

ERIC F. MATTHEWS

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OBJECTIVE

I am PhD Candidate in the Department of Nuclear Engineering at UC Berkeley with a research focus on the physics and nuclear data related to fission. After my completion of this degree, I will pursue a career as a staff scientist at a national laboratory. I will seek projects that improve the quality of nuclear data relevant to the fission process; this includes projects involving evaluation, experimentation, and theory. Through these projects, I hope to improve the nuclear data that is used in high-precision simulations and calculations for applications. In particular, I am interested in the application of nuclear data to nuclear security and forensics problems. I will graduate from my PhD program in May 2021.

EDUCATION

University of California - Berkeley PhD Candidate Department of Nuclear Engineering	<i>August 2017 - Present</i> GPA: 4.000
University of Oslo Exchange Student Department of Physics	<i>August 2018 - December 2018</i> GPA: 4.000
University of California - Berkeley Bachelor of Science - awarded May 15, 2017 Department of Nuclear Engineering	<i>August 2013 - June 2017</i> GPA: 3.300 Major GPA: 3.550
Missouri Academy of Science, Mathematics, and Computing Associate of Science - awarded June 1, 2013 Secondary School Diploma - awarded June 1, 2013	<i>August 2011 - June 2013</i> GPA: 3.450 GPA: 4.000

EXPERIENCE

National Nuclear Security Administration Fellowship *January 2019 - January 2020*
The NNSA Graduate Fellowship Program (NGFP) places highly qualified graduate students into year-long assignments across the NNSA nuclear security mission space, including nonproliferation and stockpile stewardship. During my time as a fellow, I was stationed at Lawrence Livermore National Laboratory (LLNL). Here I worked with Dr. Anton Tonchev and Dr. Jack Silano of the Nuclear and Particle Physics group on the measurement of fission yields to short-lived fission products using cyclical irradiations. This work entailed performing measurement at Triangle Universities Nuclear Laboratory at Duke University and analyzing the data that was collected.

This fellowship offered a number of unique and enriching experiences that have expanded my background in national security. As a result of this fellowship, I pursued and obtained a Department of Energy (DOE) Q security clearance in September of 2018. In June of 2018, the fellowship program took its fellows to Pacific Northwest National Laboratory (PNNL) and DOE Headquarters for an extensive 10-day seminar and training on national security matters relevant to the NNSA mission space. This enrichment has been continued at LLNL, where I have participated in a number of reviews by the NNSA field office of the laboratory's various stockpile stewardship missions..

Academic Cooperation Program - LLNL

January 2020 - present

Upon the completion of my NGFP Fellowship in January 2020, I became a member of the Academic Cooperation Program (ACP) at LLNL under Dr. Jo Ressler. This position allowed my Q clearance from the NGFP to be transferred to LLNL where it currently remains active. This position also allows me to access the LLNL campus to continue my collaboration with various staff scientists. This included attending the “Nuclear Weapons Training Course” hosted by the NNSA Livermore Field Office and the Defense Threat Reduction Agency (DTRA).

Nuclear Science and Security Consortium at UC Berkeley

Research Apprentice

January 2014 - May 2014

Undergraduate Researcher

May 2014 - August 2017

Graduate Fellow

August 2017 - Present

The Nuclear Science and Security Consortium (NSSC) is a multi-institutional organization led by the University of California - Berkeley to support the nation’s mission in nuclear nonproliferation. The NSSC seeks to cultivate a new generation of scientists by linking students with projects and mentors at the national laboratories.

During my tenure as an undergraduate researcher, I worked to develop the FIER code (Fission Induced Electromagnetic Response). FIER is a code package for the analytical modeling of time-dependent delayed gamma-ray spectra resulting from fission. Under the supervision of Dr. Bethany Goldblum of the NSSC and with mentorship from Dr. Brian Quiter of the Applied Nuclear Physics Group at Lawrence Berkeley National Laboratory (LBNL), I completed and validated this code package and developed a Monte Carlo uncertainty quantification method for the model output. Through a collaboration with LLNL and PNNL, FIER output was compared to experimentally measured delayed gamma-ray data and an investigation into discrepant evaluated fission yields was performed. This work will culminated in a peer-reviewed journal article of which I am first author. FIER was approved for publication by the DOE in 2018 and is available for download with documentation at bang.berkeley.edu/fier.

As a graduate fellow I have continued my research on nuclear fission with the support of the NSSC. My graduate research has focused on improving the state of nuclear data related to fission. This work included the design and construction the Fast Loading User Facility for Fission Yields (FLUFFY) at the 88-Inch Cyclotron at LBNL. FLUFFY is used to cyclically irradiate fissionable samples, producing short-lived fission products and allowing for the measurement of their yields. My work has also included the development of a method for covariance matrix generation for fission yields. These covariance matrices supplement the most recent evaluation of fission yields (which did not include an assessment of covariances). I have continued the development of FIER by mentoring an undergraduate researcher that will help develop the code’s delayed neutron modeling capabilities and nuclear forensics applications.

Bay Area Nuclear Data Group at Lawrence Berkeley National Laboratory *August 2015 - Present*

The Bay Area Nuclear Data Group (BAND) is a team of researchers and students led by Dr. Lee Bernstein, the nuclear data group leader at LBNL. BAND works to support the efforts of the United States Nuclear Data Program and trains students in nuclear data measurements and evaluation. The experimental efforts of this group are made possible by a cyclotron at LBNL and the High-Flux Neutron Generator (HFNG) at UC Berkeley.

During my time as a researcher with this group, I have worked on three medical isotope cross-section measurements and a depleted uranium irradiation at the HFNG. I have worked extensively on the

development of gamma-ray spectroscopy methods that focus on detailed fitting of photopeaks and calibration forms with full covariance matrix generation. This work has led to a number of co-authored publications.

TEACHING

Nuclear Reactions and Radiation - UC Berkeley

Graduate Student Instructor

Autumn 2017

Teaching Assistant

Autumn 2016

Teaching Assistant

Autumn 2015

After completing this class with an A+ in autumn of 2014, I joined the teaching team for NE 101 - Nuclear Reactions and Radiation, taught by Dr. Lee Bernstein in the fall semesters of 2015, 2016, and 2017. During the autumn of 2015, my main task was to organize and grade lab reports for the Masters level laboratory practical. I also helped grade exams and hosted two exam review sessions. In 2016, I took on a larger role, writing and grading half of the homework assignments for the class in addition to helping grade exams, hosting review sessions, and hosting office hours. In 2017, I took the lead teaching assistant role of Graduate Student Instructor. My responsibilities were to write all of the homework assignments, host a weekly lecture/discussion, host office hours, organize the Masters level laboratory practical, host exam review sessions, and help grade exams. My work in this role won me one of UC Berkeley's Outstanding Graduate Student Instructor awards in April of 2018.

Nuclear Reactions and Radiation Laboratory - UC Berkeley

Teaching Assistant

Spring 2016

After completing this class with an A in the Spring of 2015, I joined the teaching team for NE 102 - Nuclear Reactions and Radiation Laboratory, taught by Dr. Lee Bernstein in the Spring of 2016. My main task was to help organize laboratory experiments, diagnose detection circuits, and grade lab reports for 3 of the 6 experiments.

Radiation Biophysics and Dosimetry - UC Berkeley

Reader

Spring 2017

My role in this course was to grade homework and host exam review sessions. This course was taught by Dr. Jasmina Vujic.

AWARDS AND OTHER ACCOLADES

Best National Laboratory Collaboration

June 2019

Awarded by the NNSA at the 2019 University Program Review. For "Your outstanding research project. Development of the Fast Loading User Facility for Fission Yields, that demonstrated excellent collaboration with the National Labs."

Outstanding Graduate Student Instructor

April 2018

For "outstanding work in the teaching of undergraduates." This is a university-wide recognition with selection based on: "overall effectiveness as an instructor, capacity to promote critical thinking, skills in presenting course material, utilization of pedagogically effective approaches, skills in developing course materials that promote learning, command of the subject area, ability to motivate students, engagement in departmental and campus-wide activities that enhance teaching and learning."

Christopher Wootton Award For “superior service and leadership to the Department of Nuclear Engineering.”	<i>May 2017</i>
Christopher Wootton Award For “superior service and leadership to the Department of Nuclear Engineering.”	<i>May 2016</i>
Semi-Finalist - Fulbright Scholarship, Norway	<i>2019-2020</i>

PUBLICATION RECORD

h-index: 5, number of citations: 61

First Author:

FIER: Software for Analytical Modeling of Delayed Gamma-Ray Spectra

Nuclear Instrumentation and Methods A

Published February 26, 2018

Independent and Cumulative Fission Yield Covariance Matrices for 61 Compound Systems

Physical Review C - Under Review

Submitted May 2020

Co-Author:

Z=50 Core Stability in ^{110}Sn from Magnetic-Moment and Lifetime Measurements

Physical Review C

Published April 18, 2016

Magnetic Moment and Lifetime Measurements of Coulomb-Excited States in ^{106}Cd

Physical Review C

Published September 6, 2016

Possible Evidence of Nonstatistical Properties in the $^{35}\text{Cl}(n,p)^{35}\text{S}$ Cross Section

Physical Review C

Published April 25, 2019

Measurement of $^{139}\text{La}(p,x)$ Cross Sections from 35-60 MeV by Stacked-Target Activation

European Physical Journal A

Published January 1, 2020

Measurement of the ^{64}Zn , $^{47}\text{Ti}(n,p)$ Cross Sections Using a DD Neutron Generator for Medical Isotope Studies

Nuclear Instrumentation and Methods A

November 1, 2017

Design, Construction, and Characterization of a Compact DD Neutron Generator Designed for $^{40}\text{Ar}/^{39}\text{Ar}$ Geochronology

Nuclear Instrumentation and Methods A
Published May 2, 2018

Neutron Spectroscopy for Pulsed Beams with Frame Overlap using a Double Time-of-Flight Technique

Nuclear Instrumentation and Methods A
Published October 16, 2017

The 88-Inch Cyclotron: A One-Stop Facility for Electronics Radiation and Detector Testing

Measurement
Published June 21, 2017

PRESENTATIONS

Oral Presentations:

Nuclear Physics Workshop on Fission - December 2019 - Oslo, Norway
Presented my research on a method for fission yield covariance matrix generation.

Nuclear Data Week - November 2019 - Brookhaven, NY
Presented my research on a method for fission yield covariance matrix generation.

International Workshop on Fission Product Yields - October 2019 - Santa Fe, NM - *Invited Talk*
Presented my research on a method for fission yield covariance matrix generation.

Theory-5: Scientific Workshop on Nuclear Fission Dynamics and the Emission of Prompt Neutrons and Gamma Rays - September 2019 - Barga, Italy
Presented my research on the development of the Fast Loading User Facility for Fission Yields at LBNL for the purpose of cyclical irradiations to facility fission yield measurements.

National Nuclear Security Administration University Program Review - June 2019 - Raleigh, NC - *Invited Talk*
Presented my research on the development of the Fast Loading User Facility for Fission Yields at LBNL for the purpose of cyclical irradiations to facility fission yield measurements. This talk was nominated for the “Best Oral Presentation” award and won the “Best National Laboratory Collaboration” award.

7th Workshop on Nuclear Level Density and Gamma Strength - May 2019 - Oslo, Norway
Presented my research on the development of the Fast Loading User Facility for Fission Yields at LBNL for the purpose of cyclical irradiations to facility fission yield measurements.

Institute of Nuclear Materials Management 59th Annual Meeting - July 2018 - Baltimore, MD
Presented my research into the use of FIER for investigation and resolution of the nuclear data discrepancies. This talk was specifically geared towards the use of FIER in future fission yield evaluations as integral benchmarking tool.

National Nuclear Security Administration University Program Review - June 2018 - Ann Arbor, MI - *Invited Talk*

Presented my research into the use of FIER for investigation and resolution of the nuclear data discrepancies. This talk was specifically geared towards the use of FIER in future fission yield evaluations as integral benchmarking tool.

253th American Chemical Society Meeting and Exposition - April 2017 - San Francisco, CA - *Invited Talk*

Presented my research into the use of FIER for investigation and resolution of the nuclear data discrepancies.

Schubert Review of the Nuclear Data Section of the Nuclear Science and Security Consortium - June 2018 - Berkeley, CA

Presented my research into the use of FIER for investigation and resolution of the nuclear data discrepancies. This talk was specifically geared towards the use of FIER in future fission yield evaluations as integral benchmarking tool.

6th Workshop on Nuclear Level Density and Gamma Strength - May 2017 - Oslo, Norway

Presented my research into the use of FIER for investigation and resolution of the nuclear data discrepancies.

Workshop on Nuclear Data Needs and Capabilities for Applications - May 2015 - Berkeley, CA

Presented my research with the NSSC and detailed how improvement in the formatting of nuclear databases could assist nuclear simulation packages.

“Dark Matter as Art - Film Screening and Artist and Scientist Panel with Bernard Sadoulet and Karl van Bibber” - November 2017 - Berkeley, CA - *Moderator*

Moderated a panel of 7 artists and scientists by fielding questions from the audience and offering questions of my own.

249th American Chemical Society Meeting and Exposition - March 2015 - Denver, CO

Presented my research into the use of FIER for non-destructive assay of the fissionable composition of neutron-irradiated material.

Poster Sessions:

14th Nordic Meeting on Nuclear Physics - May 2018 - Longyearbyen, Svalbard, Norway

NSSC September Workshop - September 2017 - Berkeley, CA

University Program Review NNSA - June 2017 - Walnut Creek, CA

Department of Nuclear Engineering Advisory Board Poster Session - May 2017 - Berkeley, CA

LBNL Nuclear Science Division Director's Review - October 2016 - Berkeley, CA

University and Industry Technical Interchange 2016 - June 2016 - Raleigh, NC

Department of Nuclear Engineering Advisory Board Poster Session - May 2016 - Berkeley, CA

Reception for the Students of Tokyo Institute of Technology - September 2015 - Berkeley, CA

Nuclear Science and Security Consortium Advisory Board Poster Session - August 2015 - Berkeley, CA

Los Alamos Nuclear Safeguards and Security Summer School Poster Session - August 2015 - Los Alamos, NM

Department of Nuclear Engineering Advisory Board Poster Session - May 2015 - Berkeley, CA

Nuclear Science and Security Consortium Advisory Board Poster Session - August 2014 - Berkeley, CA

WORKSHOPS AND SUMMER SCHOOLS

DTRA/NNSA Nuclear Weapons Training Course - Lawrence Livermore National Laboratory - February 2020 - Livermore, CA

Nuclear Physics Summer School - University of Stellenbosch - December 2018 - Stellenbosch, South Africa

NNSA Graduate Fellowship Orientation - Pacific Northwest National Laboratory and Department of Energy Headquarters - June 2018 - Richland, WA / Washington, D.C.

Nuclear Physics Summer School - University of Oslo - May 2017 - Oslo, Norway

International Atomic Energy Agency, Nuclear Structure and Decay Data Technical Meeting - certified observer for the United States - May 2017 - Berkeley, CA

Los Alamos/Sandia National Labs Nuclear Safeguards and Security Summer School - August 2015 - Los Alamos, NM / Albuquerque, NM

Peder Sather Center Workshop - December 2014 - Berkeley, CA