

Cole A. Gentry

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SUMMARY

Dr. Cole A. Gentry is a Computational Nuclear Engineer at Oak Ridge National Laboratory (ORNL) in the Reactor and Nuclear Systems Division. His current work focuses primarily on the development and testing of Light Water Reactor (LWR) and advanced reactor simulation capabilities in both the CASL core simulator VERA and the SCALE lattice physics code POLARIS.

Prior to joining ORNL, Dr. Gentry graduated from the University of Tennessee with a B.S. in Nuclear Engineering and worked as a Reactor Engineer at the Sequoyah Nuclear Facility for two years before returning to the University of Tennessee to earn his M.S. and Ph.D. in Nuclear Engineering. His graduate work consisted of analysis of Fully Ceramic Micro-Encapsulated (FCM) Light Water Reactor (LWR) fuel for deep burnup applications, as well as adaptation of the traditional LWR Two-Step procedure to a plate fueled Advanced High Temperature Reactor (AHTR).

Dr. Gentry has been a member of the American Nuclear Society since 2010 and currently serves as the local chapter chair. During his graduate school tenure, he served as the volunteer coordinator for both the 2015 Mathematics and Computation conference and 2015 Nuclear Science Week Big Event. He has authored 6 journal articles, 18 conference papers, and 2 technical reports.

EDUCATION

UNIVERSITY OF TENNESSEE, KNOXVILLE 2012-2016

PhD in Nuclear Engineering and Interdisciplinary Graduate Minor in Computational Science

Dissertation Title: [Development of a Reactor Physics Analysis Procedure for the Plank-Based and Liquid Salt-Cooled Advanced High Temperature Reactor](#)

GPA – 4.0

UNIVERSITY OF TENNESSEE, KNOXVILLE 2010-2012

Master of Science in Nuclear Engineering

Thesis Title: [An Investigation of the use of Ceramic Micro-encapsulated Fuel for Transuranic Waste Recycling in Pressurized Water Reactors](#)

GPA – 4.0

UNIVERSITY OF TENNESSEE, KNOXVILLE 2003-2008

Bachelor of Science in Nuclear Engineering

Summa Cum Laude

GPA – 4.0

PROFESSIONAL EXPERIENCE

COMPUTATIONAL NUCLEAR ENGINEER, ORNL

2018-PRESENT

- Acting as project lead for an investigation into Machine Learning Based Reduced Order Modeling of Multiphysics Reactor Simulations
- Worked on further development of the MPACT secondary source modeling capabilities
- Implemented High Order Depletion capabilities in MPACT
- Developed MPACT interface with the SCALE-POLARIS geometry engine MOONRAKER to support advanced reactor modeling
- Assisted in development of various SCALE-POLARIS features including MOONRAKER geometry engine design and detector response calculations

POST-DOCTORAL RESEARCH ASSOCIATE, ORNL

2016-2018

- Assisted in design and implementation of various capabilities in MPACT to support MSR simulations
- Worked on implementation of an external source driven neutron transport solving capability in MPACT to support secondary source modeling
- Performed code-to-code benchmarking of MPACT, SERPENT 2, and SHIFT using AP1000 lattice models
- Implemented and tested a depletion post-corrector algorithm in MPACT to assist in gadolinium depletion
- Assisted in general upkeep and debugging of MPACT core simulator
- Assisted in design and implementation of an improved ESSM algorithm and new geometry package for Polaris lattice physics code

GRADUATE RESEARCH ASSISTANT, UNIVERSITY OF TENNESSEE

2010-2016

- Worked on the "Fuel and Core Design Options to Overcome the Heavy Metal Loading Limit and Improve Performance and Safety of Liquid Salt Cooled Reactors" NEUP project
- Developed lattice physics to core simulator two-step procedure for full core AHTR simulations
- Performed AHTR lattice design parametric study
- Developed AHTR reactor models in SERPENT 2 and developed supporting python scripts for input generation and output post processing
- Implemented parallelepiped geometries in SERPENT 2 base geometry package and random particle dispersion module
- Implemented improved random particle dispersion algorithm in SERPENT 2
- Setup and performed various full core and lattice simulations for benchmarking of VERA and SERPENT 2
- Performed scaling study of SERPENT 2 on the Cray XT5 Kraken supercomputer
- Developed and presented training material on the VERA module Cobra-TF for the CASL student workshop

- Helped code a SCALE KENO input generator and output post processor for large PWR core models for benchmarking against the CASL VERA core simulator
- Researched PWR FCM fuel design optimization for high burnup of transuranic waste
- Improved previously developed SCALE / NESTLE Peach Bottom reactor model

REACTOR ENGINEER, TENNESSEE VALLEY AUTHORITY

2008-2010

- Performed routine and periodic Pressurized Water Reactor (PWR) reactor engineering activities including flux mapping, reactivity monitoring, estimating reactor criticality conditions, low power physics testing, excore detector calibrations, and developing power maneuvering plans
- Supported fuel movement, fuel inspections, reactor vessel inspections, and other re-fueling outage activities
- Planned, scheduled, and oversaw a critical path laser measurement scanning activity during a refueling outage
- Parsed laser scanning data using CSA PanoMap for 4-Face Fuel Inspection System upgrade
- Acted as lead investigator for an apparent cause analysis
- Developed lecture material for and taught an engineering class on Critical Thinking and Documentation

STUDENT INTERN, TENNESSEE VALLEY AUTHORITY

2004-2007

- Interned with the Corporate Nuclear Fuels Design group, as well as the Sequoyah Nuclear Facility Balance of Plant and Reactor Engineering groups
- Performed video inspections of PWR fuel assemblies for debris and damage
- Assisted in PWR and BWR core / assembly design activities
- Assisted in generating fuel shuffle plans
- Performed component walk-downs of Balance of Plant systems
- Participated in routine Reactor Engineering activities including flux mapping, excore detector calibration, and power maneuvering

HONORS AND AWARDS

- Outstanding Masters Student 2013
- [Innovations in Fuel Cycle Research Award](#) – *Application of Fully Ceramic Micro-Encapsulated Fuel for Transuranic Waste Recycling in PWRs* (2012).
- Top Collegiate Scholar Award 2008
- Outstanding Undergraduate Awards 2003 – 2004, 2004 – 2005, 2005 – 2006
- Tau Beta Pi – Engineering Honor Society

PROFESSIONAL MEMBERSHIPS

AMERICAN NUCLEAR SOCIETY NATIONAL	2010-PRESENT
AMERICAN NUCLEAR SOCIETY LOCAL CHAPTER	2016-PRESENT

PROFESSIONAL SERVICE

- Chapter Chair for American Nuclear Society Local Chapter (2019-Present)
- Chapter Vice Chair for American Nuclear Society Local Chapter (2018-2019)
- Chapter Secretary for American Nuclear Society Local Chapter (2016-2018)
- Volunteer Coordinator for 2015 Nuclear Science Week Big Event
- Volunteer Coordinator for the 2015 Joint International Conference on Mathematics and Computation (M&C), Supercomputing in Nuclear Applications (SNA) and the Monte Carlo (MC) Method

WORKSHOPS AND TRAINING COURSES

- Participating in Construx Software online training courses (2019)
- Construx Software Construction Boot Camp (2018)
- Modeling Experimentation and Validation (MeV) Summer School (2017)
- Modeling Experimentation and Validation (MeV) Summer School (2016)
- Westinghouse Station Nuclear Engineering Course

SKILLS AND PROFICIENCIES

- Coding: C/C++, FORTRAN, Python, MATLAB, Java, OpenMP, MPI
- Neutronics Simulations Tools: VERA, MPACT, SHIFT, SERPENT, MCNP, SCALE, PARCS

PUBLICATIONS

Author or co-author of 6 journal articles, 18 conference proceedings, and 2 technical report.

JOURNAL PUBLICATIONS

1. K. Kim, **C. Gentry**, A. Godfrey, Y. Liu, S. Palmtag. "Development of the multigroup cross section library for the CASL neutronics simulator MPACT: Verification," *Annals of Nuclear Energy*, **132** pp.1-23 (2019).
2. **C. Gentry**, I. Maldonado, K. Kim. "Two-Step Procedure for Liquid Salt Cooled Reactor Analysis," *Nuclear Technology*, **204** pp.299-317 (2018).
3. G. Davidson, T. Pandya, S. Johnson, T. Evans, A. Isotalo, **C. Gentry**, W. Wieselquist. "Nuclide Depletion Capabilities in the Shift Monte Carlo Code," *Annals of Nuclear Energy*, **114** pp.259-276 (2018).
4. **C. Gentry**, I. Maldonado, O. Chvala, B. Petrovic. "Neutronic Evaluation of a Liquid Salt-Cooled Reactor Assembly," *Nuclear Science and Engineering*, **187** pp.166-184 (2017).

5. N. Brown, B. Betzler, J. Carbajo, A. Wysocki, M. Greenwood, **C. Gentry**, A. Qualls. "Preconceptual Design of a Fluoride High Temperature Salt-Cooled Engineering Demonstration Reactor: Core Design and Safety Analysis," *Annals of Nuclear Energy*, **103** pp.49-59 (2017).
6. **C. Gentry**, I. Maldonado, A. Godfrey, K. Terrani, J. Gehin, J. Powers. "A Neutronic Investigation of the Use of Fully Ceramic Microencapsulated Fuel for Pu/Np Burning in PWRs," *Nuclear Technology*, **186** pp.60-75 (2014).

REFEREED CONFERENCE PROCEEDINGS

1. **C. Gentry**, A. Godfrey, E. Davidson, G. Ilas, B. Collins, S. Hart, K.S. Kim, T. Pandya, K. Royston, G. Davidson, S. Johnson, T. Evans, G. Wolfram, S. Palmtag. "Source Range Detector Response Modeling Using VERA," *Proc. Global/Top Fuel 2019*, Seattle, Washington (September 22-26, 2019).
2. A. Graham, B. Collins, R. Salko, Z. Taylor, **C. Gentry**. "Development of Molten Salt Reactor Modeling and Simulation Capabilities in VERA," *Proc. Global/Top Fuel 2019*, Seattle, Washington (September 22-26, 2019).
3. **C. Gentry**, M. Jessee, K. Kim. "Improvements in the Polaris Implementation of the Embedded Self-Shielding Method," *Proc. PHYSOR 2018*, Cancun, Mexico (April 22-26, 2018).
4. K. Kim, Y. Liu, **C. Gentry**. "Simplified AMPX Library Capability of the CASL Neutronics Simulator MPACT," *Proc. PHYSOR 2018*, Cancun, Mexico (April 22-26, 2018).
5. A. Mohamed, **C. Gentry**, A. Godfrey, F. Franceschini. "VERA MPACT Depletion Validation for a Variety of PWR Fuel Types and Burnable Absorbers," *Proc. PHYSOR 2018*, Cancun, Mexico (April 22-26, 2018).
6. **C. Gentry**, B. Betzler, B. Collins. "Initial Benchmarking of ChemTriton and MPACT MSR Modeling Capabilities," *Trans. Am. Nucl. Soc.*, (2017).
7. **C. Gentry**, B. Collins, A. Godfrey. "Modeling of Subcritical PWR with Fixed Neutron Source Using MPACT," *Trans. Am. Nucl. Soc.*, (2017).
8. M. Jessee, W. Wieselquist, **C. Gentry**, U. Mertyurek. "BWR Geometry Enhancements for the Polaris Lattice Physics Code," *Trans. Am. Nucl. Soc.*, (2017).
9. B. Collins, **C. Gentry**, A. Wysocki, R. Salko. "Molten Salt Reactor Simulations using MPACT-CTF," *Trans. Am. Nucl. Soc.*, **116**, pp. 1170-1173 (2017).
10. B. Collins, **C. Gentry**, S. Stimpson. "Molten Salt Reactor Simulations Using VERA-CS," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).
11. **C. Gentry**, A. Godfrey, T. Pandya, G. Davidson, F. Franceschini. "AP1000 Benchmarking of VERA Neutronics Toolset," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).
12. A. Godfrey, B. Collins, **C. Gentry**, J. Ritchie. "Analysis of the Startup of Watts Bar Nuclear Unit 2 using VERA," *Proc. M&C 2017*, Jeju, Korea (April 16-20, 2017).
13. **C. Gentry**, I. Maldonado, K. Kim. "Development of Two-step Reactor Physics Analysis Procedure for Advanced High Temperature Reactors," *Proc. PHYSOR 2016*, Sun Valley, Idaho, USA (May 1-5, 2016).
14. F. Franceschini, D. Salazar, M. Ouisloumen, A. Godfrey, S. Stimpson, B. Collins, **C. Gentry**. "AP1000 PWR Cycle 1 HFP Depletion Simulations with VERA-CS," *Proc. PHYSOR 2016*, Sun Valley, Idaho, USA (May 1-5, 2016).
15. **C. Gentry**, I. Maldonado, O. Chvala. "Burnable Poison Reactivity Control for the Advanced High Temperature Reactor," *Trans. Am. Nucl. Soc.*, **113**, pp. 1265-1267 (2015).

16. **C. Gentry**, , N. George, O. Chvala, I. Maldonado, S. Lewis, P. Avigni, B. Petrovic. “Core Physics Parametric Studies for Liquid Salt Cooled Reactors,” *Trans. Am. Nucl. Soc.*, **108**, pp. 831-833 (2013).
17. **C. Gentry**, N. George, I. Maldonado, A. Godfrey, K. Terrani, J. Gehin. “Application of Fully Ceramic Micro-Encapsulated Fuels in Light Water Reactors,” *Proc. ICAPP 2012*, Chicago, Illinois, USA (June 24-28, 2012).
18. **C. Gentry**, I. Maldonado, A. Godfrey, K. Terrani, J. Gehin. “Application of Fully Ceramic Micro-Encapsulated Fuel for Transuranic Waste Recycling in PWRs,” *Proc. PHYSOR 2012*, Knoxville, Tennessee, USA (April 15-20, 2012).

TECHNICAL REPORTS

1. K. Kim, M. Williams, D. Wiarda, **C. Gentry**, A. Godfrey, K. Clarno, Y. Liu, S. Palmtag, “Verification and Validation of the ENDF/B-VII.1v4.3m1 MPACT 51-Group Cross Section Library,” US DOE, CASL-U-2018-1528-000.
2. A. Godfrey, B. Collins, **C. Gentry**, S. Stimpson, J. Ritchie. “Watts Bar Unit 2 Startup Results with VERA,” CASL-U-2017-1306-000, Oak Ridge National Laboratory (March 31, 2017).