

# Lawrence Livermore National Laboratory: Science and Security on a Mission

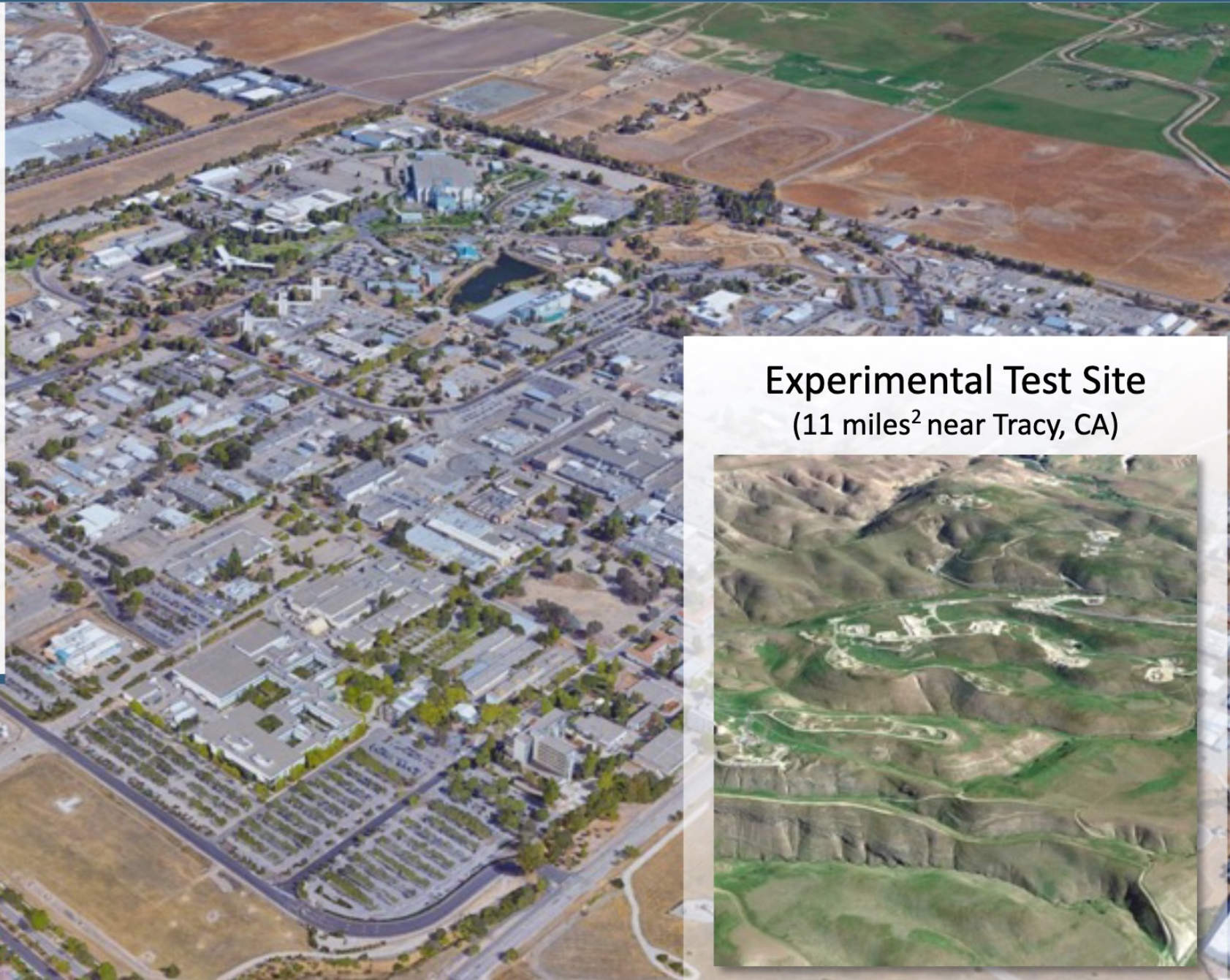
NSSC Fall Workshop

Tomi Akindele  
Deputy POC for the NSSC

October 17, 2023



- Established in 1952
- ~ 8,000 LLNS employees
- 1 square mile and 526 facilities
- Annual budget: ~ \$2.8B
- Operated by LLNS, LLC  
(University of California and Bechtel, BWXT, Amentum, Battelle)



Experimental Test Site  
(11 miles<sup>2</sup> near Tracy, CA)



# Nuclear security is LLNL's core national security mission, and Nuclear Threat Reduction is one of the pillars of this mission

## Stockpile Stewardship



- Annual Assessment
- Life extensions
- Improved predictive capability
- Enterprise integration and responsiveness

## All-WMD Threat Reduction



- Nuclear nonproliferation
- Counterterrorism
- Chemical/biosecurity
- Forensic science
- All-source intelligence

## Multi-Domain Deterrence



- Strategic defense
- Conventional strike
- Space security
- Cybersecurity

## Energy and Climate Security



- Diverse domestic energy resources
- Enhancing reliable delivery
- Climate impact assessment

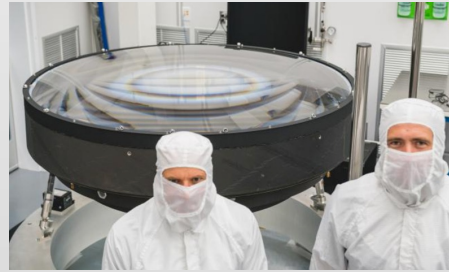
# Scientific achievements contribute to Strategic Deterrence

## National Ignition Facility



LLNL focused 2.05 MJ of laser light that produced 3.15 MJ of energy

## Large Synoptic Survey Telescope (LSST)



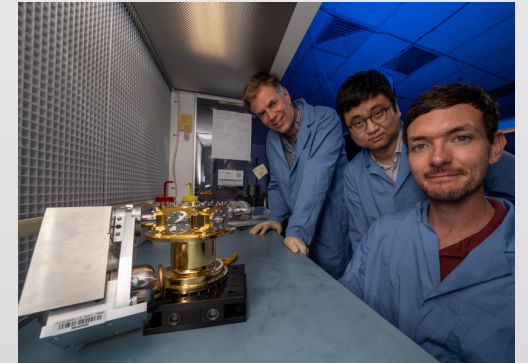
World's largest optical lens ever fabricated to observe the entire visible southern sky and reveal unprecedented details of the universe.

## El Capitan



NNSA's first exascale-class supercomputer, and when completed the fastest supercomputer in the world.

## Instrumentation for Psyche



LLNL developed instrument now on two-billion-mile journey to the metallic asteroid Psyche

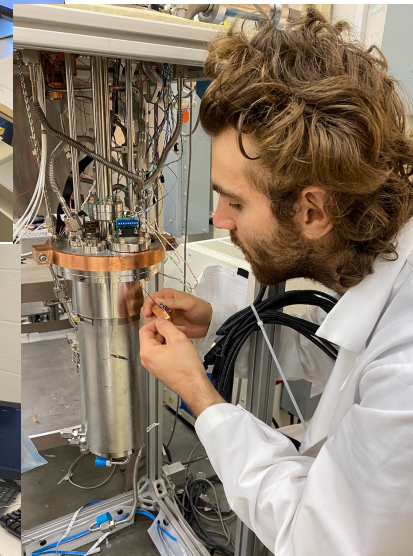
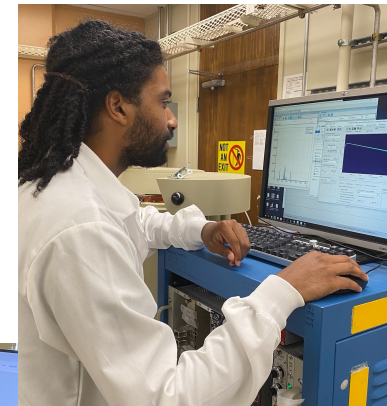
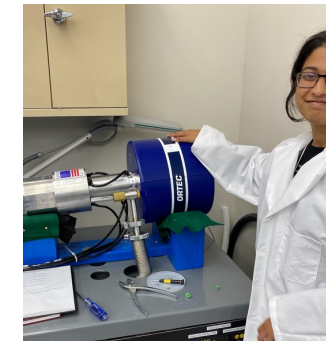
# LLNL Summer Consortia Workshop

- LLNL hosted a summer workshop with the DNN University Consortia.
- Activities include topics related to arms control, emergence response, international safeguards, and consequence management.
- Participation spanned 10 Universities and 5 National Laboratories.
- Upcoming plans to continue and expand the workshop in 2024!



# Summer Student Internships

- Over the past summer we hosted ~30 students from the NSSC and affiliated universities.
- We hosted a dedicated DNN Consortia summer series that included career talks from former NSSC students who are now staff scientists at LLNL.
- Research ranged from nuclear data, to international safeguards and spanned divisions in PLS and Global Security.
- Plenty of opportunities for summer of 2024!



# LLNL NSSC Success Stories: Building the NNSA Workforce

**Bradley Childs**



NSSC Funded Student  
from UNLV

Currently supports  
actinide chemistry at  
LLNL.

**Andrea Richard**



NSSC Funded Student  
from MSU

Currently supports  
indirect nuclear reaction  
measurement

**John Despotopulos**



NSSC Funded Student  
from UNLV

Recently awarded DOE  
Early Career Award from  
the Office of Science

**Teal Pershing**



NSSC Funded from UCD

Currently supports R&D  
for international  
safeguards

# LLNL NSSC Success Story: Developing the Next Generation of Laboratory Leaders

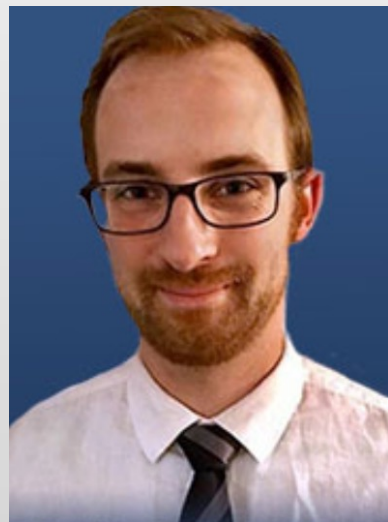
**Elizabeth Heckmaier**



NSSC Funded Student  
from UCI

Currently a science  
advisor for the  
NNSA/DNN.

**David Weisz**



NSSC Funded  
Student from UCB

Currently Deputy  
Division Leader for  
NACS.

**Perry Chodash**



NSSC Funded Student  
from UCB

Currently Group Leader  
within Strategic  
Deterrence.

**Kennan Thomas**



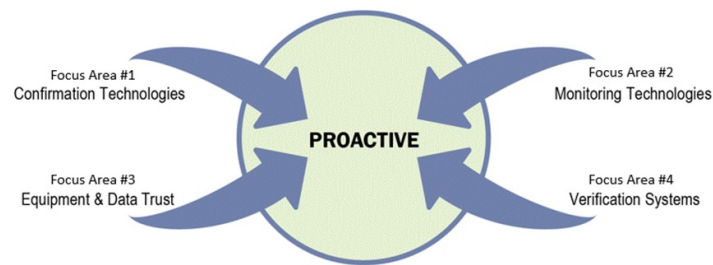
NSSC Funded from  
UCB

Leads Nuclear  
Counting Facility



# Opportunities for Laboratory Collaboration: Nuclear Nonproliferation R&D

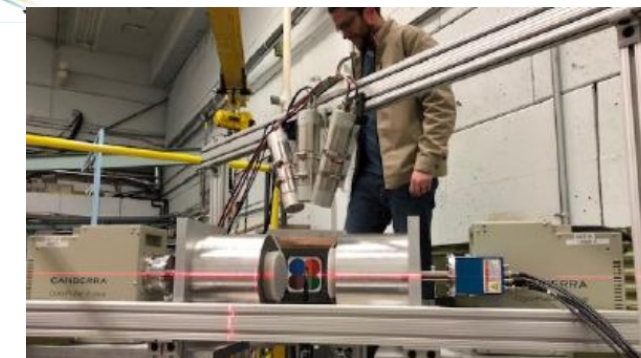
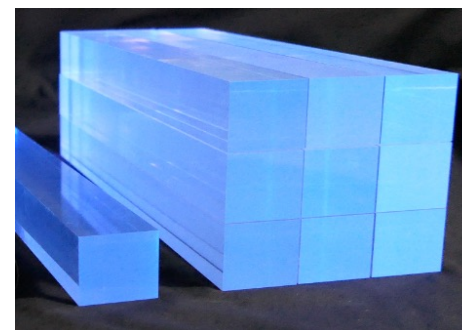
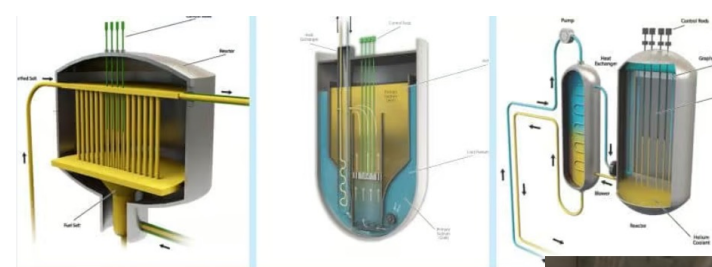
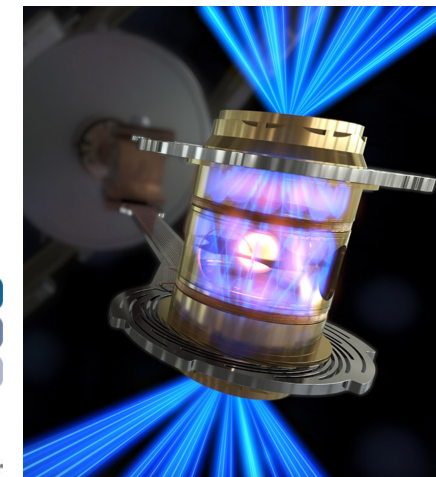
- Nonproliferation ventures related to Tritium and Treaty Verification.
- New projects utilizing scintillating plastics for neutron spectroscopy.
- Experimental R&D to study fission fragments.
- Opportunities to contribute to the FREYA computation code.
- Understanding material's attractiveness from advanced reactors.



**WG1:** Evaluation methodologies (performance, auth/cert, info protection)

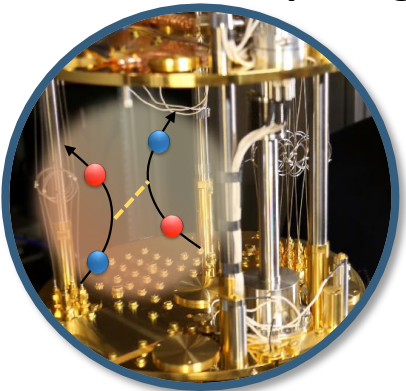
**WG2:** Modeling & experiments (technology & systems level)

**WG3:** Workshops & workforce development



# Opportunities for Laboratory Collaboration: Nuclear Science Theory and Experiments

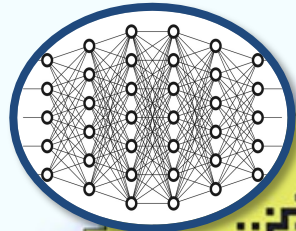
Quantum Computing



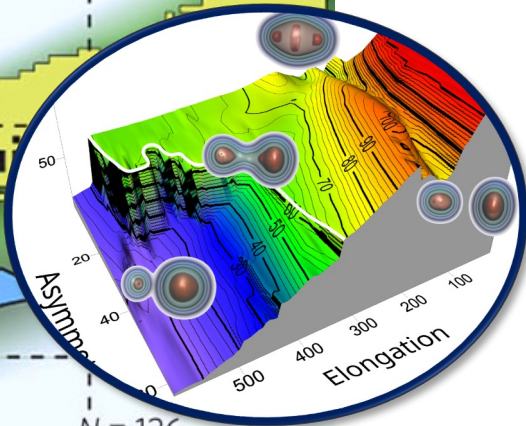
High-Performance Computing



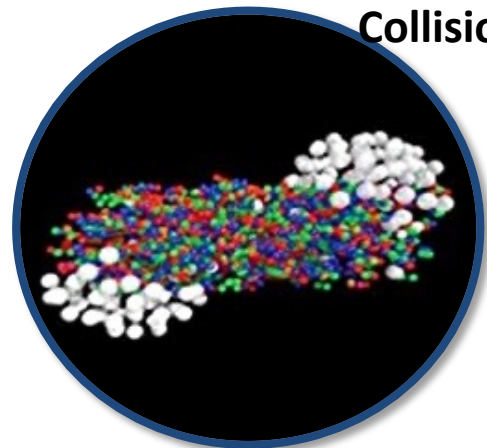
Deep Learning



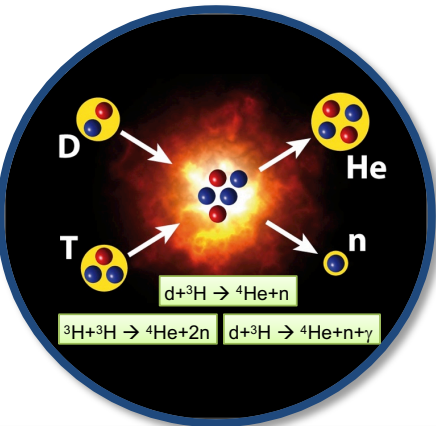
Fission



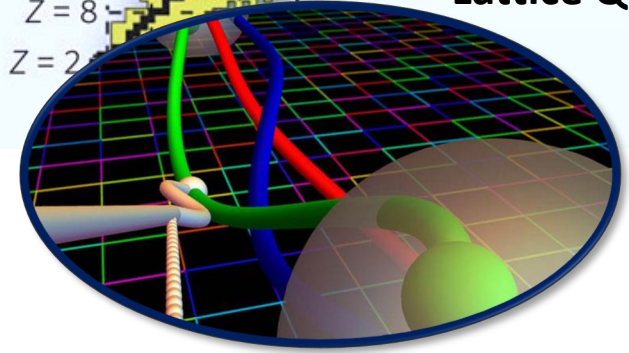
QCD in High-Energy Collisions



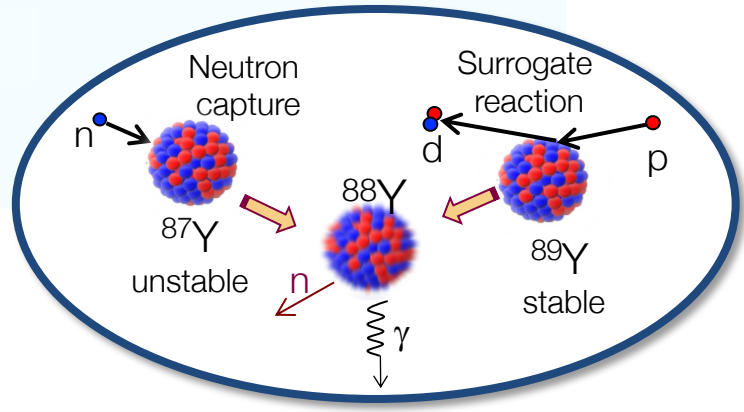
Ab Initio Nuclear Reactions



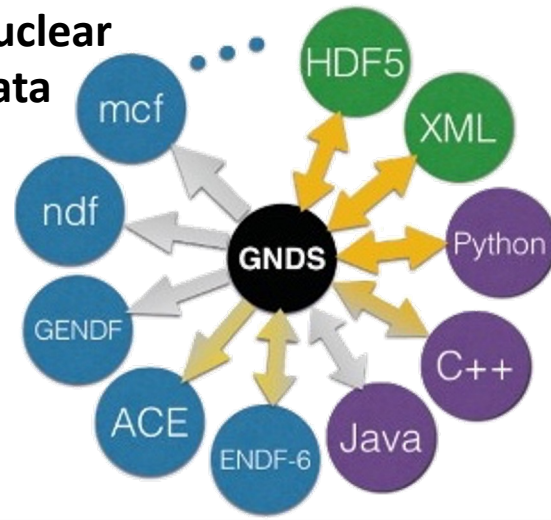
Lattice QCD



Nuclear Reactions



Nuclear Data

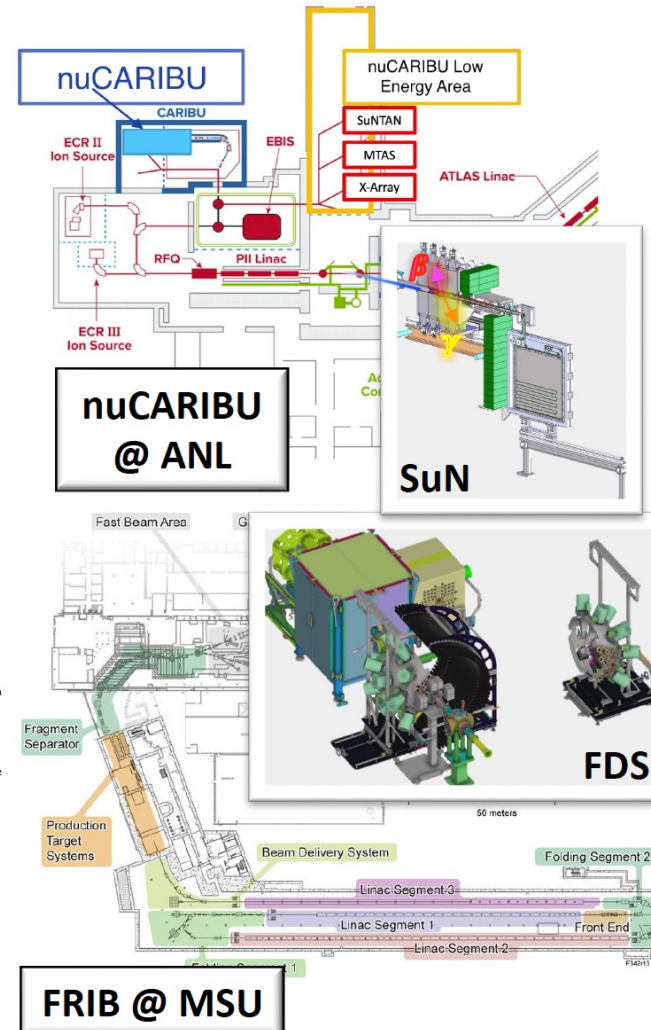
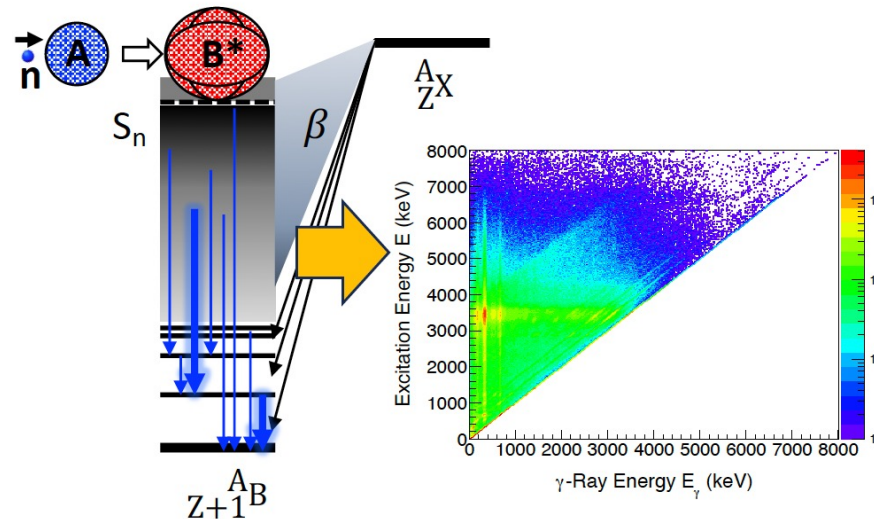


# Radioactive Beams: Indirect measurements, TAS, r-process & fission burnup ( $n, \gamma$ )

## Research Overview

Conduct radioactive beam experiments using a total absorption spectrometer (TAS) to measure key nuclear structure properties:

- Hands-on experience setting-up TAS detector
- Measure  $\beta$ -decay feeding intensities for exotic Cs and Ba isotopes
- Perform TAS analysis



## Previous NSSC Students/PDs placed @ National Labs

- PD: Adriana Sweet → NACS, 2021
- PD: Sandra Bogetic → NACS, 2020 (UTK Assistant Prof., 2021)
- GS: Chris Brand → Safety Basis, 2016
- GS: Joey Gordon → NACS, 2017
- Brian Daub → SD, 2014
- Josh Brown → SNL/LBNL
- Thibault Laplace → LBNL
- Andrew Voyles → LBNL
- Nick Brickner → LBNL

Contact: Adriana Sweet  
[sweet9@llnl.gov](mailto:sweet9@llnl.gov)  
 (925)758-1090

# LLNL Website for NNSA/DNN University Consortia



Global Security

Energy and Homeland Security Nuclear Threat Reduction Intelligence Biosecurity Center Forensic Science Center Featured Scientists

home / nuclear threat reduction / consortium

## NNSA/DNN University Consortia

Consortia Home Projects Researchers Student Resources Lab Capabilities FAQ



LLNL supports several University Consortia to help build the pipeline of talent for the next generation of nuclear national security technical experts. The goal is to bridge the academic and Department of Energy (DOE) national laboratory knowledge bases to build broader support for non proliferation research and development.

LLNL has been actively engaged since the inception of the DNN consortia structure in 2012, contributing to the training of dozens of students so far. LLNL's world-class laboratory facilities and expertise provide unique opportunities for students to work at the cutting edge of national security research as part of their training. This successful collaborative enterprise has forged deep and enduring connections between LLNL and academia, and resulted numerous job opportunities at LLNL for consortium graduates. Through ongoing student-mentor collaborations, the university consortia program is training the next generation of nuclear science and security experts to lead the nation's research endeavors across government, industry, and our national labs.

gs.llnl.gov/nuclear-threat-reduction/consortium

Consortia Home Researchers Student Resources Lab Capabilities FAQ



### Student Resources

#### Working at LLNL

- Overview of the Lab



- LLNL Student Portal
- LLNL Student Opportunities
- LLNL Careers Page
- About Livermore

#### Summer Opportunities

- Summer Institute programs
  - Data Science Summer Institute (DSSI)
  - Computational Chemistry and Materials Science (CCMS) Summer Institute
  - Materials and Chemistry Institute (MCI)
  - Seaborg Summer Institute on Nuclear Forensics
- International Nuclear Safeguards Policy Internship (joint with Middlebury Institute)
- General Summer Internships

#### Other In-residence Opportunities

#### LLNL Points of Contact

Vince Lordi (ETI)  
lordi2@llnl.gov  
(925) 423-2755

Meghan McGarry (CVT, MTV)  
mogary7@llnl.gov  
(925) 424-2397

Vladimir Mozin (NSSC, CNEC)  
mozin1@llnl.gov  
(925) 423-4492

Scot Olivier, Program Director  
olivier1@llnl.gov

- Consortia Information
- Student Resources
- Lab Capabilities
- Current R&D projects
- LLNL Researchers
- FAQ

### NNSA/DNN University Consortia

Consortia Home Projects Researchers Student Resources Lab Capabilities FAQ



### Lab Capabilities

LLNL offers a wide range of opportunities. The facilities listed below highlight some of the capabilities available.



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- Career development and advancement
- Flexible work schedule
- Opportunities for varying levels of experience and education
- Competitive salary and benefits package

[computing.llnl.gov/careers](https://computing.llnl.gov/careers)

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# Science and Technology on a Mission

 Lawrence Livermore  
National Laboratory