Andrei Rykhlevskii, Ph.D.

Contact Information	Nuclear Engineer	mobile: (217) 305-2385
	Argonne National Laboratory	e-mail: andrewryh@gmail.com
	Research and Test Reactors	

Research Interests	Advanced nuclear systems modeling/optimization, fast spectrum reactor designs, closed fuel cycle, data-driven optimization, stochastic neutronics, uncertainty quantification

PhD

University of Illinois at Urbana-Champaign, Nuclear Engineering **Aug 2016 − Aug 2020**
- Fuel processing simulation tool for liquid-fueled nuclear reactors
- Advisor: Professor Kathryn D. Huff
- Concentration in Computational Science and Engineering

MSc

University of Illinois at Urbana-Champaign, Nuclear Engineering **Aug 2016 − May 2018**
- Advanced online fuel reprocessing simulation for thorium-fueled Molten Salt Breeder Reactor
- Advisor: Professor Kathryn D. Huff

MSc

Financial University - Moscow, Russia, Financial Management   **Oct 2011 − Mar 2014**
- Using stock market tools for IT-industry investments

BSc

Bauman Moscow State Technical University, Nuclear Engineering **Sep 2004 − Jun 2010**
- Calculating structural materials activation for VVER-1200 decommissioning
- Majors: Nuclear Fuel Cycle, Computational Reactor Physics

Research Experience

Argonne National Laboratory, Lemont, IL
Nuclear Engineer, Core Design & Safety Analysis Group   **Jun 2021 − present**
Postdoctoral Appointee, Core Design & Safety Analysis Group   **Sep 2020 − Jun 2021**
- Performing neutronics calculations for research reactors to support conversion from HEU to LEU
- Developing tools for pre- and post-processing to facilitate MCNP and VESTA computations
- Analyzing reactivity initiated accidents in Belgian Reactor 2 (BR2)
- Designing irradiation experiments for new fuel designs

University of Illinois at Urbana-Champaign, Urbana, IL
Graduate Research Assistant, Advanced Reactors and Fuel Cycles Group **Aug 2016 − Aug 2020**
- Developed computational tools and models for advanced reactors and fuel cycles
- Investigated load-following capabilities of MSRs
- Modeled MSR neutronics using Monte Carlo code Serpent
- Created MSR models in multi-physics environment MOOSE
- Generated problem-oriented nuclear data libraries using Serpent, SCALE, OpenMC

Oak Ridge National Laboratory, Oak Ridge, TN
NESLS Intern − Reactor Physics Group   **May 2018 − Aug 2018**
- Developed a various Fast Spectrum Molten Salt Reactor neutronics models (SCALE, Serpent)
- Implemented and tested continuous online separation and feeds for MSR
- Analyzed MSR fuel cycle performance in comparison with Sodium-cooled Fast Reactors

OKB GIDROPRESS (State Atomic Energy Corporation "ROSATOM"), Russia
Lead Engineer   **Dec 2015 − Jul 2016**
Extending life cycle of Nuclear Power Plants (NPP) with VVER-440

BUKO Ltd, Podolsk, Russia   **Sep 2014 − Dec 2015**
Financial analyst
Developed and applied robots (C#, VB) for algorithmic trading

Svyaz Standart Ltd, Podolsk, Russia   **Feb 2012 − Aug 2014**
Chief Technology Officer
Designed and managed Internet Service Provider (ISP) metro networks

OKB GIDROPRESS (State Atomic Energy Corporation "ROSATOM"), Russia
Nuclear Engineer   **Nov 2009 − Feb 2012**
- Performed neutronics calculations for expending operation period of Balakovo and Kola NPPs
- Analyzed decommissioning for the Preliminary Safety Analysis Report of Belene NPP, Bulgaria
- Performed simulations for V&V and certification of KATRIN-2.0 deterministic S_N code
- Developed a MATLAB code for processing neutron flux data collected from NPPs

HONORS AND AWARDS		
	Kuck Computational Science & Engineering Scholarship	**2019-2020**
	American Nuclear Society, John and Muriel Landis Scholarship	**2017-2020**
	Podolsk city council innovative entrepreneurship award	**2014**
	Graduated FU with high distinction (highest graduation honor)	**2014**
	Graduate scholarship for excellent students, FU	**2013**
	Research achievement award, OKB GIDROPRESS	**2011**
	Academic scholarship for distinguished student, BMSTU	**2008–2010**
	Student Professional Society scholarship, BMSTU	**2004–2010**

BOOKS

[1] Dolan, T.J., Pázsit, I., **Rykhlevskii, A.**, Yoshioka, R. (In press) "Molten Salt Reactors and Thorium Energy." Science & Technology Books Elsevier, Cambridge, MA, United States, 2023.

JOURNAL PUBLICATIONS

[2] Ashraf, O., **Rykhlevskii, A.**, Tikhomirov, G.V., Huff, K.D. "Preliminary design of control rods in the single-fluid double-zone thorium molten salt reactor (SD-TMSR)." **Annals of Nuclear Energy**, vol. 152. `https://doi.org/10.1016/j.anucene.2020.108035`, March 2021.

[3] Ashraf, O., **Rykhlevskii, A.**, Tikhomirov, G.V., Huff, K.D. "Strategies for thorium fuel cycle transition in the SD-TMSR." **Annals of Nuclear Energy**, vol. 148. `https://doi.org/10.1016/j.anucene.2020.107656`, December 2020.

[4] Bae, J.W., **Rykhlevskii, A.**, Chee, G., Huff, K.D. "Deep Learning Approach to Nuclear Fuel Transmutation in a Fuel Cycle Simulator." **Annals of Nuclear Energy**, vol. 139. `https://doi.org/10.1016/j.anucene.2019.107230`, May 2020.

[5] Ashraf, O., **Rykhlevskii, A.**, Tikhomirov, G.V., Huff, K.D. "Whole core analysis of the single-fluid double-zone thorium molten salt reactor (SD-TMSR)." **Annals of Nuclear Energy**, vol. 137. `https://doi.org/10.1016/j.anucene.2019.107115`, March 2020.

[6] **Rykhlevskii, A.**, Bae, J.W., Huff, K. "Modeling And Simulation of Online Reprocessing in the Molten Salt Breeder Reactor." **Annals of Nuclear Energy**, vol. 128, Pages 366 - 379. `https://doi.org/10.1016/j.anucene.2019.01.030`, June 2019.

[7] Lindsay, A., Ridley, G., **Rykhlevskii, A.**, Huff, K. "Introduction to Moltres: an Application for Simulation of Molten Salt Reactors." **Annals of Nuclear Energy**, vol. 114, Pages 530 - 540. `doi.org/10.1016/j.anucene.2017.12.025`, April 2018.

REFEREED CONFERENCE PROCEEDINGS

[8] **Rykhlevskii, A.**, O'Grady, D., Kozlowski, T., Huff, K. "The Impact of Xenon-135 on Load Following Transatomic Power Molten Salt Reactor." **Transactions of the American Nuclear Society Winter Meeting.** Washington, DC, United States, 2019.

[9] Park, S.M., **Rykhlevskii, A.**, Huff, K. "Safety Analysis of the Molten Salt Fast Reactor Fuel Composition Using Moltres." **Proc. GLOBAL International Fuel Cycle Conference.** Seattle, WA, United States, September 2019.

[10] Betzler, B.R., **Rykhlevskii, A.**, Worrall, A., Huff, K. "Impacts of Fast Spectrum Molten Salt Reactor Characteristics on Fuel Cycle Performance." **Proc. GLOBAL International Fuel Cycle Conference.** Seattle, WA, United States, September 2019.

[11] **Rykhlevskii, A.**, Betzler, B.R., Worrall, A., Huff, K. "Fuel Cycle Performance of Fast Spectrum Molten Salt Reactors designs." **Proc. M&C 2019 - International Conference on Mathematics & Computational Methods Applied to Nuclear Science and Engineering.** Portland, OR, United States, August 25-29, 2019.

[12] **Rykhlevskii, A.**, Lindsay, A., Huff, K. "Full-Core Analysis of Thorium-Fueled Molten Salt Breeder Reactor using the SERPENT 2 Monte Carlo code." **Transactions of the American Nuclear Society Winter Meeting.** Washington, DC, United States, 2017.

[13] **Rykhlevskii, A.**, Lindsay, A., Huff, K. "Online Reprocessing Simulation for Thorium-Fueled Molten Salt Breeder Reactor." **Transactions of the American Nuclear Society Winter Meeting.** Washington, DC, United States, 2017.

REFEREED CONFERENCE ABSTRACTS

[14] **Rykhlevskii, A.**, Lindsay, A., Huff, K. "Simulation of Molten Salt Reactors with Moltres." **2019 SIAM Conference on Computational Science and Engineering**, Spokane, WA, February 2019.

[15] **Rykhlevskii, A.**, Betzler, B.R., Bae, J.W., Huff, K. "Fuel Cycle Performance of Fast Spectrum Molten Salt Reactor Designs." (poster) **Oak Ridge National Laboratory Nuclear Engineering Science Laboratory Synthesis Poster Session.** Oak Ridge, TN, United States, 2018.

[16] **Rykhlevskii, A.**, Huff, K. "Computational Tools for Advanced Molten Salt Reactor Simulation." **Blue Waters Symposium**, Sun River, OR, June 2018.

TECHNICAL REPORTS	[17]	**Rykhlevskii, A.** et al. "MITR & NBSR DDE Irradiations in BR2 - Fluence in LEU Cladding and Structural Materials." Argonne National Laboratory, ANL/RTR/TM-22/25, February 2023.

[18] **Rykhlevskii, A.** et al. "Analysis of Reactivity Insertion Transients with Automatic Power Reduction by the Control Rods for the COBRA Lead Test Assembly." Argonne National Laboratory, ANL/RTR/TM-22/15, August 2022.

[19] **Rykhlevskii, A.** et al. "MITR & NBSR DDE Irradiations in BR2 - Review of SCK CEN Preliminary Neutronics Evaluation of Irradiation Conditions." Argonne National Laboratory, ANL/RTR/TM-22/11, July 2022.

[20] Aliberti, G., **Rykhlevskii, A.** "Testing and Verification of VESTA-2.1.5 Code for Software Quality Assurance (NQA-1)." Argonne National Laboratory, ANL/RTR/TM-21/35, Nov 2021.

[21] **Rykhlevskii, A.** et al. "Fuel Plate Irradiation in the FUTURE-5 Basket: Reactivity Insertion Transients with Automatic Power Reduction by the Control Rods." Argonne National Laboratory, ANL/RTR/TM-21/20, September 2021.

[22] **Rykhlevskii, A.**, Bergeron, A., Puig, F. "FUTURE-HFIR Irradiation Test - Complementary Beginning of Cycle Neutronics Analysis." Argonne National Laboratory, ANL/RTR/TM-21/4, March 2021.

[23] **Rykhlevskii, A.**, Huff, K. "Milestone 2.1 Report: Demonstration of SaltProc." **Advanced Reactors and Fuel Cycles Report Series**, Nuclear Plasma and Radiological Engineering, University of Illinois. Report UIUC-ARFC-2019-04, `https://doi.org/10.5281/zenodo.3355649`, June 2019.

OTHER PUBLICATIONS

[24] **Rykhlevskii, A.** Fuel processing simulation tool for liquid-fueled nuclear reactors. Ph.D. dissertation. University of Illinois at Urbana-Champaign. July 2020.

[25] **Rykhlevskii, A.** Advanced online fuel reprocessing simulation for Thorium-fueled Molten Salt Breeder Reactor. M.Sc. thesis. University of Illinois at Urbana-Champaign. May 2018.

SOFTWARE PRODUCTS

[26] **Rykhlevskii, A.**, Bae, J.W., Huff, K. "SaltProc v0.2." **zenodo**, July 2018. `http://dx.doi.org/10.5281/zenodo.1196454`.

[27] Lindsay, A., Huff, K., **Rykhlevskii, A.** "moltres v0.1." **zenodo**, June 2017. `http://dx.doi.org/10.5281/zenodo.801823`.

[28] 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, K., Jackson, S., Kiesling, K., Klebenow, M., Kuett, M., Manalo, K., M. McCormick, A. Opotowsky, C., Pavlovsky, R., Rabbani, M., Relson, E., Romano, P., **Rykhlevskii, A.**, Scopatz, A., Shriwise, P., Slaybaugh, R., Wilson, P., Xia, J., J. Zachman, C., and Zweig, M. "PyNE v0.5.11." **github**. github.com/pyne/pyne/releases/tag/0.5.11. March 2018.

INVITED TALKS	**ANS Winter 2020**, Chicago, IL. *Lightning Talk.*	**Nov 17, 2020**
	U. Illinois, Nuclear, Plasma, & Radiological Engineering. *Seminar.*	**Apr 10, 2018**

ENGINEERING TEACHING	**University of Illinois at Urbana-Champaign**	**Nov 29, 2017**
	Guest Lecturer	**Nov 9, 2018**
	DEPT. OF NUCLEAR, PLASMA, AND RADIOLOGICAL ENGINEERING	
	NPRE 247, Modeling Nuclear Energy System	
	UNIX Shell, Basic Scripting, Serpent usage, Monte Carlo methods	

UNDERGRADUATE RESEARCHERS	NAME	DEGREE - YEAR	ROLE
	Jin Whan Bae	BS - 2017	Mentor
	Louis Kissinger	BS - 2019	Mentor

GRADUATE RESEARCHERS	NAME	DEGREE - YEAR	ROLE
	Gwendolyn Chee	PhD - 2022	Mentor
	Anshuman Chaube	PhD - (est. 2023)	Mentor
	Sun Myung Park	PhD - (est. 2023)	Mentor

Scientific Computing Skills		
	Programming	Python, bash/csh, C++, FORTRAN, VB, MPI, OpenMP
	Build Systems	make, CMake
	Databases	PyTables, HDF5, SQL
	Test Frameworks	Travis CI, pytest
	Version Control	git
	Transport Software	MCNP, VESTA, OpenMC, Serpent, SCALE, WIMS, CNCSN 2009
	Other Tools	PARET/ANL, MOOSE, MATLAB/Octave, PyNE, CYCLUS, ANSYS CFX, LaTeX

Other University Service		
	Judge, HackIllinois	**2020**
	Mentor, HackIllinois	**2017**

Editing and Reviewing		
	Manuscript Referee	*Annals of Nuclear Energy*
		Progress in Nuclear Energy
		2019 GLOBAL International Fuel Cycle Conference