

# NUCLEAR SCIENCE AND SECURITY CONSORTIUM NEWSLETTER

Summer 2019



## IN THIS ISSUE

Letter from the NSSC Director	1
NSSC Overview	2
Highlights from the NSSC's History	3
Focus Areas & Crosscutting Areas	4
Fellow & Affiliate Research Highlights	5
Events	9
Summer Programs	10
Awards & News	14
Metrics	15
Pipeline	16

## LETTER FROM THE NSSC DIRECTOR

The Nuclear Science and Security Consortium's (NSSC) primary objectives are to recruit, educate and train top students in relevant nuclear topics, to connect students with a core set of disciplines that support the nonproliferation and nuclear security mission, and to expand national laboratory collaboration to provide students the opportunity to engage deeply in research under the guidance of national laboratories staff scientists. All current NSSC Graduate Fellows have a laboratory mentor in addition to an academic mentor. The majority of NSSC Fellows (129 NSSC students and postdocs) have conducted in-residence lab research since 2016, and over 100 NSSC students are working on lab-led projects.

A total of 94 NSSC Fellows and Affiliates have accepted positions in DOE national laboratories or other government — 40% of students and postdocs completing the program — while an additional 48 were hired into faculty and research positions at U.S. universities. The NSSC has graduated 106 B.S., 56 M.S., and 88 Ph.D. student fellows and affiliates and has supported 45 postdoctoral scholars through program completion.



Of these, 69 NSSC Fellows and Affiliates are continuing with graduate education in technical fields, a large fraction of which are expected to accede to positions supporting the NNSA mission in the coming year. The NSSC has demonstrated scientific excellence in several subject areas through the publication of numerous highly cited manuscripts in influential journals. The consortium has produced 267 peer-reviewed publications and 1,074 oral and poster presentations on fundamental and applied research within the core set of scientific disciplines supporting the nuclear security mission. The wide reach of the NSSC provides a unique infrastructure for recruitment, education and training, as well as human capital development, formidable for the quantity, quality, and diversity of fellows and a rich collaborative research environment between the university members, their student and faculty researchers, and the DOE National Laboratory scientists and staff.

# NSSC OVERVIEW

## NSSC EXECUTIVE TEAM

**DR. JASMINA VUJIC**  
Director  
UC Berkeley

**DR. BETHANY GOLDBLUM**  
Executive Director  
UC Berkeley

**DR. JASON HAYWARD**  
Deputy Executive Director  
UT Knoxville

**DR. KAI VETTER**  
NNSA Liaison  
UC Berkeley

**DR. LEE BERNSTEIN**  
Director for Laboratories  
UC Berkeley

## NSSC ADVISORY BOARD

**DR. CAROL BURNS – Chair**  
Los Alamos National Laboratory

**DR. ROGER FALCONE**  
University of California, Berkeley

**DR. MIRIAM “MIM” JOHN**  
Retired from Sandia National  
Laboratory

**DR. DAVID MCCALLEN**  
University of California, Office of the  
President/  
Lawrence Berkeley National  
Laboratory

**DR. SONIA LETANT**  
Lawrence Livermore National  
Laboratory

**JOHN TAYLOR**  
Retired from Sandia National  
Laboratory

**DR. BENN TANNENBAUM**  
Sandia National Laboratory

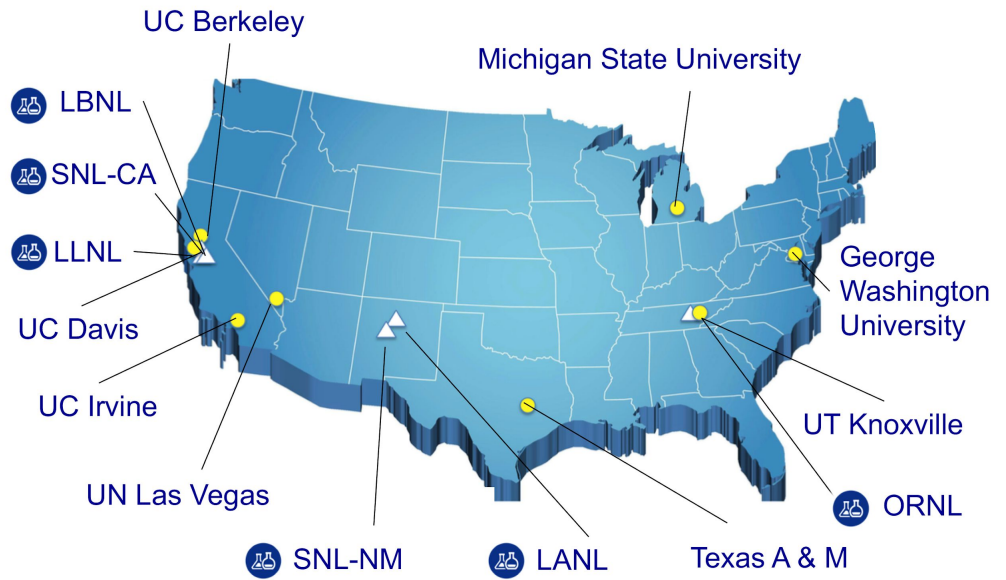
**DR. CATHERINE ROMANO**  
Oak Ridge National Laboratory

## NSSC STAFF

**CHARLOTTE CARR**  
Program Manager

**DEREK JOHNSON**  
Financial Analyst

## PARTNER INSTITUTIONS



## PARTNER INSTITUTIONS MAIN POINT OF CONTACT COUNCIL

**DR. ALLISON MACFARLANE**  
George Washington University

**DR. GEORGE MILLER**  
University of California, Irvine

**DR. JOHN VALENTINE**  
Lawrence Berkeley  
National Laboratory

**DR. SEAN LIDDICK**  
Michigan State University

**DR. FREDERIC POINEAU**  
University of Nevada, Las Vegas

**DR. VLADIMIR MOZIN**  
Lawrence Livermore  
National Laboratory

**DR. CHARLES FOLDEN**  
Texas A&M University

**DR. JASON HAYWARD**  
University of Tennessee, Knoxville

**DR. DAVE WILLIAMS**  
Oak Ridge  
National Laboratory

**DR. MANI TRIPATHI**  
University of California, Davis

**DR. SUZANNE NOWICKI**  
Los Alamos  
National Laboratory

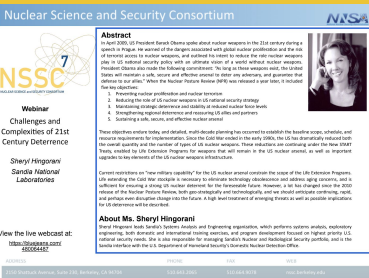
**DR. DAVID PETERS**  
Sandia National Laboratory



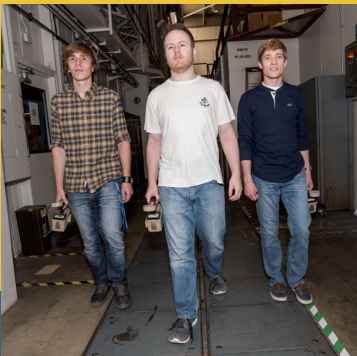
Members of the NSSC Executive Team, External Advisory Board, and NNSA attend the 2018 Fall Workshop at Sandia National Laboratories' California site. Back row (from left to right): Roger Falcone, John Taylor, Benn Tannenbaum, Jason Hayward, Dave McCallen. Front row: Mim John, Bethany Goldblum, Jasmina Vujic, Victoria Franques, Carol Burns, Sonia Letant.

# HIGHLIGHTS FROM NSSC'S HISTORY

**2011** - The Nuclear Science and Security Consortium was established as the first NNSA academic consortium. During Phase 1 the NSSC was comprised of 7 universities and 4 national labs.



**2013** - The NSSC Webinar Series debuts. Webinars on nuclear security technology and policy are broadcast live to all partner institutions.



**2015** - NSSC Phase 1 draws to a close. By the end of NSSC1, NSSC had supported 127 Undergraduates, 139 Graduate Students, 34 Postdocs, and 42 Faculty Members.

Nuclear Physics Eric Norman	Nuclear Chemistry & Radiochemistry Ken Czerwinski	Nuclear Engineering Rachel Slaybaugh	Radiation Detection & Instrumentation Kai Vetter	Nuclear Security Policy Michael Nacht
<ul style="list-style-type: none"> <li>Nuclear reactions &amp; structure physics</li> <li>Neutron physics</li> <li>Low background measurements</li> <li>Anti-Neutrino Reactor Monitoring</li> <li>Nuclear data</li> </ul>	<ul style="list-style-type: none"> <li>Isotope ratio measurements</li> <li>Actinides in soil samples</li> <li>Radiochemical separations</li> <li>Fallout sample characterization</li> <li>Molecular nuclear forensics methods</li> </ul>	<ul style="list-style-type: none"> <li>Modeling and simulation</li> <li>High performance computing</li> <li>Detector material characterization</li> <li>Beta-delayed gamma ray analyses</li> </ul>	<ul style="list-style-type: none"> <li>Gamma-ray imaging systems</li> <li>Position sensitive HPGe detectors</li> <li>Image reconstruction and 3D data fusion</li> <li>Background radiation characterization</li> </ul>	<ul style="list-style-type: none"> <li>Cross domain deterrence</li> <li>International cooperation on nuclear security</li> <li>Complexity science for nuclear security</li> <li>Nuclear Policy Working Group</li> </ul>

**2012** - The original five research focus areas of the NSSC were established.

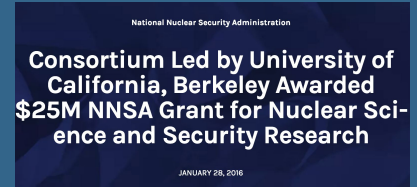


**2014** - NSSC and Los Alamos National Laboratory partner to hold their first summer program.

**2017** - NSSC2 continues the tradition of holding an annual Fall Engagement Workshop and Advisory Board Meeting.



**2016** - NSSC re-competes and is awarded funding for an additional five years! NSSC Phase 2 begins.



**2018** - The NSSC Boot Camp on Nuclear Security Policy hosted by George Washington University is held for the first time.



**2019** - 94 NSSC alumni are working in the national labs or other government positions. The NSSC Pipeline to the National Labs continues to grow.



# NSSC FOCUS AREAS & CROSSCUTTING AREAS

Barbara Jacak serves as the **Nuclear & Particle Physics Focus Area** Lead. Jacak is the Director of the Nuclear Science Division at Lawrence Berkeley National Lab, as well as a Faculty Senior Scientist, and a Professor of Physics at the University of California, Berkeley.

Ken Czerwinski leads the **Radiochemistry and Forensics Focus Area**. Czerwinski is a Professor of Radiochemistry at the University of Nevada, Las Vegas.

Max Fratoni is the **Nuclear Engineering Focus Area** Lead, and an Assistant Professor of Nuclear Engineering at the University of California, Berkeley.

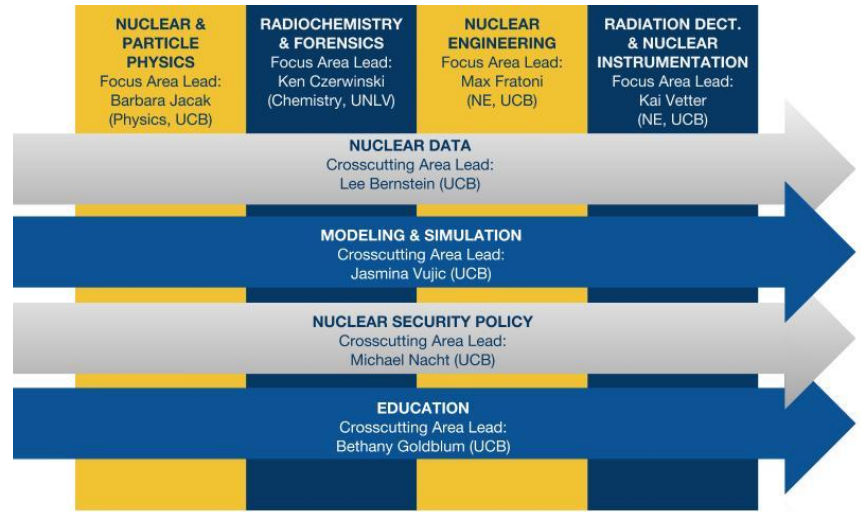
Kai Vetter leads the **Radiation Detection & Nuclear Instrumentation Focus Area**, and is the NNSA Liaison for NSSC. Vetter is a Professor in the Department of Nuclear Engineering at the University of California, Berkeley and a Faculty Senior Scientist and Head of the Applied Nuclear Physics program at the Lawrence Berkeley National Laboratory. He is the Director of the Institute for Resilient Communities, and serves as a supervising Professor and Professor-in-Residence for Berkeley RadWatch.

Lee Bernstein is the **Nuclear Data Crosscutting Area** Lead, and the Director for Laboratories at NSSC. Bernstein is the Nuclear Data Group Leader at Lawrence Berkeley National Laboratory, and an Adjunct Professor in Nuclear Engineering at UC Berkeley.

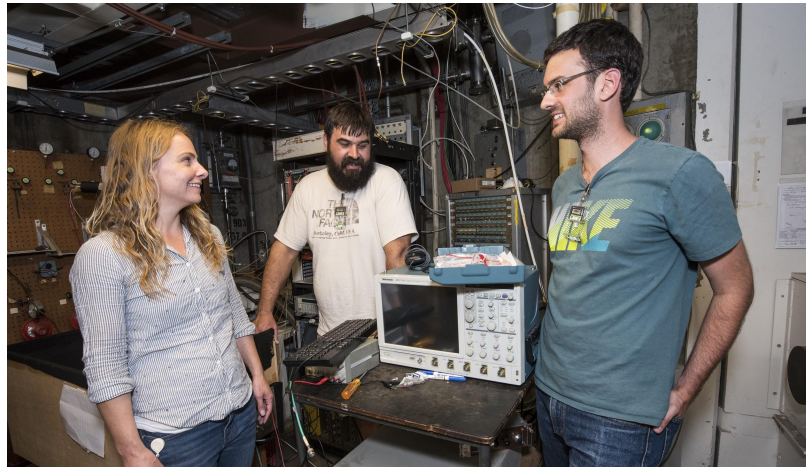
Jasmina Vujic, NSSC Director, is the **Modeling and Simulation Crosscutting Area** Lead. Vujic is a Professor in the Department of Nuclear Engineering at the University of California, Berkeley.

Michael Nacht leads the **Nuclear Security Policy Crosscutting Area**, and is a Professor of Public Policy at the Goldman School at the University of California, Berkeley. He served previously as Assistant Secretary of Defense for Global Strategic Affairs and as an Assistant Director of the U.S. Arms Control and Disarmament Agency.

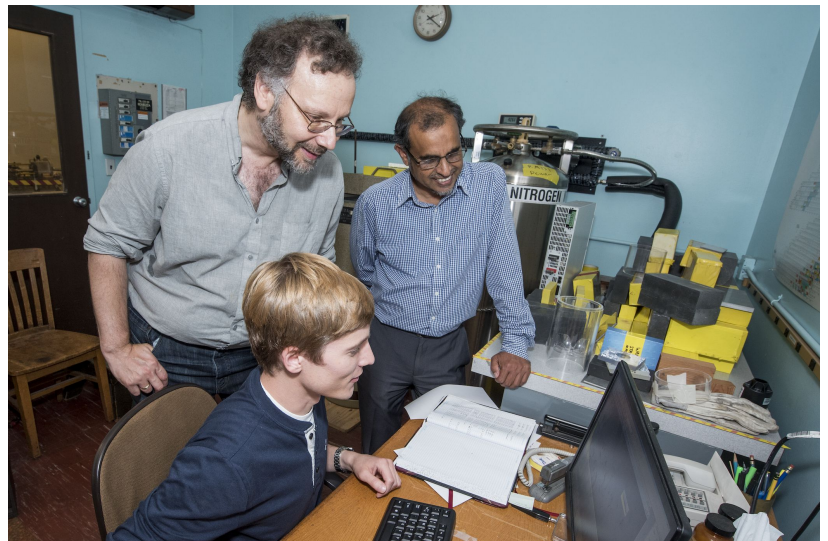
Bethany Goldblum is the Executive Director of NSSC and leads the **Education Crosscutting Area**. Goldblum is also the Founder and Director of the Nuclear Policy Working Group, and the Director of the Public Policy and Nuclear Threats Boot Camp.



NSSC's Focus and Crosscutting Areas



Dr. Bethany Goldblum, NSSC Education Crosscutting Area Lead with NSSC Fellows Josh Brown and Thibault Laplace at LBNL



Prof. Lee Bernstein (left), NSSC Nuclear Data Crosscutting Area Lead with Eric Matthews, and M. Shamsuzzoha Basunia at work at LBNL

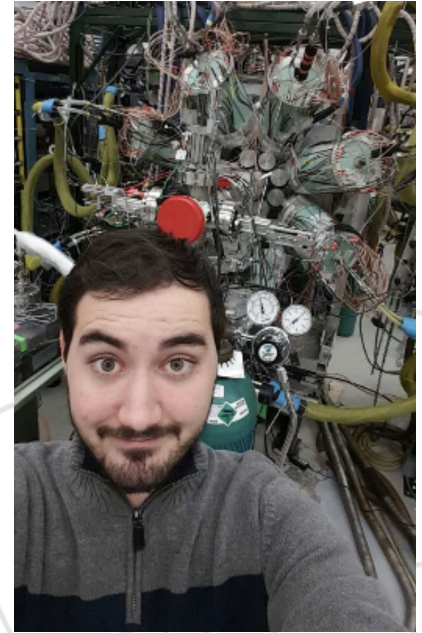
# NSSC FELLOW & AFFILIATE RESEARCH HIGHLIGHTS

## NUCLEAR & PARTICLE PHYSICS

### FOCUS AREA HIGHLIGHT

**BRENDEN LONGFELLOW**  
MICHIGAN STATE UNIVERSITY  
NSSC GRADUATE FELLOW  
Academic Advisor: Alexandra Gade  
Lab Mentor: Nicholas Scielzo, LLNL

Brenden has been studying nuclear structure near the proton drip line using in-beam gamma-ray spectroscopy at the National Superconducting Cyclotron Laboratory (NSCL). In a recent paper, he reported the first detection of gamma rays from energy levels above the proton separation energy in  $^{25}\text{Si}$ , allowing for an improved calculation of the  $^{24}\text{Al}(p,\gamma)^{25}\text{Si}$  reaction rate for the astrophysical rp-process. In addition, he has submitted a manuscript for publication detailing gamma-ray spectroscopy and lifetime measurements in  $^{26,27,28}\text{P}$  and expanding the nuclear data available in this region of the chart of the nuclides. Brenden's research helps to inform the late-time neutron-induced destruction cross sections for the interpretation of stockpile radiochemistry on neutron-deficient nuclei. He has also collaborated on a campaign of low-energy Coulomb excitation experiments at the NSCL with Ching-Yen Wu of Lawrence Livermore National Laboratory (LLNL) and has worked on a summer project at LLNL with Nicholas Scielzo to study angular correlations in the beta decays of  $^8\text{Li}$  and  $^8\text{B}$ .



## RADIOCHEMISTRY & FORENSICS

### FOCUS AREA HIGHLIGHT

**LIUBA PAULINE WILLIAMS**  
UNIVERSITY OF NEVADA, LAS VEGAS  
NSSC SPECIALIST AFFILIATE  
Academic Advisor: Artem Gelis, Frederic Poineau

Liuba Pauline Williams is currently working with the UNLV radiochemistry program investigating the actinide lanthanide separation (ALSEP) technique for reprocessing spent fuel. ALSEP, which utilizes a neutral and acidic hybrid extractant, targets the trivalent actinides caught in the raffinate generated from a TBP-based extraction process. The goal of this project is to reduce the number of steps required for reprocessing while maintaining cost efficiency. In addition to this project, Liuba is interested in working on density functional theory calculations to explore the interactions between different compounds in nuclear fuel.



# NUCLEAR ENGINEERING

## FOCUS AREA HIGHLIGHT

### **MATTHIEU ANDRE**

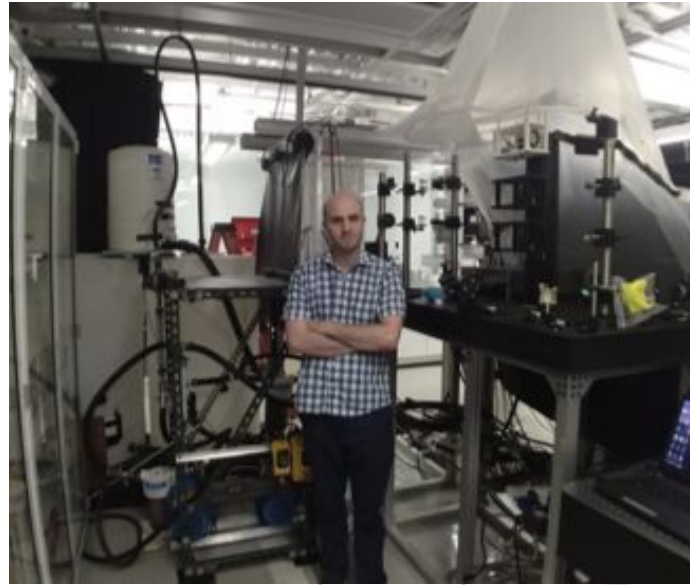
GEORGE WASHINGTON UNIVERSITY

NSSC SPECIALIST

Academic Advisor : Philippe Bardet

Lab Mentor: Marianne Francois (LANL)

Matthieu Andre's research work at the George Washington University is focused on the prediction of the geographical spread of fallout in the atmosphere. The effect of density difference (atmospheric stratification) and plume buoyancy (explosion products) on the mixing and entrainment rate with surrounding air is still poorly understood. Therefore an experimental approach is taken to replicate this complex buoyancy driven flow at smaller scale by creating a buoyant plume spreading in a linearly stratified environment. In order to gain physical insights into this flow, validate high-fidelity CFD codes, and develop meteorological models with reduced/no empiricism, advanced non-intrusive optical diagnostics are deployed onto the experiment. Two high power lasers and twelve high-speed cameras are synchronized to spatially and temporally resolve all scales of the flow for a buoyant jet spreading in a stratified environment. New correlations for the mixing and spreading rate of the plumes are being developed.



# RADIATION DETECTION & NUCLEAR INSTRUMENTATION

## FOCUS AREA HIGHLIGHT



### **TYLER JORDAN**

UNIVERSITY OF CALIFORNIA, BERKELEY

NSSC GRADUATE FELLOW

Academic Advisor: Jasmina Vujic

Lab Mentors: Ed Mckigney, Madison Andrews, Krista Meierbachtol (LANL)

Tyler Jordan is a third year Nuclear Engineering PhD student at UC Berkeley. His research focus is radiation detection for national security applications. Tyler spent the first two summers of his PhD at Los Alamos National Lab (LANL), where he contributed to the development of fission models and detector response models for use in conjunction with MCNP. Having completed his course requirements, Tyler will now begin full-time thesis research at LANL. His work will consist of developing novel scintillators, Cherenkov radiators, and photodetectors, and assembling these components to create fast, radiation hard detectors.

# NUCLEAR DATA

## CROSSCUTTING AREA HIGHLIGHT

### ADRIANA SWEET

UNIVERSITY OF CALIFORNIA, BERKELEY  
NSSC GRADUATE FELLOW  
Academic Advisor: Jasmina Vujic  
Lab Mentor: Darren L. Bleuel

Adriana Sweet has been investigating the nuclear structure of neutron-rich nuclei using the  $\beta$ -Oslo Method at the Lawrence Berkeley National Laboratory. Cross sections for neutron-induced reactions on neutron-rich nuclei play an important role in understanding cosmogenic nucleosynthesis, fundamental nuclear physics, and supporting the U.S. science-based stockpile stewardship mission. In support of the nuclear data need, Adriana performed an experiment to indirectly determine the neutron-capture cross section on a short-lived fission fragment,  $^{92}\text{Sr}$ , at the National Superconducting Cyclotron Laboratory at Michigan State University, using a total absorption spectrometer to measure the emitted  $\gamma$  rays emitted from  $^{93}\text{Sr}$  following the decay of  $^{93}\text{Rb}$ . She is currently analyzing the large body of quality data obtained using the  $\beta$ -Oslo Method to extract statistical nuclear properties, the key ingredients in Hauser-Feshbach calculations to infer reaction rates. The overall results of this work will prove critical for extrapolating nuclear structure properties to more neutron-rich Sr isotopes, and will provide insight into fission-product burn-up and astrophysical modeling. Through this work, Adriana is developing a strong collaboration with scientists from LLNL and NSCL in order to be able to undertake future similarly successful studies in the neutron-rich Sr region.



# MODELING & SIMULATION

## CROSSCUTTING AREA HIGHLIGHT

### AARON NOWACK

UNIVERSITY OF TENNESSEE, KNOXVILLE  
NSSC GRADUATE FELLOW  
Academic Advisor: Jason Hayward  
Lab Mentor: Seth McConchie (ORNL)



The current state of the art in characterization of uranium assemblies may be represented by technologies including Active Well Coincidence Counting (AWCC) and tagged active neutron interrogation imaging (TNI) systems. Analysis of AWCC measurements relies on point kinetics, a simplified model of neutron transport, which provides rapid analysis but cannot account for geometric variation very well. Current TNI systems are able to assay large assemblies but analysis of the associated data relies on slow and detailed Monte Carlo modeling. This work brings together fast, point-kinetics-based methods and the imaged data taken by TNI systems, developing image reconstruction methods that include the statistics of fission chains. A model of the fission process and physics is used to create a forward projection. Linear and nonlinear iterative methods are then applied for quickly estimating material properties related to enrichment and multiplication. Real-time characterization of imaged, shielded uranium assemblies will assist operators and inspectors conducting material accountability and arms control. The results of this work will be incorporated into the TNI systems present at ORNL.

# NUCLEAR SECURITY POLICY

## CROSSCUTTING AREA HIGHLIGHT



### ANDREW REDDIE

UNIVERSITY OF CALIFORNIA, BERKELEY

NSSC GRADUATE AFFILIATE

Academic Advisor: Bethany Goldblum (UCB)

Lab Mentor: Wes Spain (LLNL)

Andrew Reddie (areddie@berkeley.edu) is pursuing his PhD in Political Science at the University of California, Berkeley where his dissertation focuses on the institutional design of arms control agreements and their consequences for both compliance and proliferation. His broader research agenda considers the effects of emerging technologies on patterns of conflict escalation and nuclear deterrence in an era of strategic competition. This work has taken him to the Center for Global Security Research at Lawrence Livermore National Laboratory under the direction of Wes Spain, Dr. Brad Roberts, Dr. Zachary Davis, and Dr. Mona Dreicer where he worked on three research projects concerning the future of arms control, experimental gaming as a method for social science inquiry, and the impact of artificial intelligence technologies on international security. Following the completion of his PhD in August 2019, Andrew intends to take up a two-year University of California Post-doctoral Fellowship to continue work on a book manuscript concerning the future of arms control in the 21<sup>st</sup> century while also continuing to serve as Deputy Director of the Nuclear Policy Working Group. During this period, he intends to continue working with policy-makers across government and to prepare for roles in public service and the academy.

# EDUCATION

## CROSSCUTTING AREA HIGHLIGHT

The Graduate Level course “**Nuclear Security: The Nexus Between Technology and Policy**” was held for the eighth year at UC Berkeley in Spring 2019. This year’s course was co-taught by Prof. Michael Nacht of the Goldman School of Public Policy and Prof. Karl van Bibber of the Department of Nuclear Engineering. The recorded course is available on the NSSC website.

A group of graduate students from the Michigan State University and the National Superconducting Cyclotron Laboratory met weekly to review the online lectures. The group organizer, Daniel Puentes, states, “Prior to utilizing this online course, I had a solid introduction to nuclear policy from attending the NSSC’s Public Policy and Nuclear Threats (PPNT) boot camp. After PPNT, I was inspired to organize a group of students who wanted to learn more about nuclear policy and how we, as scientists, can be more involved. Thanks to our group discussions and participating remotely in the NSSC sponsored Nuclear Security course, our group members have gained a background in nuclear policy.”



A MSU/NSCL student group met weekly to watch lectures broadcast from UC Berkeley.



# NSSC EVENTS

## **NSSC FALL WORKSHOP AND ADVISORY BOARD MEETING**

The Nuclear Science and Security Consortium Fall Workshop and Advisory Board Meeting was held October 1 – 2, 2018 at Sandia National Laboratories in Livermore, California. The event featured updates on NSSC programs and accomplishments, student oral and poster presentations, and individual reports by NSSC Focus Area Leads. The workshop concluded with the Advisory Board providing feedback and recommendations to the NSSC Leadership team.



NSSC Fall Workshop 2018 Attendees

## **NSSC MONTHLY WEBINARS AT UC BERKELEY**

NSSC continued to host monthly webinars. A few highlights from the past year's webinar series included "Is There A Light At The End Of The North Korean Nuclear Tunnel?" presented by Siegfried S. Hecker, "Nuclear Forensics and What it Can Tell Us about Materials from the Front End of the Uranium Fuel Cycle" presented by Dr. Naomi Marks of LLNL, and "When to hold it, when to fold it, when to play it right" by Lalah Shayesteh and Kate Lewis of UC Berkeley, which provided an overview of intellectual property and sponsored research. Webinars were broadcast live to all consortium academic partners. Students were also invited to attend in person, and had the opportunity to connect with invited speakers.



Teal Pershing, of UC Davis, presenting at the NSSC Fall Workshop 2018

## **NUCLEAR POLICY TALK SERIES AT GEORGE WASHINGTON UNIVERSITY**

The talk series is a conversation about the dangers posed by nuclear weapons and appropriate responses for the 21st Century. Highlights from this year included Anton Khlopkov on "After Helsinki- What's next for U.S.-Russia Nuclear Relations?", and Anita Friedt (State Department), Daryl Kimball (Arms Control Association), and Sharon Squassoni (Elliott School of International Affairs) on "The End of the INF Treaty".

## **NSSC WORKING SESSION WITH LOS ALAMOS NATIONAL LABORATORY**

Every semester NSSC Fellows at the University of California, Berkeley meet for a working session to present updates on their research and connect. In Spring 2019, this working session was attended by Alexei Klimenko and Suzanne Nowicki of the Space Science and Applications group at LANL. The LANL representatives were able to discuss their research with NSSC Fellows as well as share information about working at a National Laboratory.



Suzanne Nowicki and Alexei Klimenko, (front row right, with Prof. Vujic, and Dr. Goldblum) attending the NSSC Fellow Working Session at UC Berkeley

# NSSC SUMMER PROGRAMS

## Focus on NSSC-LANL Keepin Nonproliferation Science Summer Program

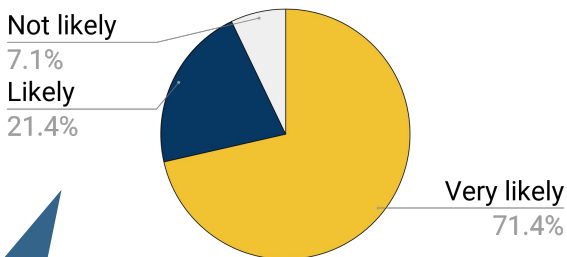
JUNE 17-AUG 9, 2019 | LOS ALAMOS

Five NSSC Fellows or Affiliates will spend summer 2019 learning about how game-changing science, engineering, and technology are applied to reduce the dynamic threats of nuclear nonproliferation. The NSSC-LANL Summer Program is an eight week extended research internship hosted by the Nuclear Science and Security Consortium and Los Alamos National Laboratory. The program provides a survey of the national laboratory activities and mission space, focused research projects with a strong connection to nonproliferation science and technology, and a companion symposium series linking nuclear security science, technology, and policy. Students will have broad exposure to LANL, access to mentors from LANL and SNL, and opportunities for lab-directed research.



### FEEDBACK ON 2018 PROGRAM

After completing this program, how likely are you to pursue a career in nuclear security and nonproliferation?



I had a really great time and a really great summer. I can't wait to come back next summer!

Thanks for the educational summer and for influencing my considerations for future career direction

This was a fantastic program and I'm glad I had the opportunity to take part in it.



# NSSC-LANL SUMMER PROGRAM ALUMNI

## Highlights



Jaclynn Unangst

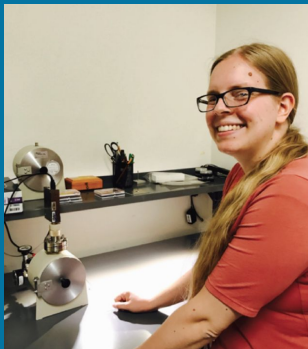
**Jaclynn Unangst**, a NSSC Fellow at the University of California, Irvine attended the NSSC LANL Keepin Nonproliferation Science Summer Program during the summer of 2018. Unangst worked at Sandia National Laboratory with Tina Nenoff. Her work focused on creating an optical actinide sensor based on novel hybrid material chemistry. Lab mentor Nenoff was instrumental in connecting Unangst with SNL department managers. These meetings ultimately led to Unangst accepting a postdoc position at SNL with Jim McElhanon's group. Unangst will be working with lead scientists Dr. Leah Appelhans and Dr. Brad Jones on their polymer project.

**Tyler Jordan** attended the NSSC LANL Summer Program in 2017 and is currently finishing his coursework at the University of California, Berkeley before transitioning to full time thesis research at LANL. At Los Alamos Tyler will be working on the development of novel scintillators, Cherenkov radiators, and photodetectors.



Tyler Jordan

**James Louis-Jean** and **Katherine Lueke** of the University of Nevada Las Vegas, both attended the NSSC LANL Program in 2017, and were both awarded the prestigious Seaborg Institute Fellowship to continue their work at LANL. Louis-Jean returned in summer 2018 to continue work on Isotopic Ratios of Samarium by Thermal Ionization Mass Spectrometry (TIMS) for Nuclear Forensic Application with Jeremy Inglis. Lueke plans to return in summer 2019 to continue her work on the silicon drift detector with Robert Rundberg.



Katherine Lueke

**Joshua Smith** of the University of Tennessee, Knoxville, has continued his project started during the NSSC LANL Summer Program in 2018, researching sol-gel synthesis of  $\text{Li}_5\text{La}_3\text{Ta}_2\text{O}_{12}$  and  $\text{BaF}_2$  nanopowders to make transparent ceramic scintillators. Smith works with LANL Lab Mentor Chris Chen.



James Louis-Jean (left)

**Daine Danielson** was a NSSC Fellow at the University of California, Davis from 2012 until he graduated in 2017. He attended the NSSC LANL Summer Program in 2014. After graduation Danielson accepted a post-baccalaureate position in Theoretical Division at Los Alamos National Laboratory, working with Dr. Anna Hayes on nuclear and neutrino phenomenology relating to NIF and reactor-antineutrinos. Danielson was awarded the Distinguished Student Award; Los Alamos National Laboratory, in 2018.

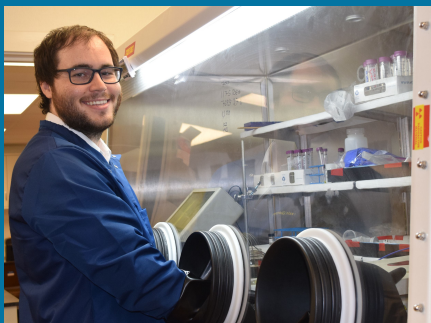


Joshua Smith



Daine Danielson

**Kevin Glennon** is a radiochemistry graduate student at Texas A&M where he works on projects related to nuclear forensics. He attended the NSSC LANL summer program in 2018, where we worked with the C-NR group, with lab mentors Todd Bredeweg and Evelyn Bond. Kevin has continued to study the distribution coefficients of various fission products through the PUREX process under varying conditions. He is looking for forensic indicators of fission product ratios that may describe the conditions a sample of Pu was separated in. Project goals also include compiling the distribution coefficients of fission product elements which are not currently available in public works. Glennon recently published work on measuring fission product isotope ratios in irradiated uranium materials, and is currently designing an experiment to measure these ratios in separated Pu at LANL this summer. Glennon was awarded a Seaborg fellowship to complete the work at LANL.



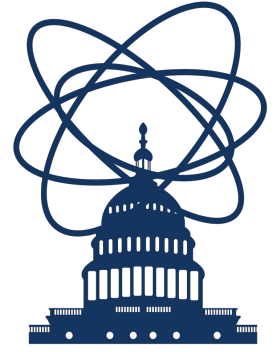
Kevin Glennon

# GW BOOT CAMP ON NUCLEAR SECURITY POLICY

JUNE 9-21, 2019 | WASHINGTON, DC

[bootcampnsp.elliott.gwu.edu/](http://bootcampnsp.elliott.gwu.edu/)

The boot camp features an intensive introduction to nuclear security for the prevention of nuclear weapons proliferation and nuclear terrorism. This course explores the implications of scientific and technological developments on government function and policy issues as well as international norms, treaties, and diplomacy. Specific topics will include technical policy issues associated with nuclear weapons, nuclear energy, forensics, and missile defense, as well as regional issues such as the Iran Nuclear Deal, the North Korean nuclear situation, the Russian and Chinese situations, and more. The Boot Camp will leverage GW's unique location two blocks from the White House and across the street from the State Department to feature high level personnel from government agencies and nuclear arena NGOs, as well as field trips to NNSA/DOE, Capitol Hill, and other government agencies.



**GW Boot Camp on Nuclear Security Policy**



2018 Program Participants



Field Trip to Capitol Hill



Mock Congressional Briefings

## Featured Topics:

- Keynote Presentation: The Nuclear Security Summits, Amb. Laura Holgate (NTI)
- Nuclear Weapons, Stockpile Stewardship- Dr. Benn Tannenbaum (Sandia National Lab)
- Nuclear Weapons- Who has what? Hans Kristensen (FAS)
- Nuclear Weapons- Why do countries proliferate? Dr. Doug Shaw (GW)
- JCPOA with Paul Kerr (CRS)
- Panel Discussion: Complexities of the Nuclear Enterprise ISN/WMDT (Including AAAS Sci/Pol Fellows)
- Other Proliferation Risks/Issues- Jon Wolfsthal (Nuclear Crisis Group)



Field Trip to State Dept.

## Program Feedback from 2018 participants:

- Expectations far **exceeded**
- Students developed sense of **community** & network
- Strong interplay between **tech and non-tech** participants
- Participants felt more deeply engaged in broader nuclear security **community**, as well as more prepared for more diverse **career** opportunities.

# NSSC SUMMER PROGRAMS cont.

## PUBLIC POLICY AND NUCLEAR THREATS BOOT CAMP

JULY 28–AUGUST 7, 2019 | SAN DIEGO, CA

The NSSC co-sponsors this summer workshop-in-residence at UC San Diego, known as the PPNT boot camp, which aims to give participants the knowledge and analytic tools to contribute to the debate on future US nuclear policy. The boot camp features lectures, discussions, debates, and policy simulations. Participants attend talks by distinguished researchers, academics, policy officials, and operational specialists from leading universities, the National Laboratories, international organizations, and government agencies dealing with nuclear threats, command and control, international safeguards, nonproliferation strategies, and other nuclear issues.



2018 Program Participants

## NUCLEAR ANALYTICAL TECHNIQUES SUMMER SCHOOL

AUGUST 12–18, 2019 | DAVIS, CA

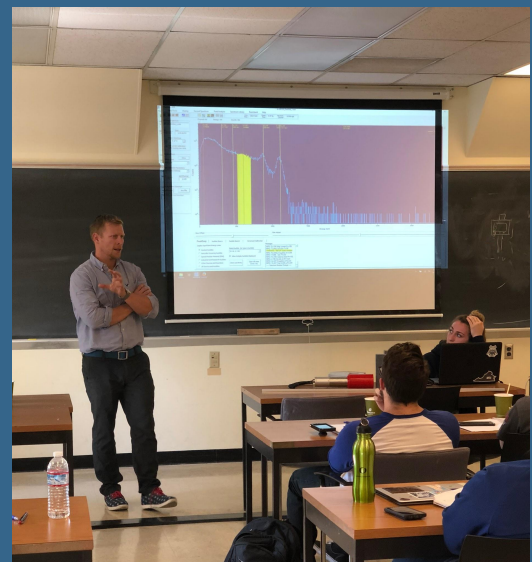
The Nuclear Analytical Techniques Summer School consists of some lectures, but mostly hands-on activities involving nuclear analytical techniques. Students perform Neutron Activation Analysis using the McClellan Nuclear Research Center, study proton elastic scattering at the Crocker cyclotron facility, gain experience and skills in counting with NaI and HPGe crystals, and learn about detectors and analysis techniques important across a broad range of science and industry.



2018 Program Participants



PPNT participants conduct a safeguards training exercise



Dr. James Miller (LANL) presents a lecture to program participants

# NSSC AWARDS & NEWS

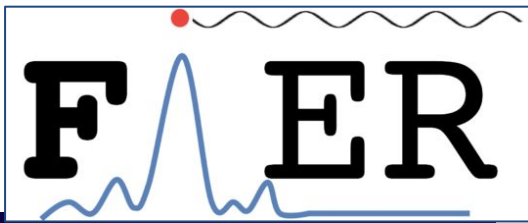


The Nuclear Science and Security Consortium is proud to announce that Dr. Catherine Romano joined our Advisory Board. Dr. Catherine E. Romano is a Senior R&D Scientist at Oak Ridge National Laboratory participating in a broad area of nuclear research



Dr. Mariya Zhuravleva (right), Assistant Professor in the Department of Materials Science and Engineering at the University of Tennessee Knoxville and NSSC Faculty member, has received the prestigious NSF Career Award

Photo from UTK



The Fission Induced Electromagnetic Response (FIER) code was published. This code enables analytical prediction of delayed-ray spectra following fission. FIER was developed by NSSC Fellow Eric Matthews with support from NSSC Executive Director Bethany Goldblum, LBNL Scientist Brian Quiter, and NSSC undergraduate Matthew Shinner [bang.berkeley.edu/fier/](http://bang.berkeley.edu/fier/)

The SIGNAL Online Game was publicly launched on May 7th, 2019. SIGNAL was developed by the Project on Nuclear Gaming (PoNG). The PoNG team is developing new experimental wargaming methods to study conflict escalation, deterrence, and strategic stability [pong.berkeley.edu/](http://pong.berkeley.edu/)



Photo by: Lorenzo Vidali, Sandia National Laboratories



"Next-generation wargames" co-authored by NSSC Affiliate Andrew Reddie, Dr. Bethany Goldblum, and Prof. Michael Nacht was published in *Science*



Nuclear Criticality Safety Course taught by Professor Max Fratoni at UC Berkeley, with lectures from LLNL and LANL representatives

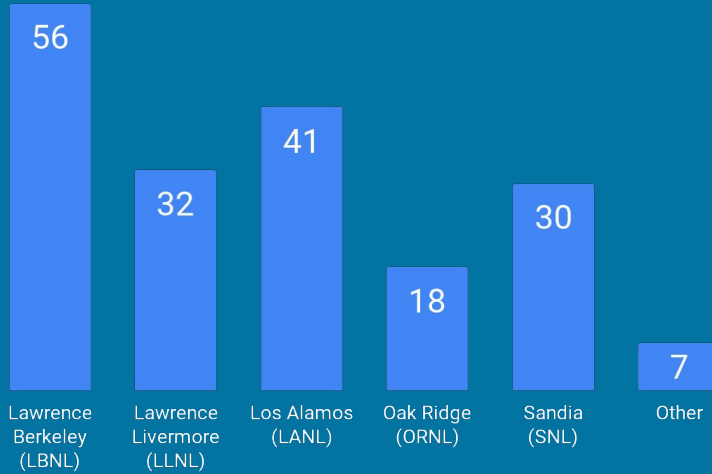


The UCB Nuclear Policy Working Group received an honorary mention for their memo "Decisions on the Next Generation NC3 Enterprise" from the National Science Policy Network

# NSSC METRICS

## LAB ENGAGEMENT METRICS since September 2016

NSSC students or postdocs conducting in-residence research per lab\*



**101** students or postdocs worked on a Lab Directed Project



**100%** of Graduate Fellows have a Lab Mentor



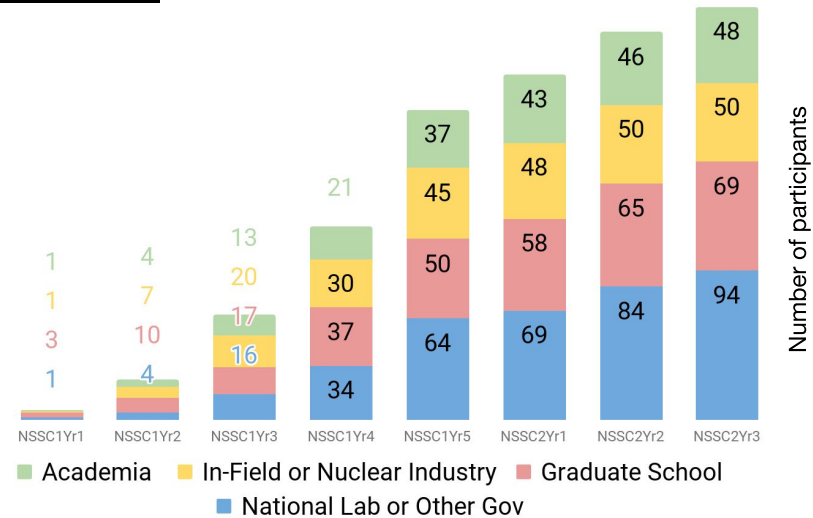
**133** Lab Mentors at National Laboratories worked with NSSC Fellows and Affiliates

\*If a student conducts in-residence research at more than one lab, they are counted towards each lab

## CUMULATIVE PIPELINE METRICS



**40%** of alumni to labs and other government  
**234** students/postdocs have completed program  
**203** students are still in school



## METRICS OF SUCCESS since 2011



**499**  
Personnel Supported



**249**  
Degrees Earned



**163**  
Awards



**267**  
Peer-Reviewed Publications



**436**  
Posters



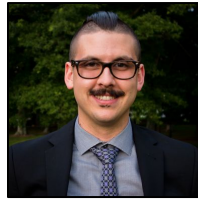
**638**  
Oral Presentations

# NSSC PIPELINE METRICS (2011-2019\*)

## NSSC ALUMS HIRED AT THE NATIONAL LABS OR GOVERNMENT POSITIONS



Sherry Faye  
PhD UNLV  
Postdoc UCB  
Postdoc | LLNL  
Dec 2015



Joseph Curtis  
M.S. UCB  
Staff | LBNL  
Dec 2014



Ross Barnowski  
PhD UCB  
Postdoc | LBNL  
Spring 2016



Jonathan Plaue  
PhD UNLV  
Staff | LANL  
Fall 2012



Brian Daub  
Postdoc UCB  
Staff | LLNL  
Weapons & Complex  
Integration Directorate  
Fall 2013



Deepa Khatri  
B.S. UCB  
Staff Engineer | LLNL  
Nuclear Criticality  
Safety Division  
Summer 2014



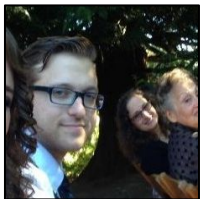
Victor Negut  
B.A. UCB  
Staff, NSD | LBNL  
Applied Nuclear  
Physics  
Spring 2014



Quinn Looker  
PhD UCB  
Staff | SNL  
Fall 2013



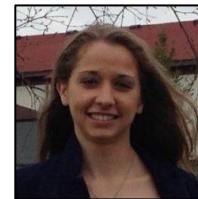
Anthony Lubbers  
B.Sc. UCB  
Staff Engineer | LLNL  
Nuclear Criticality  
Safety Division  
Summer 2014



Ross Meyer  
B.Sc. UCB  
Staff, NSD | LBNL  
Applied Nuclear  
Physics  
Spring 2015



Andrew Haefner  
PhD UCB  
Staff, NSD | LBNL  
Applied Nuclear  
Physics  
Spring 2015



Kalee Hammerton  
PhD MSU  
Staff | Savannah River  
Spring 2016



Joe Belarge  
Postdoc MSU  
MIT Lincoln Lab  
Spring 2017



Steven Gardiner  
PhD UCD  
Fermi National  
Accelerator Lab |  
Postdoc  
2018



Alexander Dixon  
Bachelors UCB  
US Navy  
Spring 2012



Jeff Rolfes  
M.S. UNLV  
DTRA | Postdoc  
Spring 2017



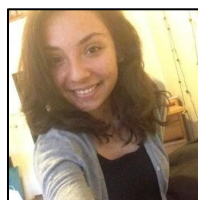
Tomi Akindede  
PhD UCB  
LLNL | Postdoc  
2018



Joseph Labrum  
B.S. UCB  
Intelligence  
Spring 2017



Thomas Halverson  
Masters UCB  
West Point  
Spring 2016



Berenice  
Garcia  
B.S. UCB  
LANL | Intern  
2018



Sarah Laderman  
Dual Masters | UCB  
IAEA  
Spring 2018

\*As of May 2019





Marc Bergevin  
Postdoc UCD  
Staff | LLNL  
May 2015



Tashi Parsons-Moss  
Postdoc UCB  
Postdoc | LLNL  
Nuclear & Chemical  
Sciences Division  
Fall 2014



Brian Plimley  
PhD UCB  
Postdoc | LBNL  
May 2014



Christopher Brand  
B.S. UCB  
Staff | LLNL  
May 2015



Perry Chodash  
PhD UCB  
Postdoc | LLNL  
Spring 2015



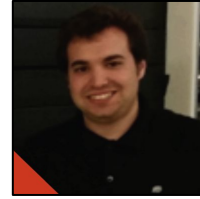
Jeremy Mock  
PhD UCD  
Postdoc | LBNL  
Fall 2014



Caleb Roecker  
PhD UCB  
Staff | LANL  
May 2016



Cameron Bates  
PhD UCB  
Postdoc | LANL  
Fall 2014



Michael Jones  
PhD MSU  
Postdoc | LBNL  
Feb 2016



Keri Campbell  
PhD UNLV  
Postdoc | LANL  
Fall 2014



John Despotopoulos  
PhD UNLV  
Postdoc | LLNL  
Nuclear & Chemical  
Sciences Division  
Spring 2015



Erika Suzuki  
B.S. UCB  
Staff | LBNL  
Dec 2013



Maryline Ferrier  
PhD UNLV  
Postdoc | LANL  
Fall 2014



Tenzing Joshi  
PhD UCB  
Postdoc, NSD | LBNL  
Applied Nuclear Physics  
Spring 2015



Scott Parker  
PhD UCB  
Staff | LANL  
Dec 2018



Timothy Shokair  
Postdoc UCB  
Postdoc | LLNL  
Spring 2015



Sergey Uvarov  
Masters UCD  
Postdoc | LLNL  
Spring 2016



Barbara Wang  
PhD UCB  
Postdoc UCB  
Postdoc | LLNL  
May 2016



Audrey Roman  
PhD UNLV  
Postdoc | LANL  
Fall 2014



Janelle Droessler  
PhD UNLV  
Postdoc | LANL  
Mar 2016



Daine Danielson  
B.S. UCD  
Intern | LANL  
Summer 2014



Matthew Proveaux  
M.Sc. UCB  
NNSA Fellow  
Pacific Northwest NL  
June 2014



Duane Smalley  
Postdoc MSU  
Staff |  
NSTec@LANL  
Summer 2014



Jeromy Tompkins  
Postdoc MSU  
Staff | NSCL  
Summer 2014



Steven Ragnar Stroberg  
PhD MSU  
Postdoc | TRIUMF  
2014



Anagha Iyengar  
B.S. UCB  
Staff | NNSA  
May 2014



Keenan Thomas  
Masters UCB  
Staff | LLNL  
Summer 2016



Jenna Smith  
PhD MSU  
Postdoc | TRIUMF  
2014



Scott Suchyta  
PhD MSU  
Postdoc UCB  
Staff | RSL  
Apr 2016



Jessica Roche  
B.S. UCB  
Staff | LLNL  
Spring 2016



Tim Aucott  
PhD UCB  
Staff | SRNL  
December 2014



Ligang Bai  
Postdoc UNLV  
Postdoc | ANL  
May 2013



Nicole Larson  
B.S. | MSU  
Nuclear Ops. Engineer  
LLNL  
Spring 2016



Paul Davis  
Postdoc UCB  
Fellow | DoD  
Spring 2013



Nick Bricker  
Masters UCB  
Staff | LBNL  
Summer 2016



Andrew Wysong  
M.S. UCB  
Staff | LANL  
Fall 2015



Angela Simone Moore  
PhD UTK  
Staff | PNNL  
Spring 2019



David Weisz  
PhD UCB  
Postdoc | LLNL  
Summer 2016



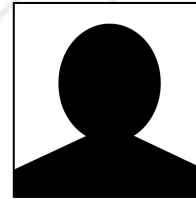
Anthony Juarez  
MPP | UCB  
Staff | SNL  
Spring 2016



Alex Braatz  
PhD UCI  
Postdoc | ORNL  
2015



Uday Mehta  
Bachelors UCB  
Engineer | LLNL  
Spring 2016



Christopher Prokop  
PhD MSU  
Postdoc | LANL  
Spring 2016



David Sweeney  
Postdoc UC Berkeley  
Postdoc | DTRA  
Fall 2015



Quinlan Smith  
Masters UNLV  
Staff | ORNL  
Spring 2016



Justin Munson  
PhD UCB  
Postdoc | LLNL  
Spring 2015



Derek McLain  
PhD UNLV  
Postdoc | ANL  
May 2016



Nick Walsh  
Postdoc UCD  
Postdoc | LLNL  
Summer 2016



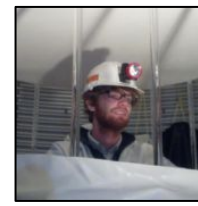
James Bevins  
PhD UCB  
Staff | AFIT  
Summer 2017



Adam Rice  
Masters UCB  
Intelligence  
2013



Josh Brown  
PhD UCB  
SNL | Postdoc  
2018



Morgan Askins  
PhD UCD  
Postdoc | LBNL  
2018



Andrew Gillick  
Masters UCB  
Army  
2014



Charles Loelius  
Masters MSU  
NNSA | PNNL  
2016



Brian Champine  
PhD UCB  
US Army  
Spring 2016



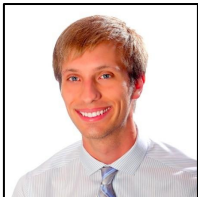
Eva Uribe  
PhD UCB  
SNL | Staff  
2016



Mark Quint  
M.S. UTK  
U.S. Army  
2018



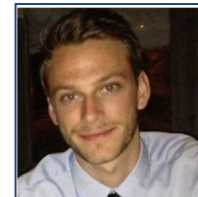
Christian Bustillos  
PhD UCI  
Staff | LLNL  
Spring 2019



Leo Kirsch  
PhD UCB  
LBNL | Staff  
Spring 2018



Mike Shattan  
PhD UTK  
AFIT | Staff  
2018



Daniel Hellfeld  
PhD UCB  
LBNL  
Spring 2019



Elizabeth Heckmaier  
PhD UCI  
LLNL | Postdoc  
Spring 2018



Gian Surbella  
PhD GWU  
PNNL | Fellow  
Spring 2017



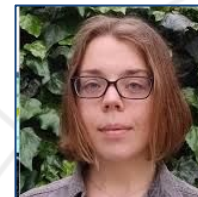
Jaclynn Unangst  
PhD UCI  
SNL | Postdoc  
Spring 2019



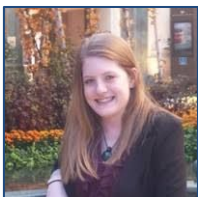
Jason Richards  
PhD UNLV  
ORNL | Postdoc  
Spring 2018



Joseph Gordon  
Bachelors UCB  
LLNL | Intern  
Spring 2018



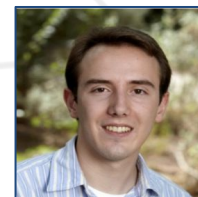
Kelly Rowland  
PhD UCB  
LBNL  
Spring 2018



Kelsey Ammundon  
Masters UCB  
LANL | Staff  
Spring 2019



Krystin Stiefel  
PhD MSU  
ORNL  
Spring 2018



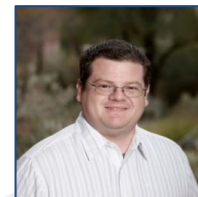
Marc Fitzgerald  
PhD UNLV  
LLNL | Staff  
Spring 2017



Matthew Tweardy  
PhD UTK  
NNSA at PNNL  
Spring 2018



Maxwell Sherrod  
PhD UNLV  
SRNL | Staff  
Spring 2018



William Kerlin  
PhD UNLV  
LLNL | Staff  
Spring 2019



Winston Degraw  
Bachelors UCB  
LBNL  
Spring 2018

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