

## LUTHER W. MCDONALD IV, Ph.D.

Associate Professor; University of Utah (UU)  
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### EDUCATION

2013 Ph.D., Radiochemistry; Washington State University  
2009 B.S., Chemistry; University of West Florida

### PROFESSIONAL DEVELOPMENT

2014 Workshop on nuclear forensics for nonproliferation – Next Generation Safeguards Initiative, Oak Ridge National Laboratory  
2012 Advanced leadership and development training on intercultural communication, research ethics, teamwork and entrepreneurship, Washington State University  
2011 Intensive introduction to international safeguards, Pacific Northwest National Laboratory

### PROFESSIONAL EXPERIENCE

7/20 – Present Associate Professor, Civil and Environmental Engineering - Nuclear Engineering Program, University of Utah

- Pursued federal research funding from the Department of Energy and National Science Foundation to expand education and research opportunities for underrepresented minorities in STEM degrees.
- Developed Undergraduate Radiochemistry and Nuclear Principles in Science and Engineering as fully autonomous (online) courses, including 30 modules, 140 lecture videos, interactive quizzes and homework, and online classroom debates.
- Led the Outreach and Communications Committee developing strategies to reach future students, current students, alumni, and donors through social media, newsletters, and email campaigns.
- Served on the College of Engineering Teaching Excellence Committee reviewing Undergraduate Research Opportunities Program (UROP) proposals and helping select the Outstanding Teacher and Teaching Assistant.
- Awarded federal research grants (>\$3 M) from the Department of Homeland Security and National Nuclear Security Administration to advance forensic signatures of uranium oxides.

1/14 – 6/20 Assistant Professor, Civil and Environmental Engineering - Nuclear Engineering Program, University of Utah

- Built a leading radiochemistry laboratory that made critical advancements in nuclear materials analysis to support environmental remediation and nuclear forensics for the Department of Homeland Security, Department of Defense, and Department of Energy.
- Developed, as part of the Strategic Hiring and Planning Committee, a five-year plan for growing the Civil Department through the strategic recruitment of faculty in emerging fields (i.e., cybersecurity and water resources), revitalization of the B.S., M.S., and Ph.D. degrees, and initiation of social media campaigns to expand the outreach of the department.

Curriculum Vitae  
**Luther W. McDonald IV, Ph.D.**

- Prepared State and Federal grant applications to secure research, education, and facility funding.
  - Managed the scope, schedule, budget, and regulatory guidelines for multiple research grants (\$4.5 M) to execute quantitative research fulfilling the research aims of the Federal clients.
  - Mentored over 40 researchers in designing and executing experiments, including analytical method development, quantitative data analysis, and effective communication of results to both technical and non-technical audiences.
  - Served as an academic advisor to multiple minority supporting programs, including the University of Utah Graduate Preparation Institute, Brazilian Scientific Mobility Program, and National Science Foundation ACCESS Program.
  - Chaired the nuclear engineering curriculum committee developing three new courses, revitalizing two courses, and streamlining the nuclear engineering minor to enhance student participation and success.
  - Taught multiple courses at introductory and advanced levels on the lifecycle and environmental impact/waste management of power technologies.
- 8/16 – 7/19      Group Leader, Nuclear Engineering Program, University of Utah
- Restructured the undergraduate minor, non-thesis M.S., and Ph.D. degrees to modernize and streamline the curriculum.
  - Chaired the nuclear engineering hiring committee, aggressively recruiting candidates from national laboratories, academia, and industry, growing the program by 300%.
- 1/17 – 12/18      University Director, Department of Homeland Security Nuclear Forensics Undergraduate Summer School, University of Utah
- Developed 21 lecture modules, hosted ten guest lectures, escorted the students on a national laboratory tour, and created laboratory procedures to give the students hands-on experience synthesizing and characterizing nuclear materials.
- 8/13 – 12/13      Adjunct Professor, Department of Chemistry, Washington State University Tri-Cities
- Instructed an undergraduate inorganic chemistry laboratory.
- 5/13 – 12/13      Postdoctoral Fellow, Signature Science and Technology Division, Pacific Northwest National Laboratory
- Developed a new methodology based on fluorination technology and negative thermal ionization mass spectrometry to determine the isotopic ratio, origin, and purification age of uranium.
  - Developed new analytical methods to observe uranium complexation with fungi by electrospray ionization mass spectrometry.
- 5/12 – 8/12      Visiting Scientist, Department of Physico-Chemistry, Commissariat à l'énergie atomique (CEA) Saclay, France
- Developed analytical methods and data analytics to quantify uranium and plutonium complexes in spent nuclear fuel reprocessing technologies.
- 4/09 – 12/13      White Water Rafting Guide, River Recreation, Wenatchee, Washington
- Guided and coached customers in teamwork to navigate class III and IV rapids on various Washington State rivers.
  - Developed extensive interpersonal skills to communicate with a wide array of audiences effectively.
- 1/10 – 5/13      Graduate Research Assistant, Department of Chemistry, Washington State University

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**Luther W. McDonald IV, Ph.D.**

- Develop rapid, inexpensive, in-line analytical monitoring tools that could be used to follow the flow of U, Pu, and minor actinides through a reprocessing facility.
  - Develop metabolomics protocols to characterize metabolic changes in urine, saliva, and skin cells following exposure to unique chemical or radiological environments.
- 1/09 – 8/09      Science Undergraduate Laboratory Intern, Pacific Northwest National Laboratory
- Identified inositols and O-methylinositols in plant roots related to soybean cyst nematodes.
- 8/07 – 12/09      Undergraduate Research and Teaching Assistant, University of West Florida
- Synthesized and characterized polymers for drug delivery and performed toxicity studies of quinones.

### **CONSULTING EXPERIENCE**

1. Technical Reviewer for Department of Energy – Nuclear Energy University Proposals, 2021.
2. Panelist on “Accelerating Career Development for Radiochemists within the Team Science Context” in the Seaborg Award Symposium at the American Chemical Society Spring Meeting, 2021
3. Panel Review Expert for the U.S. Department of Energy's Office of Defense Nuclear Nonproliferation R&D project: "Molecular and Microstructural Provenance of Uranium and Plutonium Oxides," 2020
4. Technical Reviewer for Department of Energy – Nuclear Energy University Proposals, 2020.
5. Panel Review Expert for U.S. Department of Energy's Office of Defense Nuclear Nonproliferation R&D on Project: "Morphological Provenance Signatures," 2019.
6. Symposia Chair of the Session "Crosscutting Research in Environmental Radiochemistry and Nuclear Forensics" at the Spring American Chemical Society National Meeting 2019.
7. Technical Reviewer for Department of Energy – Nuclear Energy University Proposals, 2019.
8. Technical reviewer for Department of Energy – Basic Energy Sciences Proposals, 2019.
9. Panel Review Expert for Los Alamos National Laboratory Directed Research and Development on the project "The Fundamental Physical Interpretation and Exploitation of Stable Isotope Fractionation," 2019.
10. Technical Reviewer for Department of Energy – Nuclear Energy University Proposals, 2018.
11. Technical reviewer for Department of Energy – Basic Energy Sciences Proposals, 2018.
12. Technical Reviewer for Department of Homeland Security Nuclear Forensics Undergraduate Summer School Curriculum, 2018.
13. Technical Reviewer for Department of Energy – Small Business Innovation Research (SBIR) Proposals, 2018.
14. Technical Reviewer for Department of Energy – Nuclear Energy University Proposals, 2017.
15. Technical reviewer for Department of Energy – Basic Energy Sciences Proposals, 2017.
16. Secretary of the American Chemical Society's Division of Nuclear Chemistry and Technology, 2013 – 2016.
17. Technical reviewer for Department of Energy – Nuclear Energy University Proposals, 2016.
18. American Chemical Society Multidisciplinary and Planning Committee, 2014 – 2016.
19. Peer reviewer for *Analytical Chemistry*, *Journal of Radioanalytical and Nuclear Chemistry*, *Journal of Environmental Radioactivity*, and *Industrial & Engineering Chemistry Research*, 2014 – Present.
20. Panelist on the Nuclear Innovation Workshop hosted by Idaho National Laboratory, 2015.
21. Panelist on the Department of Energy – Office of Science workshop, "Basic Research Needs for Environmental Management," 2015.
22. Symposia Chair of the Session "Applications of Gas Adsorption and Ion Exchange" at the American

Curriculum Vitae  
**Luther W. McDonald IV, Ph.D.**

Institute of Chemical Engineers National Meeting, 2015.

23. Panelist on the Nuclear Energy Stewardship panel at the American Chemical Society National Meeting in San Francisco, 2014.

### **HONORS AND AWARDS**

1. Top 15% of undergraduate instructors in the University of Utah College of Engineering for the course Nuclear Principles in Science and Engineering, Fall 2020
2. Top 15% of undergraduate instructors in the University of Utah College of Engineering for the course Undergraduate Radiochemistry, Spring 2020
3. Top 15% of undergraduate instructors in the University of Utah College of Engineering for the course Nuclear Principles in Science and Engineering, Fall 2018
4. Top 15% of graduate instructors in the University of Utah College of Engineering for the course Analytical Nuclear Forensics, Spring 2018
5. Top 15% of undergraduate instructors in the University of Utah College of Engineering for the course Undergraduate Radiochemistry, Spring 2018
6. Top 15% of undergraduate instructors in the University of Utah College of Engineering for the course Nuclear Principles in Science and Engineering, Fall 2017
7. *Forbes* "30 under 30 in Science," 2017
8. Top 15% of undergraduate instructors in the University of Utah College of Engineering for the course Undergraduate Radiochemistry, Spring 2017
9. Latter-day Saint Student Association (LDSSA) Excellence in Education Recognition Award, 2017
10. Top 15% of undergraduate instructors in the University of Utah College of Engineering for the course Nuclear Principles in Science and Engineering, Fall 2016
11. Top 15% of graduate instructors in the University of Utah College of Engineering for the course Analytical Nuclear Forensics, Spring 2016
12. Top 15% of graduate instructors in the University of Utah College of Engineering for the course Analytical Nuclear Forensics, Spring 2014
13. National Technical Nuclear Forensics Center Postdoctoral Fellowship, 2013
14. Actinet-i3 European Award for Visiting Scientist at Commissariat à l'énergie atomique et aux énergies alternatives, 2012
15. Pacific Northwest National Laboratory Distinguished Graduate Fellowship in Radiochemistry, 2010 - 2013
16. American Chemical Society Division of Inorganic Chemistry Undergraduate Award in Inorganic Chemistry, 2009
17. Chemistry Department Outstanding Undergraduate Research Award, 2009
18. Science Undergraduate Laboratory Internship at Pacific Northwest National Laboratory, 2009
19. Chemistry Department Outstanding Undergraduate Research Award, 2008

Curriculum Vitae  
**Luther W. McDonald IV, Ph.D.**

**AWARDED GRANTS**

Since joining the University of Utah in 2014, I have worked independently and in collaboration with colleagues to generate over **\$8 million** in extramural funding. A list of pending grant applications is available upon request.

<i>Dates</i>	<i>Project Title</i>		<i>Funding Agency</i>	<i>Role</i>	<i>Total Project Budget</i>	<i>McDonald Share</i>
8/2021 – 1/2023	Post-Irradiation Morphology Signatures	Uranium	DHS (subcontract from INL)	Co-PI	\$124,000	\$62,000
8/2021 – 1/2023	Process Signatures of Fluorides	Uranyl	DHS (Subcontract from LANL)	Co-PI	\$124,000	\$124,000
5/2021 – 9/2025	Morphology Testbed		NNSA (Subcontract from LANL)	Co-PI	\$2,717,998	\$1,760,000
8/2020 – 7/2021	Reactor Cooling System Upgrade for the University of Utah TRIGA Reactor (UUTR)		DOE-NEUP	Collaborator	\$487,387	\$0
9/2019 – 8/2023	NRC Graduate Fellowships		NRC	Co-PI	\$444,000	111,000
7/2019 – 1/2020	Image Processing		AFTAC	PI	\$50,000	\$50,000
1/2017 – 12/2018	Nuclear Forensics Undergraduate Summer School		DHS	PI	\$444,000	\$444,000
9/2016 – 8/2021	Machine Learning and Signature Analysis of Nuclear Forensics Data		DHS	Co-PI	\$1,550,000	\$450,000
8/2016 – 7/2019	Identification of Morphological and Oxygen Isotopic Signatures in uranium Oxides		DTRA	PI	\$1,061,338	\$661,338
9/2015 – 8/2021	Investigation of Morphological Characteristics of U-Materials		DHS	PI	\$944,384	\$944,385
2/2015 – 1/2016	INL Student Research		DOE-INL	Collaborator	\$48,119	\$24,059
8/2014 – 7/2015	Development of Capabilities to Study the Thermodynamics of Nuclear Energy-Related Infrastructure at the Utah Nuclear Engineering Program		DOE-NEUP	PI	\$122,000	\$122,000
4/2014 – 12/2014	Next Generation Safeguards		DOE-NNSA	Collaborator	\$17,000	\$8,500
<b>Total</b>					<b>\$8,134,226</b>	<b>\$4,650,282</b>

## PUBLICATIONS

<sup>1</sup>Ph.D. Student, <sup>2</sup>M.S. Student, <sup>3</sup>Undergraduate Student

### JOURNAL PUBLICATIONS

1. Klosterman<sup>1</sup>, M.R., Oerter, E.J., Singleton, M.J. and McDonald IV, L.W., **2022**. Oxygen Isotope Fractionation in U<sub>3</sub>O<sub>8</sub> during Thermal Processing in Humid Atmospheres. *ACS Omega*.
2. Abbott<sup>1</sup>, E.C., O'Connor<sup>3</sup>, H.E., Nizinski<sup>1</sup>, C.A., Gibb<sup>3</sup>, L.D., Allen<sup>3</sup>, E.W. and McDonald IV, L.W., **2022**. Thermodynamic Evaluation of the Uranyl Peroxide Synthetic Route on Morphology. *Journal of Nuclear Materials*, p.153533.
3. Burr, T., Schwerdt, I., Sentz, K., McDonald, L. and Wilkerson, M., **2021**. Overview of Algorithms for Using Particle Morphology in Pre-Detonation Nuclear Forensics. *Algorithms*, 14(12), p.340.
4. Ly<sup>1</sup>, C., Nizinski<sup>1</sup>, C.A., Toydemir<sup>3</sup>, A., Vachet, C., McDonald, L.W. and Tasdizen, T., **2021**. Determining the Composition of a Mixed Material with Synthetic Data. *Microscopy and Microanalysis*, pp.1-11.
5. Girard, M., Hagen, A., Schwerdt, I., Gaumer, M., McDonald, L., Hodas, N. and Jurrus, E., **2021**. Uranium Oxide Synthetic Pathway Discernment through Unsupervised Morphological Analysis. *Journal of Nuclear Materials*, 552, p.152983.
6. Klosterman<sup>1</sup>, M.R., Oerter, E.J., Deinhart, A.L., Chakraborty, S., Singleton, M.J. and McDonald IV, L.W., **2021**. Oxygen Kinetic Isotope Effects in the Thermal Decomposition and Reduction of Ammonium Diuranate. *ACS Omega*.
7. Ly<sup>1</sup>, C., Nizinski<sup>1</sup>, C., Vachet, C., McDonald, L. and Tasdizen, T., **2021**. Learning to estimate the composition of a mixture with synthetic data. *Microscopy and Microanalysis*, 27(S1), pp.2522-2525.
8. Hanson<sup>1</sup>, A.B., Nizinski<sup>1</sup>, C.A. and McDonald IV, L.W., **2021**. Effect of Diel Cycling Temperature, Relative Humidity, and Synthetic Route on the Surface Morphology and Hydrolysis of  $\alpha$ -U<sub>3</sub>O<sub>8</sub>. *ACS omega*, 6(28), pp.18426-18433.
9. Klosterman<sup>1</sup>, M.R., Oerter, E.J., Chakraborty, S., Singleton, M.J. and McDonald IV, L.W., **2021**. Fractionation of Oxygen Isotopes in Uranium Oxides during Peroxide Precipitation and Dry Air Calcination. *ACS Earth and Space Chemistry*.
10. Hanson<sup>1</sup>, A.B., Schwerdt, I.J., Nizinski<sup>1</sup>, C.A., Lee<sup>3</sup>, R.N., Mecham<sup>3</sup>, N.J., Abbott<sup>1</sup>, E.C., Heffernan, S., Olsen, A., Klosterman<sup>1</sup>, M.R., Martinson<sup>3</sup>, S. and Brenkmann<sup>3</sup>, A., **2021**. Impact of Controlled Storage Conditions on the Hydrolysis and Surface Morphology of Amorphous-UO<sub>3</sub>. *ACS omega*, 6(12), pp.8605-8615.
11. Nizinski<sup>1</sup>, C. A., Hanson<sup>1</sup>, A. B., Fullmer<sup>2</sup>, B. C., Mecham<sup>2</sup>, N. J., Tasdizen, T., & McDonald IV, L. W. **2020**. Effects of process history on the surface morphology of uranium ore concentrates extracted from ore. *Minerals Engineering*, 156, 106457.
12. Ly<sup>1</sup>, C., Vachet, C., Schwerdt, I., Abbott<sup>1</sup>, E., Brenkmann<sup>2</sup>, A., McDonald, L. W., & Tasdizen, T. **2020**. Determining uranium ore concentrates and their calcination products via image classification of multiple magnifications. *Journal of Nuclear Materials*, 152082.
13. Heffernan<sup>2</sup>, S.T., Ly<sup>1</sup>, N.C., Mower<sup>3</sup>, B.J., Vachet, C., Schwerdt<sup>1</sup>, I.J., Tasdizen, T. and McDonald IV, L.W., **2020**. Identifying surface morphological characteristics to differentiate between mixtures of U<sub>3</sub>O<sub>8</sub> synthesized from ammonium diuranate and uranyl peroxide. *Radiochimica Acta*, 108(1), pp.29-36.
14. Hanson<sup>1</sup>, A.B., Nichols<sup>3</sup>, R., Schwerdt<sup>1</sup>, I.J., Vachet, C., Tasdizen, T., and McDonald IV, L.W., **2019**. Quantifying the Impacts of Impurities on Morphological Features, *Analytical Chemistry*.
15. Abbott<sup>1</sup>, E.C., Brenkmann<sup>3</sup>, A., Galbraith<sup>3</sup>, C., Ong<sup>3</sup>, J., Schwerdt<sup>1</sup>, I.J., Albrecht, B.D., Tasdizen, T. and McDonald IV, L.W., **2019**. Dependence of UO<sub>2</sub> surface morphology on processing history within a single synthetic route. *Radiochimica Acta*.

Curriculum Vitae  
**Luther W. McDonald IV, Ph.D.**

16. Ly<sup>1</sup>, C., Olsen<sup>1</sup>, A.M., Schwerdt<sup>1</sup>, I.J., Porter, R., Sentz, K., McDonald, L.W. and Tasdizen, T., **2019**. A new approach for quantifying morphological features of U<sub>3</sub>O<sub>8</sub> for nuclear forensics using a deep learning model. *Journal of Nuclear Materials*, 517, pp.128-137.
17. Olsen<sup>1</sup>, A.M., Schwerdt<sup>1</sup>, I., Jolley<sup>3</sup>, A., Halverson<sup>3</sup>, N., Richards, B. and McDonald IV, L.W., **2019**. A response surface model of morphological changes in UO<sub>2</sub> and U<sub>3</sub>O<sub>8</sub> following high temperature aging. *Radiochimica Acta*.
18. Schwerdt<sup>1</sup>, I.J., Hawkins<sup>2</sup>, C.G., Taylor<sup>2</sup>, B., Brenkmann<sup>3</sup>, A., Martinson<sup>3</sup>, S. and McDonald IV, L.W., **2019**. Uranium oxide synthetic pathway discernment through thermal decomposition and morphological analysis. *Radiochimica Acta*, 107(3), pp.193-205.
19. Liu<sup>1</sup>, W., McDonald IV, L.W., Wang, X. and Miller, J.D., **2018**. Bastnaesite flotation chemistry issues associated with alkyl phosphate collectors. *Minerals Engineering*, 127, pp.286-295.
20. Schwerdt<sup>1</sup>, I.J., Brenkmann<sup>3</sup>, A., Martinson<sup>3</sup>, S., Albrecht, B.D., Heffernan<sup>2</sup>, S., Klosterman<sup>1</sup>, M.R., Kirkham<sup>3</sup>, T., Tasdizen, T. and McDonald IV, L.W., **2018**. Nuclear proliferomics: A new field of study to identify signatures of nuclear materials as demonstrated on alpha-UO<sub>3</sub>. *Talanta*, 186, pp.433-444.
21. Olsen<sup>1</sup>, A.M., Schwerdt<sup>1</sup>, I.J., Richards, B. and McDonald IV, L.W., **2018**. Quantification of high temperature oxidation of U<sub>3</sub>O<sub>8</sub> and UO<sub>2</sub>. *Journal of Nuclear Materials*, 508, pp.574-582.
22. Schwerdt<sup>1</sup>, I.J., Olsen<sup>1</sup>, A., Lusk<sup>3</sup>, R., Heffernan<sup>2</sup>, S., Klosterman<sup>1</sup>, M., Collins<sup>3</sup>, B., Martinson<sup>3</sup>, S., Kirkham<sup>3</sup>, T. and McDonald IV, L.W., **2018**. Nuclear forensics investigation of morphological signatures in the thermal decomposition of uranyl peroxide. *Talanta*, 176, pp.284-292.
23. Levinthal<sup>2</sup>, J.D., Richards, B., Snow, M.S., Watrous, M.G. and McDonald IV, L.W., **2017**. Correlating NORM with the mineralogical composition of shale at the microstructural and bulk scale. *Applied geochemistry*, 76, pp.210-217.
24. Olsen<sup>1</sup>, A.M., Richards, B., Schwerdt<sup>1</sup>, I., Heffernan<sup>2</sup>, S., Lusk<sup>3</sup>, R., Smith<sup>3</sup>, B., Jurrus, E., Ruggiero, C. and McDonald IV, L.W., **2017**. Quantifying morphological features of  $\alpha$ -U<sub>3</sub>O<sub>8</sub> with image analysis for nuclear forensics. *Analytical chemistry*, 89(5), pp.3177-3183.
25. McDonald IV, L.W., Campbell, J.A., Vercouter, T. and Clark, S.B., **2016**. Characterization of actinides complexed to nuclear fuel constituents using ESI-MS. *Analytical chemistry*, 88(5), pp.2614-2621.
26. McDonald IV, L.W., Campbell, J.A. and Clark, S.B., **2014**. Failure of ESI spectra to represent metal-complex solution composition: a study of lanthanide-carboxylate complexes. *Analytical chemistry*, 86(2), pp.1023-1029.
27. McDonald IV, L.W., Goheen, S.C., Donald, P.A. and Campbell, J.A., **2012**. Identification and quantitation of Various Inositols and O-Methylinositols Present in Plant Roots Related to Soybean Cyst Nematode Host Status. *Nematropica*, 42(1), pp.1-8.
28. Vaughan, P.P., Novotny, P., Haubrich, N., McDonald, L., Cochran, M., Serdula, J., Amin, R.W. and Jeffrey, W.H., **2010**. Bacterial growth response to photoactive quinones. *Photochemistry and photobiology*, 86(6), pp.1327-1333.
29. Garland, S., Goheen, S., Donald, P., McDonald, L. and Campbell, J., **2009**. Application of derivatization gas chromatography/mass spectrometry for the identification and quantitation of pinitol in plant roots. *Analytical Letters*, 42(13), pp.2096-2105.

BOOKS/BOOK CHAPTERS

30. Nizinski, C.A., Ly, C., McDonald IV, L.W. and Tasdizen, T., **2021**. Computational Image Techniques for Analyzing Lanthanide and Actinide Morphology. In *Rare Earth Elements and Actinides: Progress in Computational Science Applications* (pp. 133-155). American Chemical Society.

CONFERENCE PUBLICATIONS

Curriculum Vitae  
**Luther W. McDonald IV, Ph.D.**

31. Jevremovic, T., Schow, R., McDonald, I.V. and Rey, A., **2015**. Unique approaches in emphasizing the role of reactor laboratories and facilities for training and education of future nuclear engineers' without the borders' (No. JAEA-CONF--2014-003).

*OTHER PUBLICATIONS*

32. Jevremovic, T., L. McDonald IV, and R. Schow. "The University of Utah Nuclear Engineering Program." In *History, Development and Future of TRIGA Research Reactors. Companion CD-ROM*. **2016**.
33. Meier, D.E., Coble, J.B., Jordan, D.V., McDonald, L.W., Forrester, J.B., Schwantes, J.M., Unlu, K., Landsberger, S., Bender, S., Dayman, K.J. and Reilly, D.D., **2013**. *The Multi-Isotope Process (MIP) Monitor Project: FY13 Final Report* (No. PNNL-22799). Pacific Northwest National Lab. (PNNL), Richland, WA (United States).

**CONFERENCE PRESENTATIONS**

1. M. Klosterman, E. Oerter, M. Singleton, L. McDonald "Expanding the toolbox in nuclear proliferomics to include oxygen isotope ratios," American Chemical Society Spring Meeting (2021).
2. L. McDonald "Enabling future scientist to always ask why," American Chemical Society Spring Meeting (2021).
3. C. Nizinski, C. Ly, C. Vachet, T. Tasdizen, L. McDonald "Generalizability of convolutional neural networks to out-of-distribution uranium morphology image data," American Chemical Society Spring Meeting (2021).
4. A. Hanson, I. Schwerdt, C. Nizinski, R. Lee, N. Mecham, E. Abbott, S. Heffernan, A. Olsen, M. Klosterman, S. Martinson, A. Brenkmann, L. McDonald "Impact of controlled storage conditions on the hydrolysis and surface morphology of amorphous-UO<sub>3</sub>," American Chemical Society Spring Meeting (2021).
5. C. Nizinski, C. Ly, L. McDonald, T. Tasdizen "Overview of computational image techniques for characterizing the surface morphology of lanthanide and actinide materials," American Chemical Society Spring Meeting (2021).
6. C. Nizinski, and L. McDonald IV "Effects of Process History on the Surface Morphology of Uranium Ore Concentrates Extracted from Carnotite Ore," Radiobioassay & Radiochemical Measurements Conference (2019).
7. A. Hanson and L. McDonald IV "Quantifying Impurity Effects on the Surface Morphology of  $\alpha$ -U<sub>3</sub>O<sub>8</sub>," Radiobioassay & Radiochemical Measurements Conference (2019).
8. M. Klosterman and L. McDonald IV "Effects of Calcination Conditions on the Oxygen Isotopic Signatures of Uranium Oxides," Radiobioassay & Radiochemical Measurements Conference (2019).
9. M. Klosterman, A. Deinhart, M.J. Singleton, L.W. McDonald IV, "Oxygen Isotope Fractionation in the Processing of Uranium Oxides," American Chemical Society National Meeting (2019).
10. I.J. Schwerdt, L.W. McDonald IV, "Uranium Oxide Synthetic Pathway Discernment through Morphological Analysis," Pacific Northwest National Laboratory (2018).
11. I.J. Schwerdt, L.W. McDonald IV, "Uranium Oxide Synthetic Pathway Discernment through Morphological Analysis," Los Alamos National Laboratory (2018).
12. S.T. Heffernan, B.J. Mower, L.W. McDonald IV "Identifying Surface Morphological Characteristics to Differentiate Between U<sub>3</sub>O<sub>8</sub> Synthesized from Ammonium Diuranate and Uranyl Peroxide," Methods and Applications of Radioanalytical Chemistry Conference (2018).
13. E. Abbott, L.W. McDonald IV "Dependence of Synthesis Route on UO<sub>2</sub> Surface Morphology," Methods and Applications of Radioanalytical Chemistry Conference (2018).
14. I.J. Schwerdt, L.W. McDonald IV, "Uranium Oxide Synthetic Pathway Discernment through Morphological Analysis," Methods and Applications of Radioanalytical Chemistry Conference (2018).



Curriculum Vitae  
**Luther W. McDonald IV, Ph.D.**

15. A. Hanson, L.W. McDonald IV "Effect of Impurities on the Morphology of  $U_3O_8$  through XRD, SEM, and ICP-MS Analysis," Methods and Applications of Radioanalytical Chemistry Conference (2018).
16. M. Klosterman, L.W. McDonald IV, "Oxygen Isotope Analysis of Uranium Oxides using  $NF_3$  Fluorination," Methods and Applications of Radioanalytical Chemistry Conference (2018).
17. A. Olsen, L. McDonald "High temperature aging study of  $UO_2$  and  $U_3O_8$  for nuclear forensics," 1<sup>st</sup> Annual Interagency Technical Nuclear Forensics Technical Review, Oak Ridge National Laboratory (2017).
18. I. Schwerdt, L. McDonald "Impact of controlled storage conditions on the hydration and morphology of  $UO_3$ ," 1<sup>st</sup> Annual Interagency Technical Nuclear Forensics Technical Review, Oak Ridge National Laboratory (2017).
19. A. Olsen, L. McDonald "High temperature aging study of  $UO_2$  and  $U_3O_8$  for nuclear forensics," American Chemical Society National Meeting (2017).
20. I. Schwerdt, L. McDonald "Impact of controlled storage conditions on the hydration and morphology of  $UO_3$ ," American Chemical Society National Meeting (2017).
21. E. Abbott, L. McDonald "Dependence of  $UO_2$  surface morphology on synthesis route," American Chemical Society National Meeting (2017).
22. L. McDonald, I. Schwerdt, A. Olsen, M. Klosterman, S. Heffernan "Quantifying Morphological Features in U-oxides for Nuclear Forensics," Radiobioassay & Radiochemical Measurements Conference (2017).
23. L. McDonald, J. Campbell, T. Vercouter, S. Clark "Determining Speciation of U and Pu in Spent Nuclear Fuel via Electrospray Ionization Mass Spectrometry," American Chemical Society National Meeting (2016).
24. A. Olsen, L. McDonald "Quantitative Morphological Analysis of Aged Uranium Oxides for Nuclear Forensics," Actinide Separations (2016)
25. I. Schwerdt, L. McDonald, B. Richards, A. Olsen, S. Heffernan, R. Lusk, B. Smith, J. Maschoff "Morphological Effects of Variable Calcination Condition for the Thermal Decomposition of Uranyl Peroxide," American Chemical Society National Meeting (2016).
26. L. McDonald, B. Richards, A. Olsen, R. Lusk, I. Schwerdt, B. Smith, J. Maschoff "Investigation of Morphological Characteristics of U-Materials," Domestic Nuclear Detection Office – Academic Research Initiative Annual Review (2016).
27. I. Schwerdt, A. Olsen, L. McDonald, B. Richards, R. Lusk "Impact of calcination Conditions on the Morphology of  $UO_3$ ," Domestic Nuclear Detection Office – Academic Research Initiative Annual Review (2016).
28. A. Olsen, I. Schwerdt, R. Lusk, B. Richards, L. McDonald "A Study of  $U_3O_8$  Synthesis Parameters Using Image Analysis," Domestic Nuclear Detection Office – Academic Research Initiative Annual Review (2016).
29. I. Schwerdt, J. Levinthal, C. Bahamonde, L. McDonald "Using Calorimetry and Mass Spectrometry to Probe Molecular Species in Spent Nuclear Fuel Reprocessing," Actinide Separation (2015)
30. J. Levinthal, B. Richards-McClung, L. McDonald "Quantification, Evaluation, and Correlation of Mineralogical and Chemical Composition of Shale at Multiple Scales," American Institute of Chemical Engineers National Conference (2015)
31. J. Schwerdt, Levinthal, L. McDonald, A. Lintereur "Dual Measurement Sample Characterization Systems," Institute of Nuclear Material Management, 2015.
32. J. Levinthal, B. Richards-McClung, L. McDonald "Uranium Microstructural and chemical Properties in Hydrocarbon Rich Shale," Actinide Separations (2015)
33. I. Schwerdt, J. Levinthal, C. Bahamonde, L. McDonald "Using Calorimetry and Mass Spectrometry to Probe Molecular Species in Spent Nuclear Fuel Reprocessing," Actinide Separation (2015)

Curriculum Vitae  
**Luther W. McDonald IV, Ph.D.**

34. L. McDonald, T. Jevremovic "Radio and Environmental Chemistry in the Nuclear Engineering Program at Utah," American Chemical Society National Meeting (2014).
35. L. McDonald, Bahamonde, J. Levinthal "Extraction of Uranium from Low Grade Ores using Naturally Produced Siderophores," American Chemical Society National Meeting (2014).
36. Schwantes JM, EJ Mausolf, and LW McDonald, IV. "Cs in Coastal and Marine Waters," Fukushima Daiichi Cleanup Workshop #3 (2013).
37. L. McDonald, C. Barinaga, L. Sweet, B. McNamara, and J. Schwantes. "Negative Thermal Ionization Mass Spectrometry of Fluorinated Fission Products," Pacific Northwest National Laboratory Postdoc Research Symposia (2013).
38. L. McDonald, C. Barinaga, L. Sweet, N. Ballou, B. McNamara, and J. Schwantes. "Assembly and Testing of a Negative Thermal Ionization - Quadrupole Mass Spectrometry for the Detection of Fluorinated Fission Products and Actinides," National Technical Nuclear Forensics: Annual Academic-Laboratory Collaboration and Program Review (2013)
39. L. McDonald, C. Barinaga, L. Sweet, N. Ballou, B. McNamara, and J. Schwantes. "Nitrogen Trifluoride based Volatility Separations of Fission Products and Actinides," National Technical Nuclear Forensics Center Review, (2013)
40. L. McDonald, J. Campbell, and S. Clark, "Investigation of Ternary Complexes using Electrospray Ionization Mass Spectrometry," American Chemical Society National Meeting, (2012).
41. L. McDonald, S. Clark, "Strengthening Material Accountability in Reprocessing Plants," National Nuclear Security Administration: University and Industry Technical Interchange, (2011).
42. L. McDonald, S. Clark, "Ligands for the Detection of Trivalent Lanthanides using ESI-MS," Pacifichem, (2010).

#### **INVITED PRESENTATIONS/SEMINARS**

1. L. McDonald IV "Radiochemistry Laboratories and Research at the University of Utah," Australian Nuclear Science and Technology Organization (ANSTO) (2021).
2. L. McDonald IV "Quantifying Particle Morphology to Process History for Nuclear Forensics," SciX (2020).
3. L. McDonald, E. Abbott, A. Hanson, M. Klosterman, and C. Nizinski "Geographical Signatures of Uranium Oxides," Texas A&M University (2020).
4. L. McDonald, E. Abbott, A. Hanson, M. Klosterman, and C. Nizinski "Morphological and Stable Isotope Signatures of Uranium Oxides," Nuclear Forensics Workshop at Los Alamos National Laboratory (2020).
5. L. McDonald, G. Sjoden "Processing Signatures of Uranium Oxides" Pacific Northwest National Laboratory (2019).
6. L. McDonald, E. Abbott, A. Hanson, M. Klosterman, C. Nizinski, and S. Heffernan "Processing History and Geographical Origin Signatures of U-Oxides," Pennsylvania State University (2019).
7. L. McDonald, E. Abbott, A. Hanson, M. Klosterman, C. Nizinski, and S. Heffernan "Quantifying Morphological Features of Uranium Oxides for Nuclear Forensics" University of Alaska-Fairbanks (2019).
8. L. McDonald, E. Abbott, A. Hanson, M. Klosterman, C. Nizinski, and S. Heffernan "Quantifying Morphological Features of Uranium Oxides for Nuclear Forensics" Materials Research Society Fall Meeting (2019).
9. L. McDonald, E. Abbott, A. Hanson, M. Klosterman, C. Nizinski, and S. Heffernan "Processing History and Geographical Origin Signatures of U-Oxides," University of Missouri (2019).
10. L. McDonald, M. Klosterman. "Processing History and Geographical Origin Signatures of U-Oxides from SEM, P-XRD, and  $^{18}\text{O}/^{16}\text{O}$  Ratios," Air Force Technical Applications Center (AFTAC) (2018).

Curriculum Vitae  
**Luther W. McDonald IV, Ph.D.**

11. L. McDonald, I. Schwerdt, A. Olsen, E. Abbott, A. Hanson "Investigation of Morphological and Oxygen Isotope Signatures for Nuclear Forensics," 2<sup>nd</sup> Annual Interagency Technical Nuclear Forensics Technical Review, Oak Ridge National Laboratory (2018).
12. L. McDonald, M. Klosterman, E. Abbott, A. Hanson "Investigation of Morphological and Oxygen Isotope Signatures for Nuclear Forensics," Defense Threat Reduction Agency (2018).
13. L. McDonald, S. Heffernan, M. Klosterman, I. Schwerdt, A. Olsen "Quantifying Oxygen Isotopic Signatures and Uranium Oxide Morphology for Process History Signatures," Colorado School of Mines (2018).
14. L. McDonald, S. Heffernan, M. Klosterman, I. Schwerdt, A. Olsen "Quantifying Morphological and Oxygen Isotopic Signatures of UO<sub>2</sub> based on Production History," Institute of Nuclear Materials Management, Nuclear Materials Science, Processing and Signature Discover Workshop (2018).
15. L. McDonald, S. Heffernan, M. Klosterman, I. Schwerdt, A. Olsen "Quantifying Oxygen Isotopic Signatures of UO<sub>2</sub> based on Production History," Georgia Institute of Technology (2018).
16. L. McDonald, S. Heffernan, M. Klosterman, I. Schwerdt, A. Olsen "Quantifying Oxygen Isotopic Signatures of UO<sub>2</sub> based on Production History," Los Alamos National Laboratory, Center for Nonlinear Studies (2018).
17. L. McDonald, I. Schwerdt, A. Olsen "Investigation of Morphological and Oxygen Isotope Signatures for Nuclear Forensics," 1<sup>st</sup> Annual Interagency Technical Nuclear Forensics Technical Review, Oak Ridge National Laboratory (2017).
18. L. McDonald, M. Klosterman, E. Abbott "Investigation of Morphological and Oxygen Isotope Signatures for Nuclear Forensics," Defense Threat Reduction Agency (2017).
19. L. McDonald "Non-Traditional Signatures in Nuclear Forensics," University of Notre Dame (2017).
20. L. McDonald "Statistics in Nuclear Forensics," U.S. Department of Energy National Analytical Management Program (2016).
21. L. McDonald "Shortening the Technical Nuclear Forensics Timeline," Nuclear Forensics Summer School, Washington State University (2016).
22. L. McDonald "Nontraditional Detection Techniques in Nuclear Forensics," Nuclear Forensics Summer School, Washington State University (2015).
23. L. McDonald "Environmental Radiochemistry Research and Collaboration Opportunities with UNEP," Idaho National Laboratory (2015).
24. L. McDonald "Interfacial Complexes in Spent Nuclear Fuel Reprocessing," Pittsburg Conference on Analytical Chemistry and Applied Spectroscopy (2015).
25. L. McDonald "Radiochemistry in the Nuclear Engineering Program at the University of Utah," University of West Florida (2014).
26. L. McDonald "Improving Radiochemical Separations for Nuclear Forensics," Los Alamos National Laboratory (2014).
27. L. McDonald "Attribution in Nuclear Forensics," Summer Chemistry Enrichment Program/Department of Chemistry, University of Utah (2014).
28. L. McDonald "Shortening Detection Times in Nuclear Forensics," Department of Chemical Engineering, University of Utah (2014).