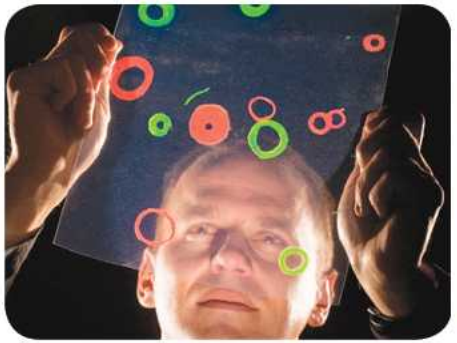
SAND2013-10614P

Exceptional service in the national interest

Sandia National Laboratories



Sandia National Laboratories Overview

Julia M. Phillips, PhD

Chief Technology Officer

U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000..

Sandia's History

Sandia National Laboratories

AMERICAN TELEPHONE & TELEGRAPH CO. BELL SYSTEM AND ASSOCIATED COMPANIES

THE WHITE HOUSE
WASHINGTON

May 13, 1949

Dear Mr. Wilson:

I am informed that the Atomic Energy Commission intends to ask that the Bell Telephone Laboratories accept under contract the [illegible] at Albuquerque, New Mexico.

This operation, which is a vital [illegible] atomic [illegible] national defense, and should have the best [illegible] technical direc-[illegible]

I hope that after you have heard more in detail from the Atomic Energy Commission, your organization will find it possible to [illegible] this task. In my opinion you have here an opportunity to render an exceptional service in the national interest.

I am writing a similar note direct to Dr. C. E. Buckley.

Very sincerely yours,

Harry Truman

Mr. Leroy A. Wilson,
President,
American Telephone and Telegraph Company,
195 Broadway,
New York 7, N. Y.

exceptional service in the national interest.

Sandia's Mission Work Reflects the Nation's Security Challenges

Sandia National Laboratories

1950s	1960s	1970s	1980s	1990s	2000s	2010s
NW production engineering & manufacturing engineering	Development engineering Vietnam conflict	Multiprogram laboratory Energy crisis	Missile defense work Cold War	Post–Cold War transition Stockpile stewardship	Expanded national security role post 9/11	LEPs New START Evolving national security challenges

Sandia's National Security Missions

- Maintain a safe, secure stockpile and an effective nuclear deterrent now and into the future
- Reduce global nuclear dangers
- Provide nuclear assessments and warning
- Enable the United States to defend and dominate in cyberspace
- Maintain US defense technological superiority through synergistic products
- Reduce global chemical and biological dangers
- Ensure a secure and sustainable energy future
- Maintain US defense technological superiority through leveraged innovations

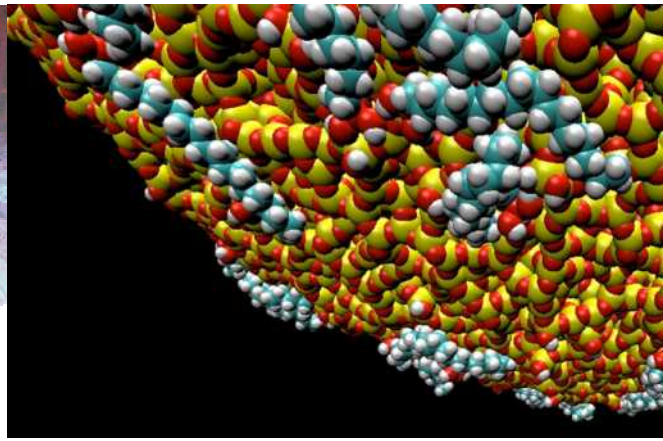
Strong Research Foundations Enable Mission Performance

Sandia National Laboratories

Computing and Information Sciences

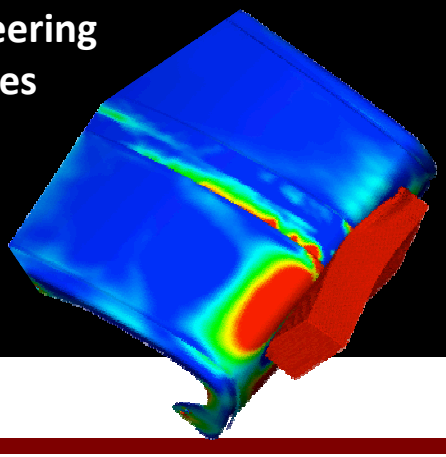
Radiation Effects and High Energy Density Science

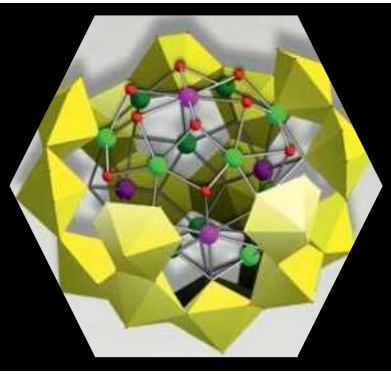
Materials Science

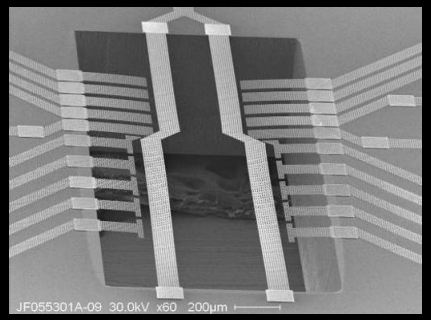


Nanodevices and Microsystems

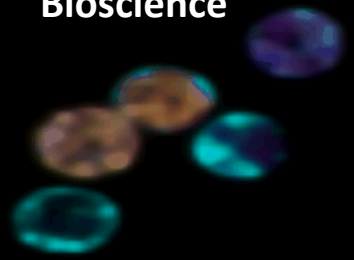
Engineering Sciences







Bioscience

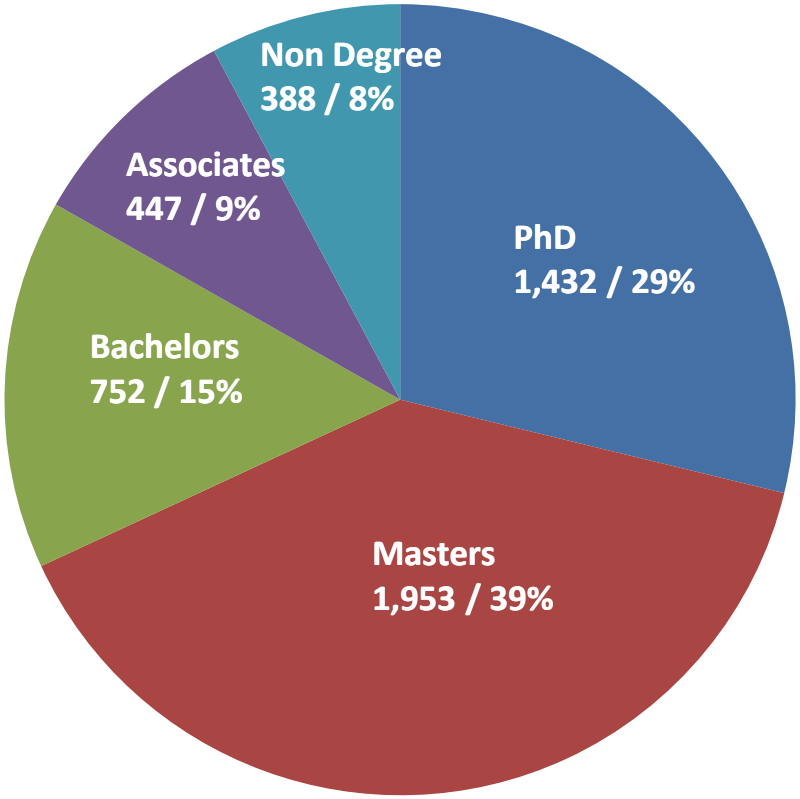


Geoscience

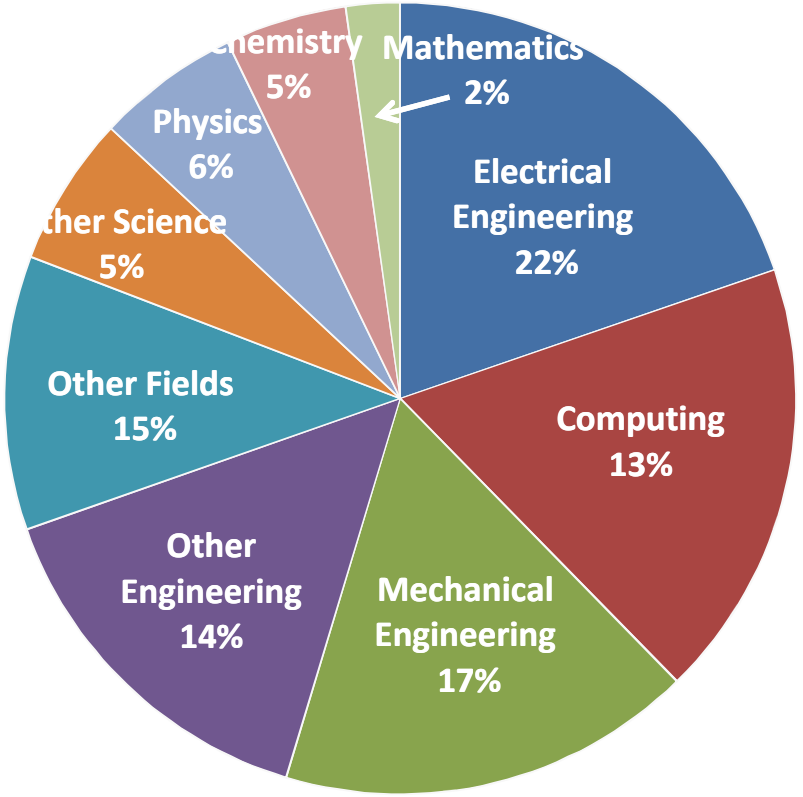
Sandia's R&D Workforce

- **Total workforce: 11,065**
- **Regular employees: 9,831**
- **R&D staff: 4,972**

R&D staff by degree



R&D staff by discipline



Data as of November 29, 2013

Research Objective

Sandia National Laboratories

Research conducted at SNL shall enable mission delivery now and in the future and advance the frontiers of science and engineering.

Research Strategy

Sandia National Laboratories Strategic Plan

Strategic Management Unit Strategic Plans

Research Strategy

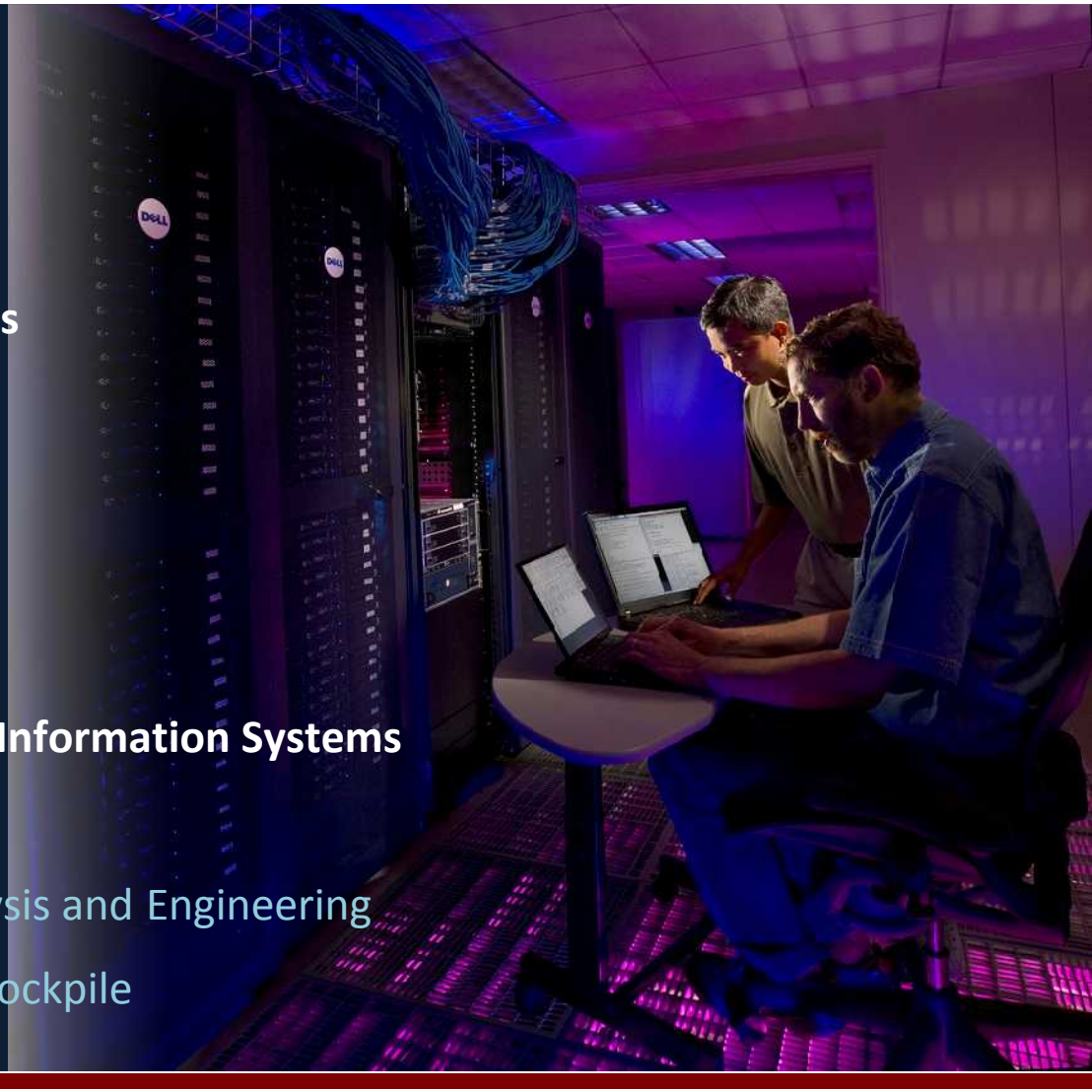
Laboratory Directed Research & Development (LDRD) is a critical component of strategy implementation

- Enable the national security mission
- Advance the frontiers of science and engineering
- Attract and retain a world-class research community

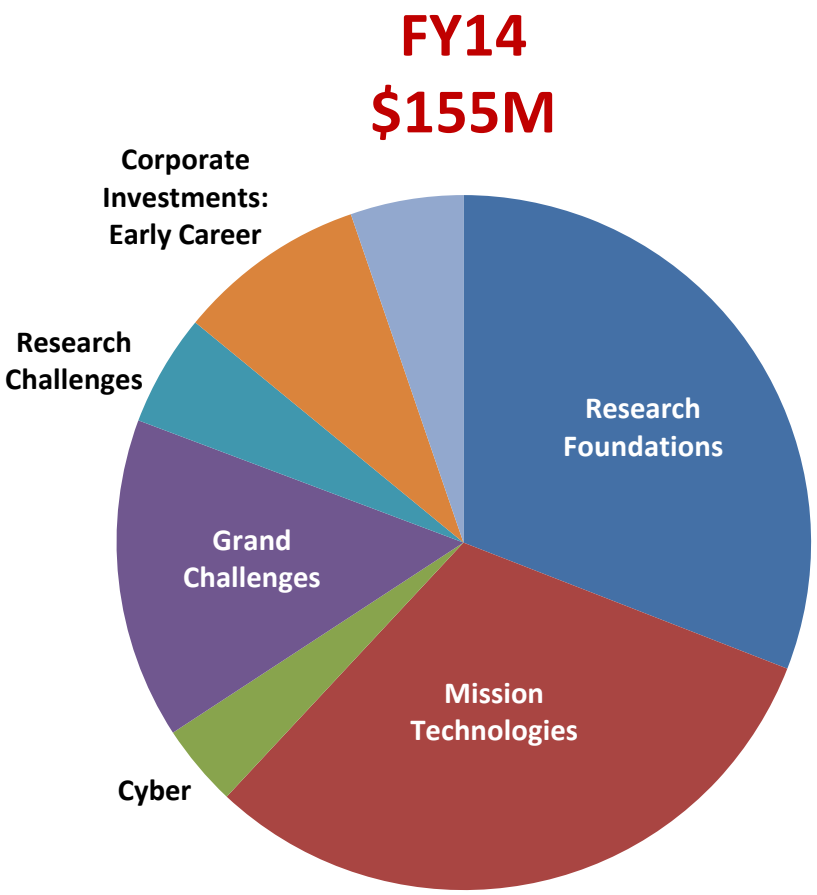
Sandia's Research Challenges

Sandia National Laboratories

- **Beyond Moore Computing**
- **Data Science**
- **Cyber Resiliency**
- **Trusted Systems & Communications**
- **First to High-Yield Fusion**
- **Detection at the Limit**
- **Engineering of Materials Reliability**
- **Resiliency in Complex Systems**
- **Science and Engineering Quantum Information Systems**
- Power on Demand
- Integrative Biological Systems Analysis and Engineering
- Revolutionary Approaches to the Stockpile



LDRD Portfolio Overview



- **Research Foundations** – provide foundational support for all national security missions
- **Mission Technologies** – seeks to create innovative technologies in direct support of NNSA, DOE, and WFO missions
- **Grand Challenges** – bold, high risk ideas with the potential for significant national impact
  - Microsystems Enabled Photovoltaics
  - Exascale Computing
  - Pattern Analytics to Support High Performance Exploitation and Reasoning (PANTHER)
  - New Capabilities for High Fidelity Fast Neutron and Warm X-ray Hostile Environments
  - **Secure Communications and Authentication Network using quantum Key Distribution (SECANT QKD)**
- **Corporate Investments**
  - Strategic Partnerships
  - Early Career
  - Exploratory Express
  - Reserves and Program Management

Research Assessment Elements (Five Element Framework)

Strategy	Research strategy is clear, having strategic and timely goals, bold and leading-edge areas of research focus, objective competitive analysis, and simple measures of success.
Relevance	Research enables the Labs' national security missions, benefits Sandia, DOE/NNSA, and the nation, and is clearly differentiating for Sandia.
Quality	Research is high quality and at the leading edge of science and engineering, is performed with high integrity and fidelity, and appropriately managed to address key challenges.
Workforce / Capabilities	Research enables the attraction, retention, and development of Sandia's technical staff, the development of differentiating capabilities, and the initiation of short- and long-term strategic collaborations.
Impact	Research leads to outcomes supportive of strategic goals, such as S&E leadership, technology deployment and intellectual property, and a long-term S&T legacy.

External reviews are linked to
SNL Performance Objective 3: Science, Technology and Engineering Mission

Research Assessment Elements

Sandia National Laboratories

Strategy: Research strategy is clear, having strategic and timely goals, bold and leading-edge areas of research focus, objective competitive analysis, and simple measures of success.

- What is your view of our planned research strategy, strategic goals, and focused research areas?
- Are resources adequate and appropriately allocated? If not, what should we consider changing?
- Do milestones strike an appropriate balance between bold and realistically attainable?
- Are the measures of success clear and indicative?
- Have we identified the highest risk areas and developed appropriate mitigation?

Research Assessment Elements

Relevance: Research enables the Labs' national security missions, benefits Sandia, DOE/NNSA, and the nation, and is clearly differentiating for Sandia.

- Where is Sandia uniquely qualified to undertake this work?
- Which technical challenges addressed in the GC are most relevant to the quantum communications community? Are there other technical directions we should consider in our project plan?
- How will our proposed work, if successful, provide benefit to the nation?

Research Assessment Elements

Quality: Research is high quality and at the leading edge of science and engineering, is performed with high integrity and fidelity, and appropriately managed to address key challenges.

- Are technical goals clear? Are they matched to the right problems?
- Do we have appropriate awareness of worldwide research in the field?
- Is the project plan well aligned with Sandia's strengths and where we are positioned to make the highest impact contributions in QKD?
- Are our IP and dissemination plans appropriate?

Research Assessment Elements

Capabilities: Research enables the attraction, retention, and development of Sandia's technical staff, the development of differentiating capabilities, and the initiation of short- and long-term strategic collaborations.

- Do you see science or technology or staffing or skill gaps that should be closed during the course of the project (e.g., through partnerships or hiring)?
- Will success with the project lead to development of differentiating capabilities that can endure after the conclusion of the GC? What are these differentiating capabilities and how could they be used going forward?
- Is our assessment of our own competitive position and differentiation with the global community accurate?

Research Assessment Elements

Impact: Research leads to outcomes supportive of strategic goals, such as S&E leadership, technology deployment and intellectual property, and a long-term S&T legacy.

- Does the GC have an effective plan to engage with the broader community and propagate the GC's technical advances?
- What is the GC's likely long-term S&T legacy at Sandia if successful? What about its broader S&T legacy? How significant would a successful GC be?
- What are your thoughts about "life after the LDRD"?