





Education in Nuclear Science, Technology & Policy

Dr. Bethany Goldblum NSSC Executive Director University of California, Berkeley

NSSC3 Kickoff Meeting and Advisory Board Review April 19-20, 2022



Education in Nuclear Science, Technology, & Policy





National lab engagement

National Laboratory internships, workshops, and rotations

Lab scientist research mentorship

FROM STUDENT TO

NUCLEAR SECURITY

EXPERT NSSC Alumni Speaker Series Spring 2021

Classroom-based & Online learning

Webinars, online lectures, and electronic engagement

Summer schools











- NSSC-sponsored course established by \bullet **Prof. Michael Nacht (Public Policy) and** Prof. Stan Prussin (NE) in 2012
- Currently fielded in cooperation with LANL's Partnership and Pipelines Office
- Archived course material available on **YouTube** (2016-2021)
- >100 students in technical and social science educated
- First of its kind textbook published in 2021!





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Nuclear Security - The Nexus Between Policy and Technology... 2020

Nuclear Security Course - Spring Nuclear Security Course - Spring

2019

Nuclear Security Course -Spring 2018

Nuclear Security Course - Spring 2017

VIEW FULL PLAYLIST



In the Classroom: Nuclear Forensics



- NSSC-sponsored course re-invented by Prof. Heino Nitsche in NSSC1
- New NSSC faculty **Prof. Rebecca Abergel** at the helm
- Designed to solidify principles and refine experimental skills in nuclear and radiochemistry
- Curriculum tightly tied with research activities at neighboring LBNL, LLNL, and SNL





Prof. Abergel (UCB NE)







Nuclear Policy Working Group



EDUCATION To educate scholars on pressing issues in nuclear security and weapons policy **COLLABORATION** To foster collaboration across technical and social science fields IMPACT To generate original policy recommendations impacting the nuclear security field



Austin Mullen (UCB) Deputy Director



Jacob Sebastian (UCB NE), Gabriel Kaufman (UCB Political Science), 2011 PONI Conference

Date	Event
Apr 25, 2022	Nuclear Jeopardy
Apr 11, 2022	Research Presentation
Apr 4, 2022	Leah Walker, Institute for Security and Technology
Mar 28, 2022	Herb Lin, Stanford University
Mar 14, 2022	Rolf Mowatt-Larssen, Harvard Belfer Center
Mar 7, 2022	Interactive Wargame (CSIS PONI)
Feb 28, 2022	Andrew Reddie, UC Berkeley/Sandia



NSSC Webinars, Seminars, and Electronic Engagement



- NSSC has organized hundreds of webinars, seminars, workshops, and panels.
- Webinars are organized monthly: <u>https://nssc.berkeley.edu/events-and-</u> programs/webinar-series/
- Recent example:
 - NuSec/NNSA: "Novel laser-based sources and how to image them," Mar 2022, Dr. Christopher Murphy (York)







Sarah ensures nuclear technology is being used for peaceful purpose

> Sarah Laderman UC Berkeley Graduate Associate Safeguards Information Analyst International Atomic Energy Agency



NSSC Graduate Fellowship





Additional NSSC3 Graduate Fellowship requirements include:

National Laboratory Internship

- NSSC-LANL Keepin Nonproliferation Science Summer Program
- SNL Summer Internship
- NSSC-LLNL Summer Experience New for NSSC3

Topical Summer School

- Nuclear Data Summer School
- Radiochemistry Summer School (in development)
- Public Policy and Nuclear Threats Boot Camp
- Topical program of choice



NSSC Nuclear Data Summer School Aug 1-12, 2022



Goal:

 ★ Train scholars in nuclear data measurement, modeling, compilation, evaluation, and uncertainty quantification





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Prof. Vlad Sobes UT Knoxville UC Berkeley





Prof. Eric Prebys UC Davis

• Topics include:

- thermal neutron scattering
- nTOF measurements
- R-matrix theory
- neutron capture data
- optical model & EMPIRE •
- inelastic scattering

- fission data
- FREYA, CGMF
- integral benchmarks
- library validation
 - AI/ML for nuclear data



Hands-on stacked target activation experiment

Applications are open now! Join us at UC Davis on August 1-12, 2022.



Nuclear Analytical Techniques Summer School | Jun 20-30, 2022



Goal:

★ Hands-on training in nuclear instrumentation and radiation detection

Activities include:

- neutron activation analysis using the McClellan Nuclear Research Center TRIGA reactor
- gamma-ray spectroscopy with HPGe detectors
- elastic proton scattering at the Crocker Nuclear Laboratory









Prof. Mani Tripathi UC Davis

Prof. Bob Svoboda UC Davis



Prof. Emilija Pantic UC Davis



Prof. Eric Prebys UC Davis

https://nssc.physics.ucdavis.edu/nssc-summer-school-2022/



Public Policy and Nuclear Threats Boot Camp | Jul 31 - Aug 12, 2022



Goal:

- ★ Train scholars in key historical, technical, legal, ethical, and policy aspects of nuclear weapons issues
 - Originally established in 2003
 - Hosted by the Institute on Global Conflict and Cooperation (IGCC)
- Technical and social scientists from graduate students to mid-career professionals
- Topics include:
 - Principles of nuclear deterrence
 - Arms control
 - Safeguards
 - $\circ \quad \text{World nuclear forces}$



Dr. Bethany Goldblum UC Berkeley/LBNL



NNSA (retired)



Ms. Marie Stewart IGCC





NSSC LANL Keepin

Nonproliferation Science Summer Program



Goals: **NSSC-LANL** ★ Create working relationships between NSSC students and LANI /SNL scientists Dr. G. Robert Keepin ★ Increase number of students performing programmatic **Nonproliferation Science** research with I ANI Summer Program ★ Turn research and training into careers at the national **laboratories** Jun 21 – Aug 12, 2022 "My mentor was super helpful \star 83% of students who with making connections in **Program Agenda:** responded ranked their overall the lab and I felt like an 85% research experience as a <u>4 or 5</u> out of 5. integral part of the research project." 15% enrichment ★ 83% of students are likely or "Making connections to very likely to recommend this various partners throughout program to others. the lab system was the best." ★ 83% of students found this "I really enjoyed all of the more program to be beneficial or focused, technical talks about very beneficial to their different areas of research being

92 students have completed the program, including 38 NSSC scholars!

professional development.

performed at the lab."





- ★ 6 out of 6 of students who responded plan to <u>continue working with LANL</u> through:
 - o Internships
 - o Remote work
 - Thesis collaborations
 - o **GRAs**

"It seems now that LANL would be the mostly likely option, but there are many good labs that would be great to work at."

- ★ 83% of students said that this Program increased the likelihood of them doing <u>dissertation research</u> at LANL.
- ★ After this Program, 5 out of 6 of students are more likely to consider <u>careers in nonproliferation</u> at:
 - o **LANL**
 - Other laboratories
 - o **DOE**
 - University



Keepin Success Stories





TYLER JORDAN University of California, Berkeley

2017 NSSC LANL Keepin Program Advanced Nuclear Technology Group (NEN-2) Lab Mentors: Madison Andrews, Krista Meierbachtol

2018-Present Full-time LANL Graduate Student Lab Mentor: Edward McKigney



Development of a pixelated BaF₂ detector for subnanosecond timing



BENJAMIN WALUSIAK George Washington University

2021 NSSC LANL Keepin Program Material Science and Technology Division Nuclear Material Science Group (MST-16) Lab Mentor: Dr. Alice Smith

2022 Glenn T. Seaborg Institute Graduate Research Program Neutron diffraction studies on uranium salts





New Laboratory Programs for NSSC3



NSSC Laboratory Investigators Rotation

- Six-to-eight-week assignment at NSSC partner national laboratories
- **Postdocs and junior faculty** perform research in basic and applied nuclear science.
- Program participants are connected with national laboratory experts to initiate new research projects, facilitate existing ones, and deepen University-Lab connections.
- This program makes available lab facilities and instrumentation to participants.
- Opportunities for participation in seminars, lectures, and organized tours.



NSSC-LLNL Summer Experience

- Provides students with an extended research internship at the National Lab.
- Students will spend eight weeks
 on a research project with a
 strong connection to
 nonproliferation science and
 technology, that directly relates
 to their research and academic
 interests.





LLNL Success Stories





James McGreivy University of California, Berkeley

2020 NSSC-LLNL Internship Nuclear Criticality Safety Division Lab Mentors: Dr. Daniel Siefman, Mr. Mark Mitchell



2022 NSSC-LLNL Internship Returning to full-time summer research ML-enabled neutron spectrum unfolding



Teal Pershing University of California, Davis

2017-2020 | LLNL In-Residence Research Lab Mentors: Adam Bernstein, Marc Bergevin, Steven Dazeley

2020-Present | LLNL Postdoc



Detector simulation software package (RAT-PAC)



The NSSC Pipeline





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