Working at SNL as a Physicist
U.S. NUCLEAR WEAPONS COMPLEX
Three national labs and five manufacturing, assembly, and disassembly facilities collectively employ 37,000 staff

SOURCE: National Nuclear Security Administration
Main sites
• Albuquerque, New Mexico
• Livermore, California

Activity locations
• Kauai, Hawaii
• Waste Isolation Pilot Plant, Carlsbad, New Mexico
• Pantex Plant, Amarillo, Texas
• Tonopah, Nevada
NUCLEAR DETERRENCE
Responsibilities form a critical mandate

Multidisciplinary capabilities
Required for design, qualification, production, surveillance, computation/experimentation
- Major environmental test facilities & diagnostics
- Materials sciences
- Light-initiated high explosives
- Computational analytics

Warhead systems engineering & integration

Design agency for nonnuclear components
- Gas transfer systems
- Radar
- Safety systems
- Arming, fuzing & firing systems
- Neutron generators

Production agency
- Neutron generators
- Sandia external production
- Microelectronics
- Thermal battery backup
Protects the nation from threats at home and abroad

- Develop space- and ground-based sensor systems for monitoring emerging threats
- Supply technology, crisis response, and training to respond to a crisis associated with weapons of mass destruction
- Provide capabilities for protecting U.S. nuclear weapons and materials at fixed sites and in transit
- Produce systems that deter proliferation and verify compliance with international agreements using space-borne and ground-based sensing technology
- Lead global technical engagement to prevent the misuse of nuclear, chemical, biological, and radiological materials
Strengthens our nation’s defenders

- Information operations
- Science & technology products
- Integrated military systems
- Proliferation assessment
- Surveillance & reconnaissance
Innovates for a secure future

• Perform fundamental and applied R&D to support the resilience and security of the nation’s energy system
• Provide protection for our nation’s digital and physical critical infrastructures
• Reduce U.S. vulnerability to chemical, biological, radiological, and nuclear threats
• Accelerate transformative innovations in the transportation sector through foundational physical and computational research
Research Foundations play an integral role in mission delivery.
NONPROLIFERATION

6.6%

Other DOE

7.4%

DoD-Nuclear

19.6%

DoD

53.0%

NNSA

6.1%

Weapons

CRADAs, licenses, royalties | inter-entity work

Department of Homeland Security

Office of the Secretary of Defense

Other federal agencies

Intelligence Community

Nonfederal entities

Other entities

Nonproliferation

DoD

Science

Energy Efficiency and Renewable Energy

Environmental Management

Nuclear Energy

Electricity Delivery and Energy Reliability

Office of the Secretary of Defense

Defense Advanced Research Projects Agency

BMDA

Defense Threat Reduction Agency

Intelligence Community

State Department

OTHER

OTHER

Air Force

Army

Navy

7.3%

19.6%

6.6%

7.4%

53.0%
Staff has grown by over 3,800 since 2009 to meet all mission needs.
• Have a Career Discussion with a Sandia on-campus Recruiter
• Together discuss interests, location preferences, and career goals
• All hires start with applying online to an existing posting
  • Sandia.gov\careers
  • Let the Recruiter know about all positions you’ve applied to. The recruiter can contact the hiring manager and share all of your strengths and advocate for you.
  • Recruiters can’t share your resume directly with a hiring manager.
• Be patient
• Apply to lots of positions
Southern California native

Decided to major in physics in High School because I read Popular Science

BS, MS Brigham Young University in Physics

PhD with Lance Cooper in 2003

Graduation Day
• Strongly correlated electron systems

• High-pressure Raman scattering at low-T and B-Field
• Know what defines success and completion. What are you trying to do? What is your goal?

• Focus on problem and not technique. You can be an expert at a technique but you solve problems.

• Give more presentations, always defending work, reporting on it, etc.

• Help with proposal writing. We have to write a lot, proposals, reports, etc.
US DOE National Lab

- 9/80 work schedule
- Volunteering encouraged
- Start 15 days vacation
- Flexible work schedule
- Very rare late nights/weekends

- Variety of departments
  - Change careers without changing jobs
  - Well supported labs
  - You focus on science not other stuff
- Good Location
  - Usually, assigned a technologist to work with

- Stability
  - New employees
    - Enhanced 401(k)
    - No pension
    - Decent Health Care
    - Decent Dental
  - Salary and Benefits indexed to industry

- Family Time
  - Staff lay-offs not since 90’s
  - Whims of politics

Interesting Problems

Money
Metal hydride with hydrogen replaced with tritium

Tritium decays into helium
- $^1\text{H}^3 \rightarrow ^2\text{He}^3 + _1\text{e}^0$
- Half-life = 12.3 years

Why does this matter?
- $^1\text{H}^2 + ^1\text{H}^3 \rightarrow ^2\text{He}^4 + _0\text{n}^1 + 17.6\text{ Mev}$
  - Energy production

  - Neutron generating devices
    - Nuclear weapons
    - Homeland security
    - Oil well logging
    - Medical applications
1-D Simulation of Carbon Contamination on Electrodes

![Graphs showing simulation results](image)

**Figure 7-11.** Electron current density at the anode for the various cases during the early phases of arc initiation. The legend shows the equivalent number of carbon monolayers that were placed in the gas phase in the region close to the anode.
Much of the work at SNL is controlled to some level. Usually able to massage to be releasable to the general public.

Whatever you want to do, you need to be trained. Can be a simple 30 minute online training or a multi-day course. Lots and lots of training.

Any new change in your lab needs to be analyzed and approved. PHS, PSDP, TWD.
The Course of Science

Sparse and Infrequent Observations

Observational Errors

Incorrect Interpretation of Observations

Theoretical Misunderstanding

Management Directives

Oversimplified Models

Computer Models

Controversy

Further Refinement of Unimportant Details

Code Errors

Unrealistic Assumptions

Crude Diagnostic Tools

Confusion

Further Misunderstanding

Coincidental Agreement between Theory and Observations

Publication

Cover-up of Subsequent Results
Exceptional service in the national interest