

Andrew S. Voyles, Ph.D., EIT

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Nuclear Science Division ◊ Lawrence Berkeley National Laboratory
Building 088-163D — M/S 88R0192 ◊ Berkeley, CA 94720 USA

EDUCATION

University of California, Berkeley

Ph.D., Nuclear Engineering
Nuclear Regulatory Commission Graduate Fellowship

Berkeley, California
August, 2018

University of Utah, Honors College

B.S., *cum laude*, Chemical Engineering
Minors: Nuclear Engineering, Chemistry
University of Utah President's Club Scholarship, Dean's List, 2009 - 2013

Salt Lake City, Utah
May, 2013

RESEARCH EXPERIENCE

University of California, Berkeley

Assistant Research Engineer

Berkeley, California
June, 2019 – Present

- Led fundamental studies of low-energy nuclear physics at the LBNL 88-Inch Cyclotron as a part of the LBNL/UCB Nuclear Data Program, and supervised M.S./Ph.D. students in these efforts.
- Efforts include the measurement of charged-particle and neutron-induced reaction cross sections relevant to the production of radionuclides for medical applications, and the measurement of independent and cumulative fission yields using cyclical neutron activation analysis,
- As Isotope Production Group leader, responsible for developing the technical vision for these research objectives, and facilitating interactions with other research organizations to promote collaboration and enhance the impact of research results, chiefly with LANL and BNL.
- Compiled all nuclear data produced in experiments into the reaction database EXFOR.

Postdoctoral Scholar

August, 2018 – June, 2019

- Responsible for overseeing the effort to determine novel production routes for ^{225}Ac , ^{212}Pb , ^{68}Ge , and ^{236}Np , through experiments at the LBNL 88-Inch Cyclotron as a part of the LBNL/UCB Nuclear Data Program.
- Developed in-house capabilities for electrodeposition and pressed-powder target fabrication.
- Assisted other members of the group by supervising M.S./Ph.D. student efforts to determine isotope production routes through cross section measurements at LBNL, LANL, and BNL.

Graduate Student Researcher / NRC Fellow

August, 2014 – August, 2018

- Dissertation Title: "Nuclear Excitation Functions for the Production of Novel Medical Radionuclides" — measurement of cross-sections for neutron-induced and charged particle-induced reaction pathways for the production of emerging novel therapeutic and diagnostic medical radionuclides, with high specific activity.
- Dissertation Advisor: Dr. Lee A. Bernstein, University of California, Berkeley
- Developed intense mono-energetic neutron source capabilities for production of novel therapeutic radionuclides.
- Research carried out at the Lawrence Berkeley National Laboratory's 88-Inch Cyclotron and the Los Alamos National Laboratory's Isotope Production Facility at LANSCE.

University of Oslo

Visiting Researcher, Department of Physics

Oslo, Norway
February – May, 2018

- Studied preparation of a chelate-conjugated biomolecule carrying a radionuclide, in the Nuclear and Energy Physics group.
- Focus on the radiolanthanide ^{161}Tb and a peptidomimetic displaying dual-receptor targeting through the endothelial growth factor receptor and the HER2/neu antigen.

Institute for Laser Engineering, Osaka University

Visiting Researcher

Osaka, Japan
February – March, 2015

- Research and evaluation of solid debris collection diagnostics in search of evidence of nuclear-plasma interactions.

University of Utah*Undergraduate Researcher, Nuclear Engineering*

Salt Lake City, Utah

August, 2010 – August, 2011

- Developed simulation of Neutron Activation Analysis, an analytical technique using neutron irradiation of matter to determine highly precise compositions of samples.
- Simulation optimizes irradiation times of samples to minimize resulting radioactivity.
- Presented paper at 2011 ANS Student Conference, 2011 2nd Utah Detection Conference.

*Undergraduate Researcher, Chemistry***August, 2009 – May, 2010**

- Synthesis and characterization of metal-doped Cadmium-Selenium quantum dots used to produce photonic crystals structured after iridescent scales of several Brazilian beetles.
- Applications include fully-optical circuitry and tunable, customizable photoluminescent sensors for desired molecules and/or cells.
- Later research involved sol-gel dip-coating quantum dots for use in geothermal wells.

University of West Florida*Visiting Researcher, Department of Physics*

Pensacola, Florida

May, 2008 – January, 2009

- Modeled specific heat capacity anomalies of 4'-octyl-4-biphenyl-carbonitrile liquid crystals, due to the effect of mesophase transitions.
- Research proceeded to place third in the 2009 Florida State Science Fair, and as a finalist in the 2009 Intel International Science and Engineering Fair.

TEACHING
EXPERIENCE**University of California, Berkeley***Graduate Student Instructor*

Berkeley, California

- NE 101 / 210M — Nuclear Reactions and Radiation **Fall 2015**
Wrote and graded homework sets for class of 41 undergraduate and graduate students, and led weekly discussion sections for entire class on supplementary material and applications of course material. Mentored students through semester in their coursework, and helped doctoral-track graduate students prepare for their departmental screening exams in this topic.

University of Utah*National Science Foundation Outreach Mentor*

Salt Lake City, Utah

May, 2010 – May, 2013

- Created and presented hands-on demos to local schools, to advocate engineering and science careers, focusing on historically underrepresented demographics.

Teaching Assistant

- CH EN 2300 — Thermodynamics I **Spring 2013**
- NUCL 3000 / 5030 — Nuclear Principles in Engineering **Fall 2011**
Designed semester-long computational simulation projects using GEANT4 for class of 63 undergraduate and graduate students, after teaching GEANT4 programming to class. Mentored students through semester in developing their projects, as well as coursework.

GRADUATE
SUPERVISION:**Advisee Name****Organizational Affiliation**

Elise Martinsen

University of Oslo, Physics M.S. student (2022 – Present)

Nora Pettersen

University of Oslo, Physics M.S. student (2018 – 2021)

<http://urn.nb.no/URN:NBN:no-87091>

Hannah Ekeberg

University of Oslo, Physics M.S. student (2018 – 2020)

<http://urn.nb.no/URN:NBN:no-82944>SELECTED
PUBLICATIONS

F. Pogliano, F. L. Bello Garrote, A. C. Larsen, H. C. Berg, D. Gjestvang, A. Görgen, M. Guttormsen, V. W. Ingeberg, T. W. Johansen, K. L. Malatji, E. F. Matthews, M. Markova, J. E. Midtbø, V. Modamio, L. G. Pedersen, E. Sahin, S. Siem, T. G. Tornyi, and **A. S. Voyles**, *Observation of a candidate for the M1 scissors resonance in odd-odd ^{166}Ho* . Physical Review C, **107** (2023) 034605. <https://doi.org/10.1103/PhysRevC.107.034605>

Sarah Stevenson, Andrew Dong, Yujun Xie, Jon Morrell, **Andrew S. Voyles**, Jeff Bickel, Lee Bernstein, S.A. Maloy, and Peter Hosemann, *The effects of high energy deuteron ion beam irradiation on the tensile behavior of HT-9*. Nuclear Instruments and Methods in Physics Research B, **531**

(2022) 65–73.
<https://doi.org/10.1016/j.nimb.2022.09.001>

Karolina Kolos, Vladimir Sobes, Ramona Vogt, Catherine E. Romano, Michael S. Smith, Lee A. Bernstein, David A. Brown, Mary T. Burkey, Yaron Danon, Mohamed A. Elsayi, Bethany L. Goldblum, Lawrence H. Heilbronn, Susan L. Hogle, Jesson Hutchinson, Ben Loer, Elizabeth A. McCutchan, Matthew R. Mumpower, Ellen M. O'Brien, Catherine Percher, Patrick N. Pelpowski, Jennifer J. Ressler, Nicolas Schunck, Nicholas W. Thompson, **Andrew S. Voyles**, William Wieselquist, and Michael Zerkle, *Current nuclear data needs for applications*. Physical Review Research, **4** (2022) 021001.

<https://doi.org/10.1103/PhysRevResearch.4.021001>

M. S. Uddin, M. S. Basunia, S. Sudár, B. Scholten, S. Spellerberg, **A. S. Voyles**, J. T. Morrell, M. B. Fox, I. Spahn, O. Felden, R. Gebel, L. A. Bernstein, B. Neumaier, and S. M. Qaim, *Excitation functions of proton-induced nuclear reactions on ^{86}Sr , with particular emphasis on the formation of isomeric states in ^{86}Y and ^{85}Y* . The European Physical Journal A, **58** (2022) 67.

<https://doi.org/10.1140/epja/s10050-022-00714-w>

Morgan B. Fox, **Andrew S. Voyles**, Jonathan T. Morrell, Lee A. Bernstein, Jon C. Batchelder, Eva R. Birnbaum, Cathy S. Cutler, Arjan J. Koning, Amanda M. Lewis, Dmitri G. Medvedev, Francois M. Nortier, Ellen M. O'Brien, and Christiaan Vermeulen, *Measurement and modeling of proton-induced reactions on arsenic from 35 to 200 MeV*. Physical Review C, **104** (2021) 064615.

<https://doi.org/10.1103/PhysRevC.104.064615>

Stephan Friedrich, Geon-Bo Kim, Dongwon Lee, J. Ad Hall, Robin Cantor, **Andrew Voyles**, Ruslan Hummatov, and Stephen P.T. Boyd, *Ultra-High Resolution Magnetic Microcalorimeter Gamma-Ray Detectors for Non-Destructive Assay of Uranium and Plutonium*. Journal of Nuclear Materials Management, **49** (2021), 114–122.

D. Gjestvang, S. Siem, F. Zeiser, J. Randrup, R. Vogt, J.N. Wilson, F. Bello-Garrote, L.A. Bernstein, D.L. Bleuel, M. Guttormsen, A. Gørgen, A.C. Larsen, K.L. Malatji, E.F. Matthews, A. Oberstedt, S. Oberstedt, T. Tornyi, G.M. Tveten, and **A.S. Voyles**, *Excitation energy dependence of prompt fission γ -ray emission from $^{241}\text{Pu}^*$* . Physical Review C, **103** (2021) 034609.

<https://doi.org/10.1103/PhysRevC.103.034609>

Andrew S. Voyles, Amanda M. Lewis, Jonathan T. Morrell, M. Shamsuzzoha Basunia, Lee A. Bernstein, Jonathan W. Engle, Stephen A. Graves, and Eric F. Matthews, *Proton-induced reactions on Fe, Cu, & Ti from threshold to 55 MeV*. The European Physical Journal A, **57** (2021) 94.

<https://doi.org/10.1140/epja/s10050-021-00401-2>

Morgan B. Fox, **Andrew S. Voyles**, Jonathan T. Morrell, Lee A. Bernstein, Amanda M. Lewis, Arjan J. Koning, Jon C. Batchelder, Eva R. Birnbaum, Cathy S. Cutler, Dmitri G. Medvedev, Francois M. Nortier, Ellen M. O'Brien, and Christiaan Vermeulen, *Investigating high-energy proton-induced reactions on spherical nuclei: Implications for the preequilibrium exciton model*. Physical Review C, **103** (2021) 034601. <https://doi.org/10.1103/PhysRevC.103.034601>

Ryan K. Chapman, **Andrew S. Voyles**, Narek Gharibyan, Lee A. Bernstein, and James E. Bevins, *Measurement of the $^{160}\text{Gd}(p,n)^{160}\text{Tb}$ excitation function from 4–18 MeV using stacked-target activation*. Applied Radiation and Isotopes, **171** (2021) 109647.

<https://doi.org/10.1016/j.apradiso.2021.109647>

D.L. Bleuel, L.A. Bernstein, R.A. Marsh, J.T. Morrell, B. Rusnak, and **A.S. Voyles**, *Precision measurement of relative γ -ray intensities from the decay of ^{61}Cu* . Applied Radiation and Isotopes, **170** (2021) 109625. <https://doi.org/10.1016/j.apradiso.2021.109625>

M. Shuza Uddin, Bernhard Scholten, M. Shamsuzzoha Basunia, Sandor Sudár, Stefan Spellerberg, **Andrew S. Voyles**, Jonathan T. Morrell, Haleema Zaneb, Jesus A. Rios, Ingo Spahn, Lee A. Bernstein, Bernd Neumaier, and Syed M. Qaim, *Accurate Determination of Production Data of the Non-Standard Positron Emitter ^{86}Y via the $^{86}\text{Sr}(p,n)$ -Reaction*. Radiochimica Acta, **108** (2020) 747–756. <https://doi.org/10.1515/ract-2020-0021>

- M.S. Basunia, J.T. Morrell, M.S. Uddin, **A.S. Voyles**, C.D. Nesaraja, L.A. Bernstein, E. Browne, M.J. Martin, and S.M. Qaim, *Resolution of a discrepancy in the γ -ray emission probability from the β decay of $^{137}\text{Ce}^g$* . Physical Review C, **101** (2020) 064619. <https://doi.org/10.1103/PhysRevC.101.064619>
- G.B. Kim, S.T.P. Boyd, R.H. Cantor, **A.S. Voyles**, J.T. Morrell, L.A. Bernstein, and S. Friedrich, *A New Measurement of the 60 keV Emission from Am-241 Using Metallic Magnetic Calorimeters*. Journal of Low Temperature Physics, (2020) 1-7. <https://doi.org/10.1007/s10909-020-02412-7>
- Jonathan T. Morrell, **Andrew S. Voyles**, M. S. Basunia, Jon C. Batchelder, Eric F. Matthews, and Lee A. Bernstein, *Measurement of $^{139}\text{La}(p,x)$ cross sections from 35–60 MeV by stacked-target activation*. The European Physical Journal A, **56** (2020) 13. <https://doi.org/10.1140/epja/s10050-019-00010-0>
- Lee A. Bernstein, David A. Brown, Arjan J. Koning, Bradley T. Rearden, Catherine E. Romano, Alejandro A. Sonzogni, **Andrew S. Voyles**, and Walid Younes, *Our Future Nuclear Data Needs*. Annual Review of Nuclear and Particle Science, **69.1** (2019) 109–136. <https://doi.org/10.1146/annurev-nucl-101918-023708>
- Andrew S. Voyles**, Lee A. Bernstein, Eva R. Birnbaum, Jonathan W. Engle, Stephen A. Graves, Toshihiko Kawano, Amanda M. Lewis, and Francois M. Nortier, *Excitation functions for (p,x) reactions of niobium in the energy range of $E_p = 40\text{--}90$ MeV*. Nuclear Instruments and Methods in Physics Research B, **429** (2018) 53–74. <https://doi.org/10.1016/j.nimb.2018.05.028>
- Mauricio Ayllon, Parker A. Adams, Joseph D. Bauer, Jon C. Batchelder, Tim A. Becker, Lee A. Bernstein, Su-Ann Chong, Jay James, Leo E. Kirsch, Ka-Ngo Leung, Eric F. Matthews, Jonathan T. Morrell, Paul R. Renne, Andrew M. Rogers, Daniel Rutte, **Andrew S. Voyles**, Karl Van Bibber, and Cory S. Waltz, *Design, construction, and characterization of a compact DD neutron generator designed for $^{40}\text{Ar}/^{39}\text{Ar}$ geochronology*. Nuclear Instruments and Methods in Physics Research A, **903** (2018) 193–203. <https://doi.org/10.1016/j.nima.2018.04.020>
- A.S. Voyles**, M.S. Basunia, J.C. Batchelder, J.D. Bauer, T.A. Becker, L.A. Bernstein, E.F. Matthews, P.R. Renne, D. Rutte, M.A. Unzueta, and K.A. van Bibber, *Measurement of the $^{64}\text{Zn}, ^{47}\text{Ti}(n,p)$ Cross Sections using a DD Neutron Generator for Medical Isotope Studies*. Nuclear Instruments and Methods in Physics Research B, **410** (2017) 230–239. <https://doi.org/10.1016/j.nimb.2017.08.021>
- CONTRIBUTED
TALKS
- A.S. Voyles, “Isotope Production Activities at LBNL: The Tri-Lab Effort in Nuclear Data (TREND), and Novel Production Pathways for ^{225}Ac .” 18th International Workshop on Targetry and Target Chemistry, Whistler, Canada. 24 August 2022.
- A.S. Voyles, “Investigating High-Energy Proton-Induced Reactions: Implications for Level Densities and the Preequilibrium Exciton Model.” 8th Workshop on Nuclear Level Density and Gamma Strength, Oslo, Norway. 10 May 2022.
- A.S. Voyles, “Nuclear data for isotope production.” Symposium on Radiotherapeutics: From Isotope Production to Targeted Delivery, American Chemical Society Spring 2021 Meeting, *online*. 06 April 2021. (invited)
- A.S. Voyles, “ $^{238}\text{U}(p,xn)$ and $^{235}\text{U}(d,xn)$ $^{235\text{--}237}\text{Np}$ Nuclear Reaction Cross Sections Relevant to the Production of ^{236g}Np .” Workshop for Applied Nuclear Data Activities, *online*. 03 February 2021.
- A.S. Voyles, “Targetry Fabrication for Nuclear Data Measurements.” Workshop for Applied Nuclear Data Activities, Washington, D.C.. 04 March 2020. (invited)
- A.S. Voyles, “Capabilities for Isotope Production Nuclear Data Measurements at LBNL.” Workshop for Applied Nuclear Data Activities, Washington, D.C.. 23 January 2019. (invited)
- A.S. Voyles, “Isotope Production Activities at LANSCE-IPF: Development of a new $\text{Nb}(p,x)^{90}\text{Mo}$ Monitor Reaction and $\text{La}(p,x)$ Production Cross-Section Measurements.” 2018 LANSCE User Group Meeting, Santa Fe, NM. 05 November 2018. (invited)

- A.S. Voyles, “Isotope Production Activities at LBNL and LANSCE-IPF: Development of a new Nb(p,x)⁹⁰Mo Monitor Reaction and Fe,La(p,x) Production Cross-Section Measurements.” 17th International Workshop on Targetry and Target Chemistry, Coimbra, Portugal. 30 August 2018.
- A.S. Voyles, “Isotope production cross section measurements at the HFNG, LANL-IPF, and LBNL.” 14th Nordic Meeting on Nuclear Physics, Longyearbyen, Norway. 24 May 2018.
- A.S. Voyles, “Cross-Section Measurements for Novel Medical Radionuclides at UCB/LBNL: The Challenge of ‘Simple’ Experiments.” UC Berkeley NE Dept. Graduate Colloquium, Berkeley, CA. 12 February 2018. (invited)
- A.S. Voyles, “Medical Isotope Production at Berkeley.” University of Oslo Nuclear Physics Summer School, Oslo, Norway. 19 May 2017. (invited)
- A.S. Voyles, “Spin Distribution of Excited Nuclear States in ^{nat}Fe(p,αn).” 6th Workshop on Nuclear Level Density and Gamma Strength, Oslo, Norway. 08 May 2017.
- A.S. Voyles, “Experimental Activities in Berkeley.” US National Nuclear Data Week (CSEWG), Upton, NY. 14 November 2016.
- A.S. Voyles, “⁶⁴Cu and ⁴⁷Sc (n,p) Cross-Section Measurements for Medical Radionuclide Production.” 16th International Workshop on Targetry and Target Chemistry, Santa Fe, NM. 30 August 2016.
- A.S. Voyles, “Neutron Cross-Sections for Radionuclide Production” (Poster). University & Industry Technical Interchange 2016 Review Meeting, Raleigh, NC. 07 June 2016.
- A.S. Voyles, “GEANT4 Simulation of Irradiation Facilities and Neutron Sources at University of Utah TRIGA for Nuclear Forensics and Detection.” AICHE Annual Meeting, Minneapolis, MN. 19 October 2011.
- A.S. Voyles, “GEANT4 Simulation of Irradiation Facilities and Neutron Sources at University of Utah TRIGA for Nuclear Forensics and Detection.” 2nd National Conference in Advancing Tools and Solutions for Nuclear Material Detection, Salt Lake City, UT. 02 May 2011.
- A.S. Voyles, “GEANT4 Simulation of Irradiation Facilities at University of Utah TRIGA (2011).” ANS Student Conference, Atlanta, GA. 15 April 2011.

ORGANIZATION OF CONFERENCES AND SYMPOSIA

- Session Chair, “Department of Energy Isotope Programs”, Workshop for Applied Nuclear Data Activities, 27 February – 02 March 2023.
- Session Chair, “Predictive Codes for Isotope Production”, Workshop for Applied Nuclear Data Activities, 25 January – 03 February 2021.

PATENTS

Lee Bernstein, Jon Batchelder, Jonathan T Morrell, **Andrew Voyles**. 2020. Systems and methods for producing actinium-225. US20220199276A1 / EP3953949A1 / WO2020210147A1, filed 08 April 2019. Patent pending.

CERTIFICATIONS

- Licensed in Utah as Engineer in Training (EIT, ID# 13-802-04) **April, 2012**

COMPUTER SKILLS

Languages	Java, C/C++, Python
Tools	git, svn, CAD, MATLAB, Mathematica, Maple, L ^A T _E X, Arduino, shell, bash, SQLite, COMSOL Multiphysics, Aspen, ANSYS Fluent
Nuclear Software	TALYS, EMPIRE, GEANT4, MCNP/MCNPX, FLUKA, EXFOR

LAB SKILLS

- Radionuclide labeling via chelate-conjugated biomolecules.
- Radio-HPLC, radio-TLC, and solid-phase extraction radiochemical purification.
- HPGe Gamma spectroscopy, radiation detection and measurement.
- Design and implementation of PID process control systems.
- Operation of heat exchanger, distillation column, ebulliometer (classroom experience).
- ¹H and ¹³C NMR , IR characterization and analysis, chromatography.
- Organic laboratory synthesis and purification techniques.

PROFESSIONAL SERVICE	Applied Radiation and Isotopes	
	• Reviewer	– since 2022
	Materials	
	• Reviewer	– since 2020
	Journal of Radioanalytical and Nuclear Chemistry	
	• Reviewer	– since 2019
	Nuclear Instruments and Methods in Physics Research B	
PROFESSIONAL SOCIETY MEMBERSHIPS	• Reviewer	– since 2017
	American Nuclear Society	
	• Program Chair, Northern California Section	– since 2016
	• Executive Committee, Northern California Section	– since 2016
	• Webmaster, Utah Student Section	2011 – 2013
	American Physical Society	– since 2016
	American Nuclear Society	– since 2011
HONORS AND AWARDS	Alpha Nu Sigma Nuclear Engineering Honor Society	– since 2011
	Tau Beta Pi National Engineering Honor Society	– since 2010
	Phi Eta Sigma National Honor Society	– since 2010
	American Institute of Chemical Engineers	– since 2009
	<i>University of California, Berkeley</i>	
	• Marie Sklodowska-Curie Actions Seal of Excellence	2018
	• Department of Nuclear Engineering Outstanding Service Award	2016
HONORS AND AWARDS	• Nuclear Regulatory Commission Graduate Fellowship	2015 – 2018
	<i>University of Utah</i>	
	• Undergraduate Research Scholar Award	May, 2013
	• University of Utah President's Club (Full Ride) Scholarship	2009 – 2013
	• Dean's List	2009 – 2013
	• Neil R. Mitchell Scholarship in Engineering	2012
	• Chevron Scholarship in Engineering	2011
	• Theodore Verender Hanks Scholarship in Science & Engineering	2011
	• Don Dahlstrom Scholarship in Chemical Engineering	2010
	• College of Science Dean's Scholarship, University of Utah	2010
	International Baccalaureate Diploma Recipient	July, 2009
	Finalist: Intel International Science and Engineering Fair	May, 2009
	3 rd Place: Florida State Science Fair	April, 2009