Kathryn D. Huff

Contact Information

Blue Waters Assistant Professor
University of Illinois, Urbana-Champaign
Nuclear, Plasma, and Radiological Engineering
Affiliate Faculty, National Center for Supercomputing Applications

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Research Interests

Advanced nuclear reactors and fuel cycles, multi-physics simulation, nuclear fuel cycle analysis, scientific computation.

PhD

University of Wisconsin - Madison, Nuclear Engineering **Aug 2008 – Aug 2013**

- An Integrated Used Fuel Disposition and Generic Repository Model for Fuel Cycle Analysis
- Advisor: Professor Paul P.H. Wilson

BA

University of Chicago, Physics **Aug 2004 – Jun 2008**

- Celestial Gain Calibrations of QUIET Telescope Polarimeters

Honors and Awards

American Nuclear Society, Young Member Excellence Award	**2016**
National Energy Research Scientific Computing Allocation, Senior Investigator	**2015–2016**
Data Science Fellowship, Berkeley Institute for Data Science, UC Berkeley	**2014–2016**
Nuclear Science and Security Consortium Postdoctoral Fellowship, UC Berkeley	**2013–2016**
DOE Office of Science Laboratory Graduate Appointment, Argonne National Lab	**2011–2013**
Roy G Post Foundation Nuclear Waste Management Graduate Scholarship	**2011**
John Randall Memorial Scholarship, American Nuclear Society FCWMD	**2009**
J.A McDeavitt Scholarship, University of Chicago, Chicago, IL	**2007–2008**
University Scholar Award, University of Chicago, Chicago, IL	**2004–2008**
Los Alamos Distinguished Student Performance Award, Los Alamos National Lab	**2004**

Research Experience

University of Illinois at Urbana-Champaign, Urbana, IL
Assistant Professor, Nuclear Plasma and Radiological Engineering **Aug 2016 – Present**
Blue Waters Asst. Prof., National Center for Supercomputing Applications **Aug 2016 – Present**
Principal investigator, advanced reactors and fuel cycles group.

University of California - Berkeley, NE Dept., Berkeley, CA
Postdoctoral Scholar, Nuclear Science and Security Consortium **Sep 2013 – Jul 2016**
Data Science Fellow, Berkeley Institute for Data Science **Aug 2014 – Jul 2016**
Developing computational tools and multiphysics models for advanced reactor safety analysis.

Argonne National Laboratory, Argonne, IL **Jun 2011 – Aug 2013**
Laboratory Graduate Research Appointee, Used Fuel Disposition Campaign
Developed a used fuel disposition and generic repository computational model.

University of Wisconsin - Madison, NEEP Dept., Madison, WI **Jun 2008 – Aug 2013**
Graduate Research Assistant, Computational Nuclear Engineering Research Group
Developed and applied Cyclus, a nuclear fuel cycle systems analysis tool.

Idaho National Laboratory, Idaho Falls, ID **Jun – Aug 2010**
Graduate Research Assistant, Systems Analysis Campaign
Developed software functions and requirements for the Fuel Cycle Simulator concept.

Kavli Institute For Cosmological Physics, Chicago, IL **Jan 2005 – Jun 2008**
Research Assistant, Laboratory for Astrophysics and Space Research
Programmed & machined instrumentation. Planned protocol for QUIET polarimeter calibration.

Universidad de Chile, Physics Dept., Santiago, Chile **Jun – Sep 2006**
Research Assistant, Chicago-Chile Research Exchange Program
Constructed and operated a far-from-equilibrium granular materials experiment.

Los Alamos Neutron Science Center, Los Alamos, NM **Jun – Sep 2004**
Research Assistant, LANSCE-3 **May – Aug 2003**
Applied digital filtration algorithms and MCNPX models to experimental data.

BOOKS

[1] Scopatz, A., **Huff, K.**. "Effective Computation in Physics: Field Guide to Research in Python" O'Reilly Media. 2015. shop.oreilly.com/product/0636920033424.do.

BOOK CHAPTERS

[2] **Huff, K.**. "Case Study: Cyclus Project," in The Practice of Reproducible Research, 1st ed., Justin Kitzes, Fatma Imamoglu, and Daniel Turek, Eds. University of California, Berkeley: University of California Press. 2017.

[3] **Huff, K.**. "Lessons Learned," in The Practice of Reproducible Research, 1st ed., Justin Kitzes, Fatma Imamoglu, and Daniel Turek, Eds. University of California, Berkeley: University of California Press. 2017.

JOURNAL PUBLICATIONS

[4] Andreades, C., Cisneros, A.T., Choi, J.K., Chong, A.Y., Fratoni, M., Hong, S., Huddar, L.R., **Huff, K.**, Kendrick, J., Krumwiede, D.L., Laufer, M., Munk, M., Scarlat, R.O., Wang, X., Zwiebaum, N., Greenspan, E. and P. Peterson. "Design Summary of the Mark-I Pebble-Bed, Fluoride SaltCooled, High-Temperature Reactor Commercial Power Plant," **Nuclear Technology**, vol. 195, no. 3, pp. 222-238, Sep. 2016.

[5] **Huff, K.**, Gidden, M., Carlsen, R., Flanagan, R., McGarry, M., Opotowsky, A., Schneider, E., Scopatz, A., Wilson, P. "Fundamental Concepts in the CYCLUS Nuclear Fuel Cycle Simulation Framework." **Advances in Engineering Software**, vol. 94, pp. 4659, Apr. 2016.

[6] Aruliah, D.A., Brown, C.T., Chue Hong, N.P., Davis, M., Guy, R.T., Haddock, S.H.D., **Huff, K.**, Mitchell, I., Plumbley, M., Waugh, B., White, E.P., Wilson, G.V., and Wilson, P.P.H. "Best Practices For Scientific Computing." **PLOS Biology**, Vol 1, Issue 12, 2014. dx.doi.org/10.1371/journal.pbio.1001745

[7] Clerc, M., Dunstan, J., **Huff, K.**, Mujica, N., Varas, G. "Liquid-Solid-Like Transition in Quasi-One-Dimensional Driven Granular Media ", **Nature Physics**, Vol 4, 249 - 254, 2008.

SUBMITTED

[8] **Huff, K.** "Rapid Methods for Radionuclide Contaminant Transport in Nuclear Fuel Cycle Simulation", 2015. **(submitted)**

REFEREED CONFERENCE PROCEEDINGS

[9] **Huff, K.**, Bae, J., Mummah, K., Flanagan, R., Scopatz, A. "Current Status of Predictive Transition Capability in Fuel Cycle Simulation" **GLOBAL 2017 International Nuclear Fuel Cycle Conference**, Seoul, South Korea. September 2017.

[10] Bae, J., Roy, W., **Huff, K.**. "Benefits of Siting a Borehole Repository on Non-Operating Nuclear Facility" Paper 19727. **International High-Level Radioactive Waste Management Converence (IHLRWM 2017)**, Charlotte, NC. April 2017.

[11] Wang, X., **Huff, K.**, Aufiero, M., Peterson, P., Fratoni, M. "Coupled reactor kinetics and heat transfer model for nuclear reactor transient analysis." Paper 60728. **24th International Conference on Nuclear Engineering (ICONE24)**, Charlotte, NC. June 2016.

[12] Wang, X., **Huff, K.**, Aufiero, M., Peterson, P., Fratoni, M. "A sensitivity study of a coupled kinetics and thermal-hydraulics model for Fluoride-salt-cooled, High-temperature Reactor (FHR) transient analysis." **The International Congress on Advances in Nuclear Power Plants (ICAPP)**, San Francisco, CA. April 2016.

[13] Greenberg, H., Fratoni, M., Djokic, D., **Huff, K.**, Nibbelink, R., Scopatz, A. "The Application of CYCLUS to Fuel Cycle Transition Modeling" Paper 5061. **Proceedings of Global**, Paris, France. September 2015.

[14] **Huff, K.**, "PyRK: Python for Reactor Kinetics." **Proceedings of the 14th Python in Science Conference**, Austin, TX. July 2015.

[15] Krumwiede, D.L., Andreades, C., Choi, J.K., Cisneros, A.T., Huddar, L., **Huff, K.**, Laufer, M.D., Munk, M., Scarlat, R.O., Seifried, J.E., Zweibaum, N., Greenspan, E., Peterson, P.F. "Design of the Mark-I Pebble-Bed, Fluoride-Salt-Cooled, High-Temperature Reactor Commercial Power Plant," Paper 14231. **Proceedings of ICAPP**, Charlotte, NC. April 2014.

[16] **Huff, K.** "Cyclus Fuel Cycle Simulation Capabilities with the Cyder Disposal System Model," Paper 7730. **Proceedings of Global**, Salt Lake City, UT. October 2013.

[17] Gidden, M., Wilson, P., **Huff, K.**, Carlsen, R. "An Agent-Based Framework for Fuel Cycle Simulation with Recycling," Paper 7737. **Proceedings of Global**, Salt Lake City, UT. October 2013.

[18] **Huff, K.**, Nutt, M. "Hydrologic Nuclide Transport Models in Cyder, a Geologic Disposal Software Library," Paper 13328. **Proceedings of the Waste Management Symposium**, Phoenix, AZ. February 2013.

[19] Oliver, K.M., Wilson, P.P.H., Reveillere, A., **Huff, K.** "Studying international fuel cycle robustness with the GENIUSv2 discrete facilities/materials fuel cycle systems analysis tool ", Paper 9166. **Proceedings of Global**, Paris, France. 2009.

[20] Rochman, D., Haight, R. C., Wender, S. A., O'Donnell, J. M., Michaudon, A., **Huff, K.**, Vieira, D. J., Bond, E., Rundberg, R.S., Kronenberg, A., Wilhelmy, J., Bredeweg, T. A., Schwantes, J., Ethvignot, T., Granier, T., Petit, M., Danon, Y. "First Measurements with a Lead Slowing-Down Spectrometer at LANSCE," **AIP Conference Proceedings, International Conference on Nuclear Data for Science and Technology.** Volume 769. 2005.

Refereed Conference Abstracts

[21] **Huff, K.**, Scopatz, A. "Modernizing Computational Nuclear Engineering Education – In the Open" **Transactions of the American Nuclear Society Winter Conference.** Washington, DC. November 2015.

[22] **Huff, K.**, Fratoni, M., Greenberg, H. "Extensions to the CYCLUS Ecosystem in Support of Market-Driven Transition Capability" **Transactions of the American Nuclear Society Winter Conference.** Anaheim, CA. November 2014.

[23] Bates, C., Biondo, E., **Huff, K.**, Kiesling, K., Scopatz, A. "PyNE Progress Report" **Transactions of the American Nuclear Society Winter Conference.** Anaheim, CA. November 2014.

[24] **Huff, K.**, Bara, A. "Dynamic Determination of Thermal Repository Capacity For Fuel Cycle Analysis." **Transactions of the American Nuclear Society Annual Conference.** Atlanta, GA. June 2013.

[25] **Huff, K.**, Nutt, M. "Key Processes and Parameters in a Generic Clay Disposal System Model." **Transactions of the American Nuclear Society Winter Conference.** San Diego, CA. November 2012.

[26] Scopatz, A.M., Romano, P.K., Wilson, P.P.H., **Huff, K.** "PyNE: Python For Nuclear Engineering." **Transactions of the American Nuclear Society Winter Conference.** San Diego, CA. November 2012.

[27] **Huff, K.**, Bauer, T. "Numerical Calibration of an Analytical Generic Nuclear Repository Heat Transfer Model." **Transactions of the American Nuclear Society Annual Conference.** Chicago, IL. June 2012.

[28] **Huff, K.**, Gidden, M., Wilson, P.P.H. "Open architecture and modular paradigm of Cyclus, a fuel cycle simulation code." **Transactions of the American Nuclear Society Annual Conference.** Hollywood, FL. June 2011.

[29] **Huff, K.**, Scopatz, A., Preston, N., Wilson, P.P.H. "Rapid Peer Education of a Computational Nuclear Engineering Skill Suite." **Transactions of the American Nuclear Society Annual Conference.** Hollywood, FL. June 2011.

[30] **Huff, K.** "Cyclus: An Open, Modular, Next Generation Fuel Cycle Simulator Platform. " (poster) **Waste Management Symposium.** Phoenix, AZ. March 2011.

[31] **Huff, K.**, "MOX Fuel Recipe Approximation Tests in GENIUSv2. " **Proceedings of the American Nuclear Society Student Conference.** Ypsilanti, MI. April 2010.

[32] **Huff, K.**, Oliver, K., Wilson, P.P.H. "GENIUSv2 Discrete Facilities/Materials Modeling of International Fuel Cycle Robustness. " **Transactions of the American Nuclear Society Winter Conference.** Washington D.C. November 2009.

[33] **Huff, K.**, Wilson, P.P.H., Oliver, K. "GENIUS Version 2: Modelling the Worldwide Nuclear Fuel Cycle." (poster) **eHub Conference.** University of Wisconsin - Madison. November 2009.

Technical Reports

[34] C. Andreades, A. T. Cisneros, J.K. Choi, A.Y.K. Chong, D. L. Krumwiede, L.R. Huddar, **K. Huff**, M. R. Laufer, M.O. Munk, R.O. Scarlat, J. Seifried, N. Zweibaum, E. Greenspan, and P. F. Peterson, "Technical Description of the Mark 1 Pebble-Bed Fluoride-Salt-Cooled High-Temperature Reactor (PB-FHR) Power Plant," **U.C. Berkeley Nuclear Engineering**, Report UCBTH-14-002, 2014.

[35] **Huff, K.**, Nutt, W.M. "FY12 Sensitivity Studies Using the UFD Clay Generic Disposal System Model." **Argonne National Laboratory**. July 2012.

[36] **Huff, K.**, Bauer, T.H. "Benchmarking a New Closed-Form Thermal Analysis Technique Against a Traditional Lumped Parameter, Finite-Difference Method" **Argonne National Laboratory**. (FCRD-UFD-2012-000142). July 2012.

[37] **Huff, K.**, Dixon, B., Braase, L. "Next Generation Fuel Cycle Simulator Functions and Requirements Document." **Idaho National Laboratory** (FCRD-SYSA-2010-000110). July 2010.

[38] **Huff, K.** "Digital Filtering Application to the Lead Slowing Down Spectrometer." Los Alamos Neutron Science Center. August 2004. (**awarded los alamos distinguished student award.**)

[39] **Huff, K.** "Excess Single Event Effects in the Second Chip of a Series." Los Alamos Neutron Science Center. August 2003.

Other Publications

[40] **Huff, K.** An Integrated Used Fuel Disposition and Generic Repository Model for Fuel Cycle Analysis. Ph.D. Dissertation–Nuclear Engineering and Engineering Physics. University of Wisconsin – Madison. August 2013.

[41] **Huff, K.** "Celestial Calibrations of the Quiet Telescope." Undergraduate Honors Thesis. University of Chicago. June 2008.

[42] Biris, O., Gracey, K., **Huff, K.**, Ng, W.K. "An Analysis of the Consolidated Fuel Treatment Center Nuclear Reprocessing Initiative." **Big Problems Energy Seminar. University of Chicago.** June 2008.

Software Products

[43] **Huff, K.**. "PyRK v0.1" **figshare.** http://dx.doi.org/10.6084/m9.figshare.1540727. September 2015.

[44] Bates, C., Biondo, E., Brachem, C., Carlsen, R., Cary, J., Davis, A., Dembia, C., Elfring, M., Flanagan, R., Gidden, M., Haines, T., Howland, J., Huff, B., **Huff, K.**, Jackson, S., Kiesling, K., Klebenow, M., Kuett, M., Manalo, K., M. McCormick, A. Opotowsky, C., Pavlovsky, R., Rabbani, M., Relson, E., Romano, P., Scopatz, A., Shriwise, P., Slaybaugh, R., Wilson, P., Xia, J., J. Zachman, C., and Zweig, M. "PyNE v0.5." **github**. github.com/pyne/pyne/releases/tag/0.5.0. April 2015.

[45] Carlsen, R., Gidden, M. **Huff, K.**, Opotowsky, A., Rakhimov, O., Scopatz, A., Welch, Z., Wilson, P. "Cyclus v1.0.0." **figshare.** http://dx.doi.org/10.6084/m9.figshare.1041745. June 2014.

[46] Carlsen, R., Gidden, M. **Huff, K.**, Opotowsky, A., Rakhimov, O., Scopatz, A., Welch, Z., Wilson, P. "Cycamore v1.0.0." **figshare.** http://dx.doi.org/10.6084/m9.figshare.1041829. June 2014.

Selected Invited Talks

SciPy 2017, Scientific Python Conference, Austin, TX, *Keynote*.	**Jul 12, 2017**
PyCon 2017, Portland, OR. *Keynote*.	**May 19, 2017**
U. Illinois, Computational Science and Engineering, *Seminar*.	**Feb 2, 2017**
U. Illinois, AE3 Lightning Symposium, *Lightning Talk*.	**Mar 2, 2017**
U. Illinois, Nuclear, Plasma, & Radiological Engineering, *Undergraduate Seminar*.	**Feb 14, 2017**
U. California, Berkeley, Berkeley Institute for Data Science, *Symposium*.	**Jan 27, 2017**
U. Illinois, Informatics, *Seminar*.	**Oct 13, 2016**
PyData 2016, Chicago, IL. *Keynote*.	**Aug 27, 2016**
Oak Ridge National Laboratory, RPNSD, *Seminar*.	**Mar 3, 2016**
U. Tennessee, Knoxville, Nuclear Engineering, *Seminar*.	**Mar 2, 2016**
Michigan State, Computational, Mathematics, Science, and Engineering, *Seminar*.	**Dec 15, 2015**
U. Illinois, Nuclear, Plasma, & Radiological Engineering, *Seminar*.	**Dec 8, 2015**
SC15, Austin TX, Python in High Performance Computing workshop, *Keynote*.	**Nov 15, 2015**
U. Illinois, National Center for Supercomputing Applications, *Colloquium*.	**Nov 6, 2015**
North Carolina State University, Nuclear Engineering, *Colloquium*.	**Oct 15, 2015**
Texas A&M University, Nuclear Engineering, *Colloquium*.	**Sep 29, 2015**
Rensselaer Polytechnic Inst, Mechanical and Nuclear Engineering, *Colloquium*.	**Sep 21, 2015**
U. Washington, What Can Academia Learn from Open Source?, *Panel*.	**Feb 2, 2015**

Engineering Teaching

University of Illinois at Urbana-Champaign, **Fall 2016**
Dept. of Nuclear, Plasma, and Radiological Engineering
NPRE 412, Nuclear Power Economics and Fuel Management

University of California, Berkeley, Dept. of Nuclear Engineering **Apr 1,3,22, 2015**
NE 155, Introduction to Numerical Simulations in Radiation Transport
Point Reactor Kinetics, Monte Carlo Methods

University of California, Berkeley, Dept. of Nuclear Engineering **Sep 11, 2014**
NE 255, Numerical Simulation in Radiation Transport
Best Practices in Computational Nuclear Engineering

University of Wisconsin - Madison, Dept. of Nuclear Engineering **Apr 1&3, 2013**
NE 571, Economic and Environmental Aspects of Nuclear Energy
Nuclear Waste Repository Technology, Policy, and History

University of Wisconsin - Madison, Dept. of Nuclear Engineering **Sep 9&11, 2009**
NE 406, Nuclear Reactor Analysis
UNIX Shell, Basic Scripting, Environment Variables, Permissions, Regular Expressions, Makefiles

University of Wisconsin - Madison, Dept. of Nuclear Engineering **Feb 10, 2010**
NE 506, Practicum in Monte Carlo Radiation Transport
UNIX Shell, Basic Scripting, Environment Variables, Permissions, Regular Expressions, Makefiles

Invited Scientific Computing Teaching

SciPy Conference, Austin, TX **Jul 6–7, 2015**
Introductory Python For Scientific Software

University of Split, Split, Croatia **Sep 8–13, 2014**
G-Node Advanced Scientific Programming in Python Summer School

SciPy Conference, Austin, TX **Jun 25, 2013**
Version Control and Unit Testing For Scientific Software

University of Chicago, Graduate School, Chicago, IL **Jan 12–13, 2013**
Computational Literacy Workshop

University of California, Berkeley, Berkeley, CA **Oct 20–21, 2012**
Department of Statistics Scientific Computing Workshop

Lawrence Berkeley National Laboratory, Berkeley, CA **Oct 17–18, 2012**
Software Carpentry Python Workshop

International Center for Theoretical Physics, Trieste, Italy **Feb 20–Mar 2, 2012**
UNESCO/IAEA Advanced School on Scientific Software Development

University of Toronto, Toronto, ON, Canada **Nov 7–8, 2011**
SciNet Consortium For High Performance Computing Software Carpentry Bootcamp

American Nuclear Society Winter Meeting, Washington, D.C. **Nov 1, 2011**
Young Professionals Congress Hacker Within Scientific Computing Tutorial

Michigan State University, East Lansing, MI **Jun 4–5, 2011**
Institute for Cyber Enabled Research (iCER) and BEACON Center THW Bootcamp

Scientific Computing Teaching

Berkeley Institute for Data Science, Berkeley, CA **Jan 14–15, 2015**
Managing Databases in SQL

Berkeley Institute for Data Science, Berkeley, CA **Jun 4–5, 2015**
Testing for Scientific Software

Lawrence Berkeley National Laboratory, Berkeley, CA **Apr 14–15, 2014**
Women in Science and Engineering Bootcamp

The University of Chicago, Chicago, IL **Apr 2–3, 2012**
Software Carpentry Scientific Computing Workshop

The University of Wisconsin, Madison, WI **Jan 12–14, 2011**

The Hacker Within Software Carpentry Bootcamp

The University of Wisconsin, Madison, WI **Jan 12–14, 2010**
The Hacker Within Python Bootcamp

The University of Wisconsin, Madison, WI **Mar 24–31, 2009**
The Hacker Within C++ Bootcamp

The University of Wisconsin, Madison, WI **Jan 12–15, 2009**
University of Wisconsin, Hacker Within UNIX Bootcamp

Scientific Computing Skills

Languages	bash/csh, C++, FORTRAN, Perl, Python, XML
Build Systems	make, CMake, automake
Databases	HDF5, SQL
Test Frameworks	CTest, GoogleTest, nose
Version Control	cvs, git, hg, svn
Other Tools	Doxygen, Sphinx, GoldSim, LaTeX, Mathematica, MatLab, MCNP, MOOSE

Editing and Reviewing

Editor
Journal of Open Source Software **2016**
Proceedings of the SciPy Scientific Python Conference **2013 & 2015**

Manuscript Referee
Annals of Nuclear Energy
Journal of Nuclear Energy Science and Power Generation Technology
Nuclear Engineering and Design
Nuclear Science and Engineering
Nuclear Technology
Progress in Nuclear Energy

Grant Proposal Referee
Department of Energy Nuclear Energy University Programs
Alfred P. Sloan Foundation

Book Proposal Referee
O'Reilly Media
Elsevier

Professional Service

Technical Program Committee, IHLRWM Conference **2017**
Chair, Fuel Cycle & Waste Management Division, ANS **2016–2017**
Vice Chair, Fuel Cycle & Waste Management Division, ANS **2015–2016**
Chair, Steering Committee, Software Carpentry Foundation **2014–2015**
Secretary–Treasurer, Fuel Cycle & Waste Management Division, ANS **2013–2015**
Secretary, Young Members Group, ANS **2013–2014**
Technical Program Co-Chair, SciPy, Scientific Python Conference **2013–2014**
Member, Next Generation Leadership Committee, Waste Management Symposium **2013–2014**
Moderator, Organizer, Panelist, inSCIght Scientific Computing Podcast **2011–2013**
Co-Founder, Nuclear Pride, LGBTQA Organization **2011–2013**
Co-Founder, Treasurer, President, Hacker Within Scientific Computing Group **2008–2011**
Governor, Treasurer, University of Wisconsin ANS student section **2008–2010**