



Exceptional service in the national interest

Physics careers in the national interest

Sandia National Laboratories Info Session

Dr. Laura Biedermann

Dr. Shannon Murray



World-changing technologies. Life-changing careers.

SAND2024 - 15626PE

All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, disability, or veteran status and any other protected class under state or federal law. Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia LLC, a wholly owned subsidiary of Honeywell International Inc. for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.



2 Celebrating 75 years of Exceptional Service to the Nation



Sandia strives to become the laboratory that the U.S. turns to first for technology solutions to the most challenging problems that threaten peace and freedom for our nation and the globe.

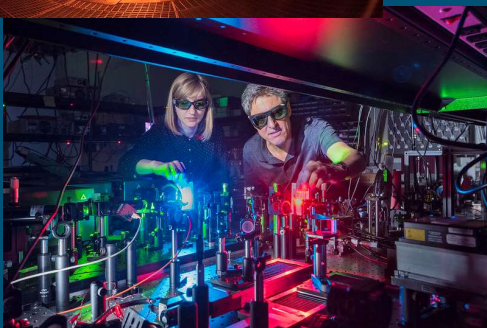
Outline



Introductions

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Our research at Sandia



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For Sandia physicists



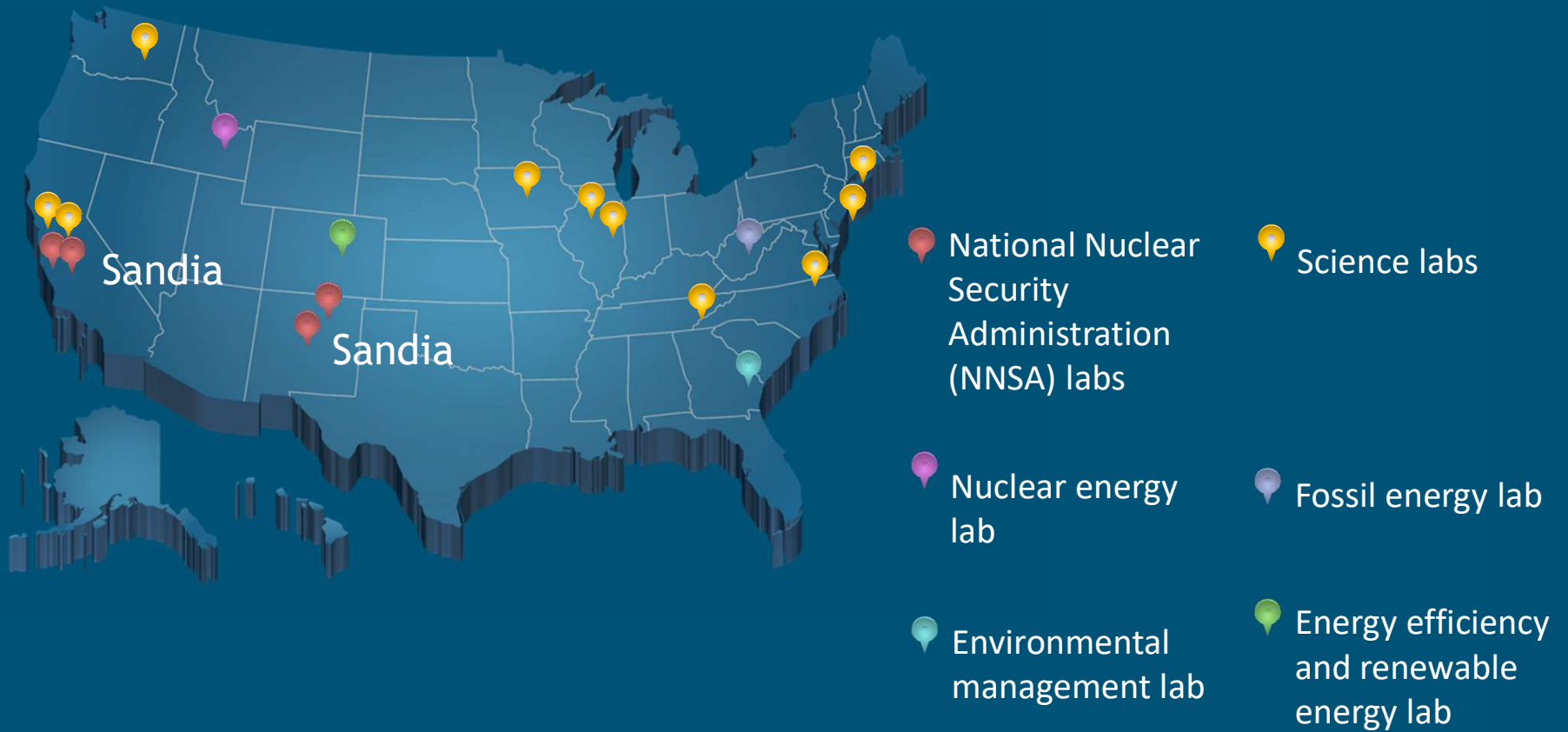
Joining Sandia

Postdoc and internships opportunities

Interview process



Sandia is one of 17 U.S Dept. of Energy National Labs



Fulfilling Our National Security Mission



Global Security



Nuclear Deterrence



National Security Programs



Energy & Homeland Security

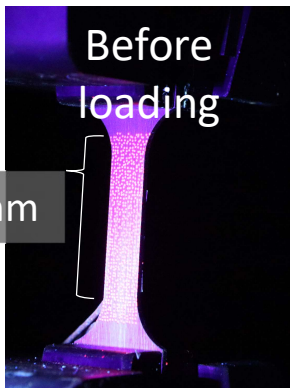


Advanced Science & Technology

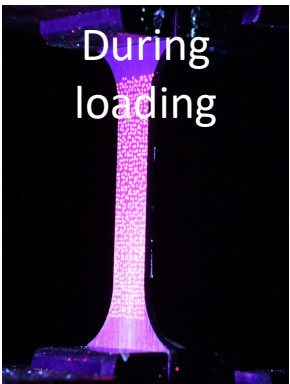
We're currently delivering the defense and national intelligence community's most advanced science and technology programs to help address our most critical national security challenges today and in the future. Some of the critical national security issues that we address lie in the cyber area.

Dr. Shannon Murray

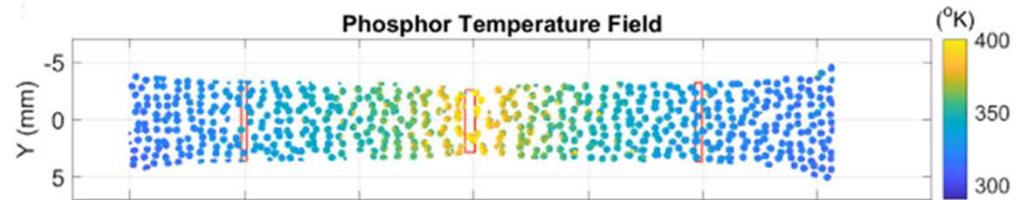
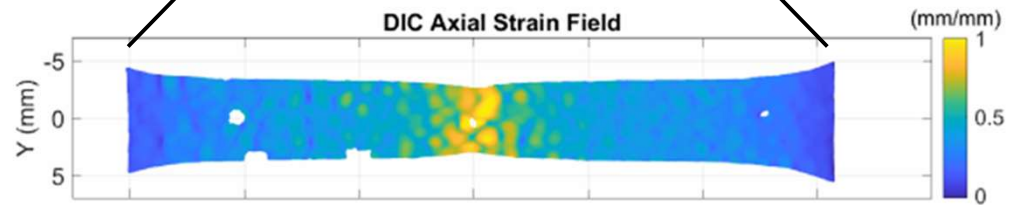
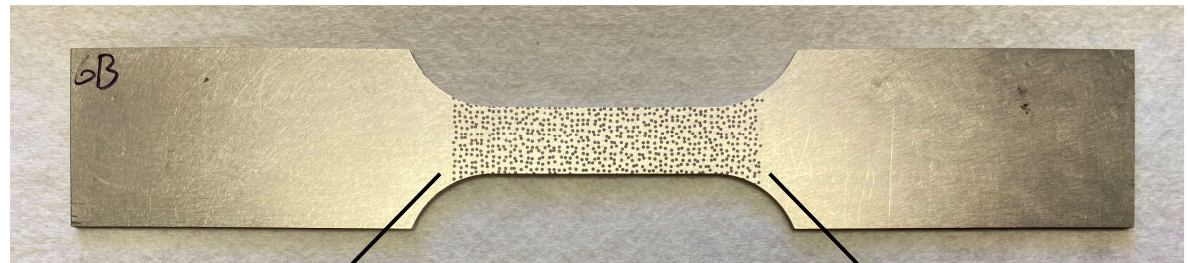
Thermographic Phosphor Digital Image Correlation (TP+DIC)



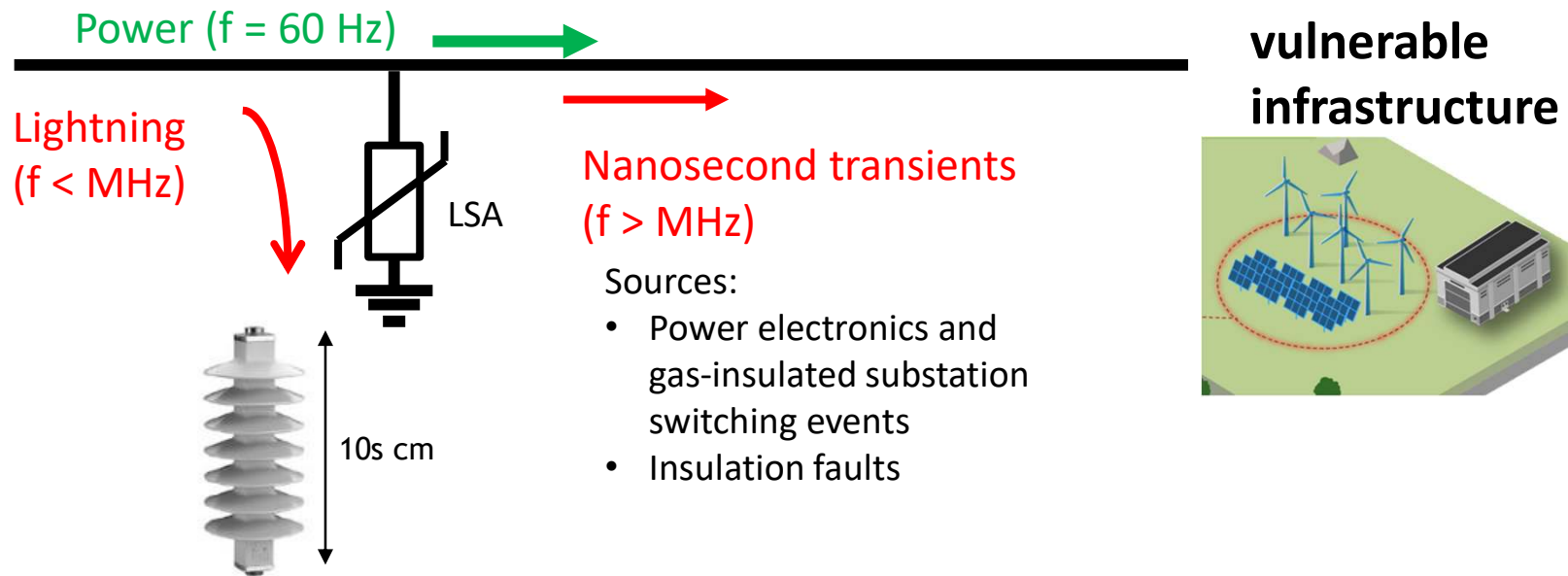
32 mm



Visible emission when excited by UV lamps



Nanosecond high-voltage transients threaten electrical grid reliability



Lightning surge arresters' (LSAs) response time is $\sim 100 \text{ ns}$

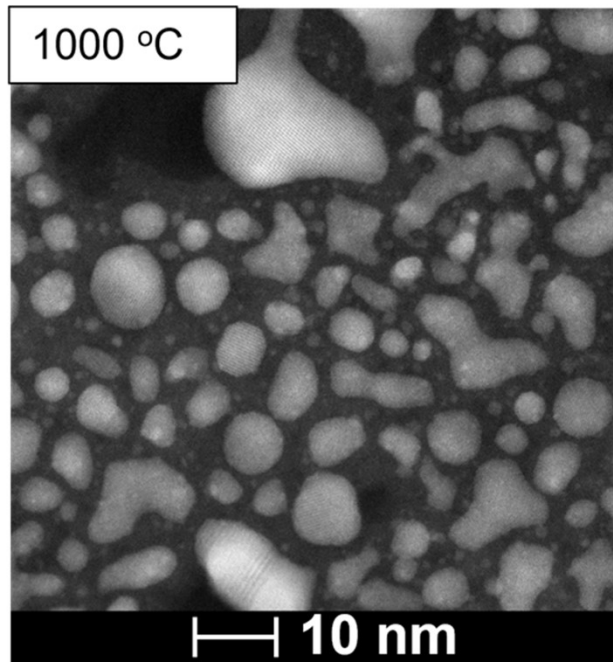
An additional ns arrester is needed with

- High breakdown strength (E_{BD})
- Low conductivity, σ , at grid voltages and frequencies
- High σ at MHz/GHz frequencies and with overvoltages

Granular metals comprise metal nanoparticles embedded in an insulating matrix

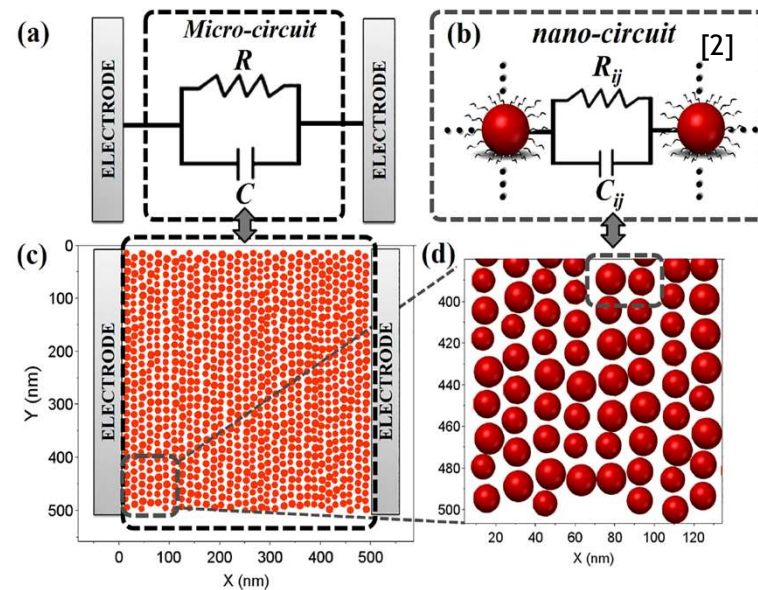
Scanning TEM image of a granular metal, Mo-SiN_x.

Mo nanoparticles (bright) are embedded in SiN_x (dark).



Complementary tunneling and capacitive conduction paths give rise to frequency-dependent conductivity^{1,2}

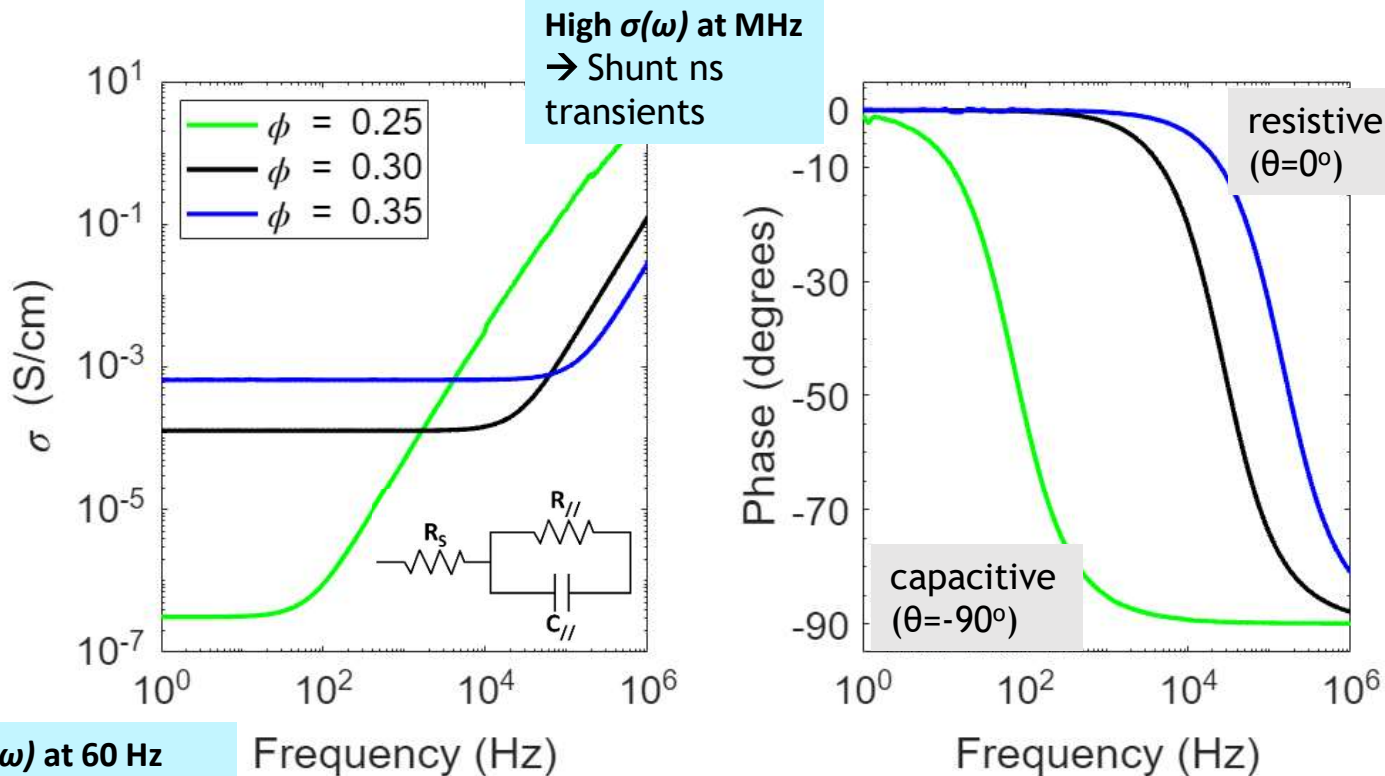
$$\sigma'(\omega) = \sigma_{DC} + A\omega^n$$



[1] A. Jonscher, *Nature* **267**, 673-679 (1977).

[2] L. Merle *et al.*, *J. Appl. Phys.* **132**, 015105 (2022).

Ideal for high-pass filters, Mo-SiN_x GMs demonstrate extraordinarily strong σ_{AC} response



M. McGarry *et al.*, "Interfacial defect reduction enhances universal power law response in Mo-SiN_x granular metals." *J. Appl. Phys.* **136**, 055101 (2024).



Work environment

Laura Biedermann

National lab work environments are interdisciplinary and mission-focused



Computational Science, Advanced Manufacturing, Buildings, Energy Storage, Grid Resilience



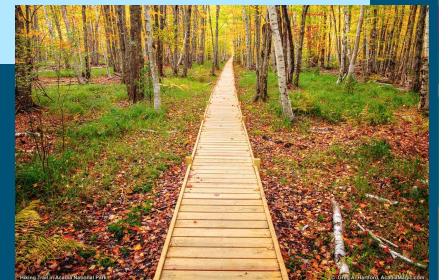
Biology & Environment, Fusion & Fission, Supercomputing, National Security



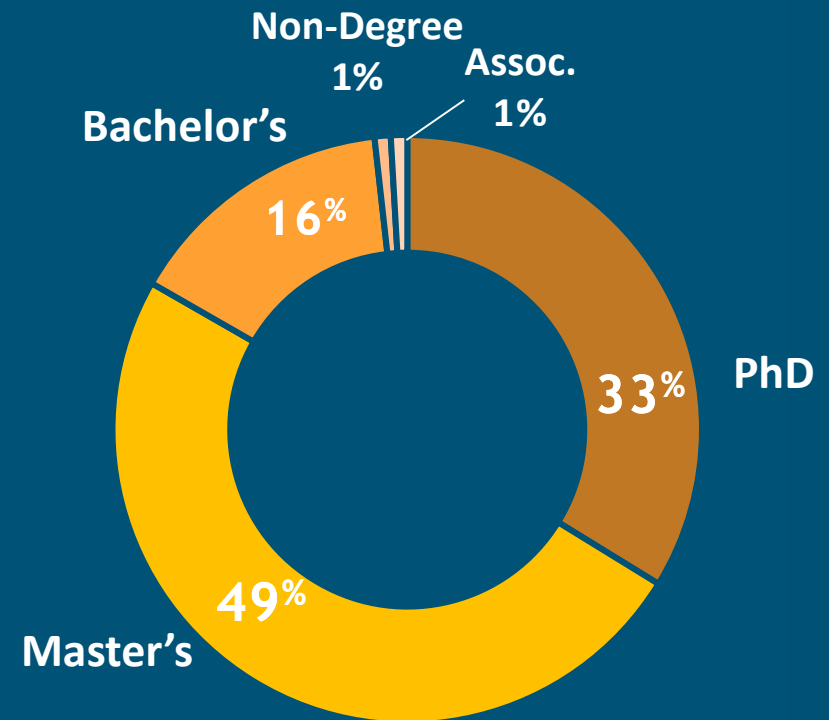
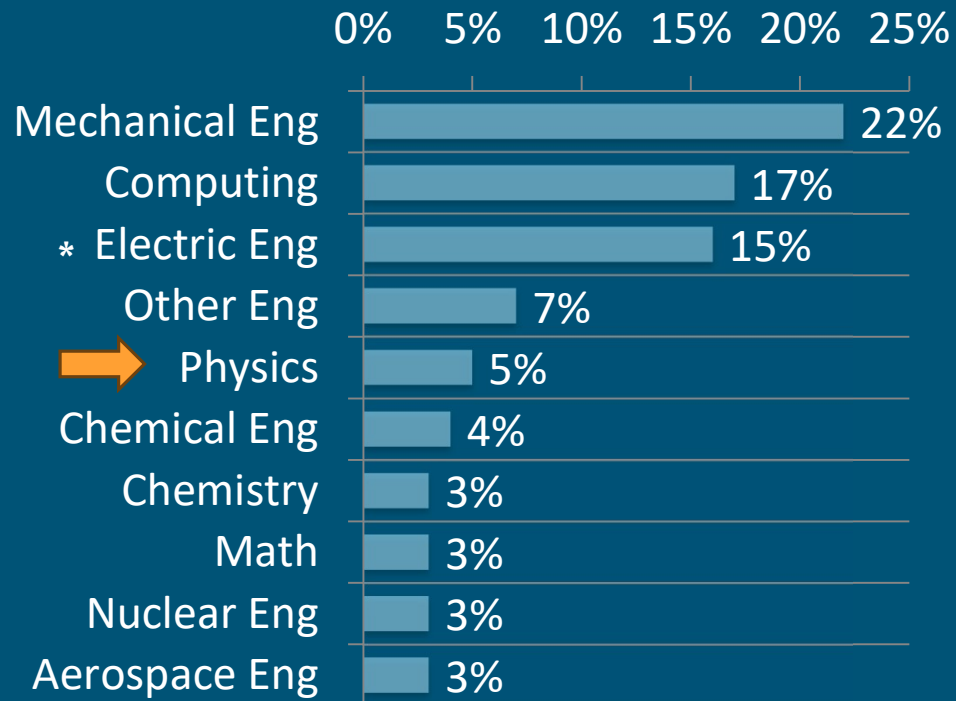
Advanced Science & Technology, Energy & Homeland Security, Global Security, National Security Programs, Nuclear Deterrence

National lab employees have the opportunity to contribute to multiple teams, grow, their career and move between research areas

National labs' research is somewhat constrained



Sandia's research & development (R&D) staff have diverse academic backgrounds



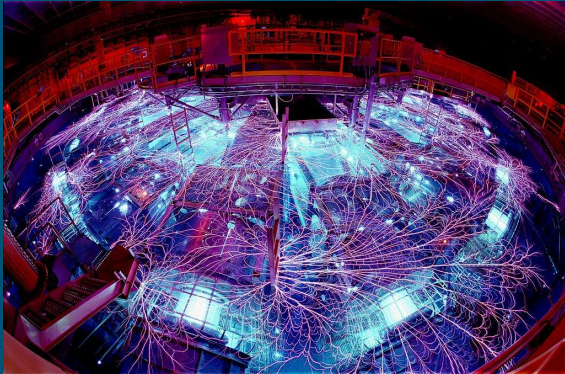
(*) Computing includes disciplines such as High Performance Computing, Cybersecurity, Machine Learning, Autonomous Sensing and Perception

Data as of July 2024

Slide from SAND2024 – 11629PE

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3

Physicists have fun at Sandia



60 staff in pulsed power



32 staff in materials science, physics, and chemistry



22 staff in photonics and quantum devices



16 staff in radiation, chemical, and biological detection

10 staff in non-proliferation (satellites)

8 staff in chemistry, combustion, and materials science

Career paths in mission and research areas at Sandia



Mission

Most staff join with MS degrees

Staff write white papers for continuing and new projects.

Nuclear weapons, non-proliferation, pulsed power engineering, ...

Research

Most staff have PhDs; many have done postdocs

Staff write research proposals, publish frequently.

Quantum devices and photonics, power electronics, pulsed power science, ...



Staff move between research and mission careers!

NNSA Administrator Jill Hruby and recent Sandia lab president



Joining Sandia

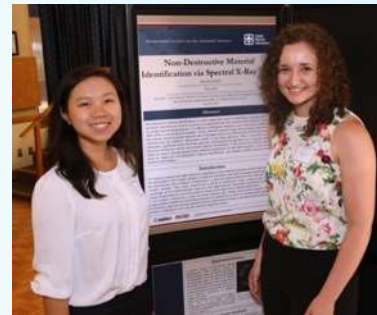
Shannon Murray

Internships – Outreach & Networking Events

- Summer Welcome Event
- Intern Career Fair
- Intern Symposium
- Graduate Fairs
- Senior Manager Shuffle
- Facility Tours
- Speaker Forums



Image from SAND2024 – 11629PE



Physics-rich intern institutes

Future of Research for Climate, Earth, and Energy (FORCEE): climate change, renewable energy, and nonproliferation

Interdisciplinary Design, Engineering, and Assurance Students (IDEAS): engineering design, component/subsystem development, and product testing

Interns for Security, Arms Control, and Force Protection Engineering (iSAFE): reduce risk of nuclear and biological proliferation, terrorist threats, and catastrophic incidents

Monitoring Systems and Technology Intern Center (MSTIC): Remote sensing for nonproliferation

Research and Applications of Mechanics of Structures (RAMS): Shock physics

Resilient Energy Systems Intern Institute (RESII): Electrical grid stability

Science of Extreme Environments Research Institute (SEERI): Pulsed power

TITANS Math & Analytics (MARTIANS): global security, cyber security, energy and climate

www.sandia.gov/careers

[Intern Institute Website](#)



Types of Postdoctoral Positions



Distinguished Fellowships

Lab Director Jill Hruby Fellowship

President Harry S. Truman Fellowship

- Applications due mid-September
- Three-year appointment, Fellow is 100% funded on their own research



Photo: SAND2024-07726N

Foundation Fellowships

Barbara McClintock Fellowship in Bioscience

John von Neumann Fellowship

S. Scott Collis Data Science Fellowship

Maxwell Fellowship

Gil Herrera Fellowship in Quantum Information Sciences

- Applications typically due in fall/winter
- Generally 50% Postdocs own research, 50% on other related PI research

Postdoctoral Appointments

- Applications ongoing, year round
- Funded by line organizations supporting PI projects



Interview processes at Sandia

Internships:

- Apply early to multiple positions (e.g. over Thanksgiving break)
- Add brief cover letter to stand out
- Expect ~1-3 phone calls; behavioral interview and career goals

Postdoc positions

- Apply **anytime** to reasonable fit; many postdoc positions will be growth positions.
- Initial ~1 hr phone call; research background and behavioral interview
- Top candidates will have a full day interview including a research seminar and in-depth interviews interviews

Staff positions

- Very similar to postdocs, but more 1:1 interviews and more likely to be in person.
- May present a research seminar participate in panel discussions.
- Emphasize technical breadth.

