130-131 (1994).

Experimental Summaries: (National Synchrotron Light Source at Brookhaven National Laboratory)

D. E. Peplow and K. Verghese “Monte Carlo Image Simulation Benchmarks” 1998 Activity Report.

D. E. Peplow and K. Verghese “Measurement of Molecular Coherent Scattering Form Factors” 1997 Activity Report.

Formal presentations:

“Advanced Variance Reduction Strategies for Optimizing Mesh Tallies in MAVRIC” at the American Nuclear Society Winter Meeting, Washington, DC, November 14, 2007. (Invited talk.)

“Monaco/MAVRIC: Computational Resources for Radiation Protection and Shielding in SCALE” at the American Nuclear Society Winter Meeting, Albuquerque, NM, November 16, 2006. (Invited talk.)

“Automated Variance Reduction for SCALE Shielding Calculations” at the American Nuclear Society’s 14th Biennial Topical Meeting of the Radiation Protection and Shielding Division, Carlsbad, NM, April 5, 2006.

“Photon Beam Transport in a Voxelized Human Phantom Model: Discrete Ordinates vs Monte Carlo” at the American Nuclear Society’s 14th Biennial Topical Meeting of the Radiation Protection and Shielding Division, Carlsbad, NM, April 3, 2006.

Invited panelist in “Java Pros and Cons - Roundtable” at the American Nuclear Society Annual Meeting, Pittsburgh, PA, June 16, 2004.

“GipGui: A GUI for the GIP Cross Section Preparation Code” Poster/presentation at the Nuclear Mathematical and Computational Sciences Conference (Mathematics & Computation Division of the American Nuclear Society), Gatlinburg, TN, April 9, 2003.

“Calculating Nuclear Power Plant Vulnerability Using Integrated Geometry and Event/Fault Tree Models” at the American Nuclear Society Winter Meeting, 8th Topical Meeting for Emergency Preparedness & Response, Washington, DC, November 20, 2002.

“Differential Sampling Applied to Mammography Image Simulation” at the American Nuclear Society Winter Meeting, Long Beach, CA, November 17, 1999. This was an invited talk to discuss the *Nuclear Science and Engineering* paper that won the American Nuclear Society’s Mark Mills award.

“Differential Sampling for Monte Carlo Mammographic Image Simulation” at the Annual Meeting of SPIE (International Society for Optical Engineering), Denver, CO, July 19, 1999.

“Collaborative Learning in Small Groups in a Mathematics Intensive NE Course” at the American Society for Engineering Education (ASEE) Annual Conference & Exposition, Charlotte, NC, June 22, 1999.

“Monte Carlo Modeling of Mammographic Images” at the American Nuclear Society Winter Meeting, Washington, DC, November 18, 1998.

“Monte Carlo Image Simulation in Support of Improvements in Mammography” at the American Nuclear Society Winter Meeting, Albuquerque, NM, November 17, 1997. (Invited talk.) Winner of the American Nuclear Society Reactor Physics Division’s “Best Paper” Award.

Awards:

Nuclear Science & Technology Division Scientific and Technical Award (December 2006)
American Nuclear Society Mark Mills Award, 1999
Alpha Nu Sigma, the nuclear engineering honor society (NCSU), 1995
National Science Foundation Engineering Education Scholar, 1995
Graduate Student Certificate for Outstanding Teaching (NCSU), 1994, 1995, 1996
Nuclear Engineering Teaching Fellow (NCSU), 1994-1996
Preparing the Professoriate (NCSU), 1994-1995
Sigma Xi, the Scientific Research Society (NCSU), 1994
Institute of Nuclear Power Operations Graduate Fellowship, 1991
Dean's Fellowship (NCSU), 1991
Sigma Pi Sigma physics honor society (WIU), 1991
Walter Eller physics scholarship (WIU), 1991
Phi Kappa Phi honor society (WIU), 1991
Foundation Scholarship (WIU), 1988
Eagle Scout, 1986

Professional Organizations:

American Nuclear Society, 1991-current
American Society for Engineering Education, 1994-current
Sigma Xi, 1994-current

Teaching Experience:

Teaching Fellow, Jan 1994-Dec 1996, Department of Nuclear Engineering, NC State University – Served as teaching assistant five semesters. Served as an instructor for five semesters. Helped typeset two books written by faculty members.

Mentored Teaching Assistant Program, College of Engineering, NC State University (1996) – a semester-long program of mentored teaching. The project was to redesign the introductory NE 201 course to incorporate active learning and to comply with new ABET standards for inclusion of design in undergraduate courses.

Named a National Science Foundation Engineering Education Scholar (1995) and attended a week-long workshop for future engineering faculty.

Preparing the Professoriate Program, NC State University (1994-1995) – year-long program of mentored teaching with monthly seminars on teaching. The project was to develop and implement a group tutorial system to accompany the NE 401 course. This system was used for several years.

Nuclear Engineering Outreach – visited many schools (middle and senior high) to perform lab demonstrations and talk to students about nuclear power and related topics. Spoke at various science teacher workshops to demonstrate nuclear labs and discuss teaching methods. Helped organize and carry out workshop programs for high school and middle school science teachers on nuclear topics. Also served in a variety of roles at Nuclear Summer Camp for high school students.

Substitute Teacher – Wake County Public Schools, Raleigh, NC (1992-1993) Taught mathematics, physics and computer science at the middle and high school levels several times per month.

Teaching Assistant – Depts. of Pre-Engineering and Physics, Western Illinois University, (1988-1991) Duties included lab assistant, grader, tutor, substitute lab instructor, and computer lab instructor. Served as lecturer for part of a graduate course in Applied Computer Programming.

Courses taught (course descriptions are from the NC State Course Catalog):

NE 201 Introduction to Nuclear Engineering: *(Instructor: Fall 1994, Fall 1995, Fall 1996)*
An introduction to the concepts, systems and application of nuclear processes. Topics include radioactivity, fission, fusion, reactor concepts, biological effects of radiation, nuclear propulsion, and radioactive waste disposal. Designed to give students a broad perspective of nuclear engineering and an introduction to fundamentals and applications of nuclear energy.

NE 202 Fundamentals of Nuclear Energy: *(Instructor: Summer 1995 and 1996; TA: Summer 1994)*
Introduction to nuclear energy. Topics include radioactivity, radiation detection, interaction of radiation with matter, nuclear reactions, fission, fusion, nuclear reactors, radiation safety and protection, and laboratory measurement of nuclear radiation.

NE 401 Reactor Analysis and Design: *(TA: Spring 1994, Spring 1995, Spring 1996)*
Elements of nuclear reactor theory for reactor core design and operation. Includes one-group neutron transport and multigroup diffusion models, analytical and numerical criticality search, and flux distribution and calculations for homogeneous and heterogeneous reactors, slowing down and thermalization models and transient isotopics. Laboratory observations and correlation of reactor measurements with theory.

NE 520 Radiation and Reactor Fundamentals: *(TA: Fall 1993)*
An introduction to radiation physics and reactor physics. Atomic and nuclear decay processes, nuclear reactions, neutron slowing down and diffusion, criticality for bare and reflected reactors and reactor kinetics.

Thesis Committees:

Gary B. Zeigler, II “Direct Detection of Microcalcification Pairs in Simulated Digital Mammograms”
Masters Thesis, NC State University, Advised by Prof. K. Verghese, September 2002