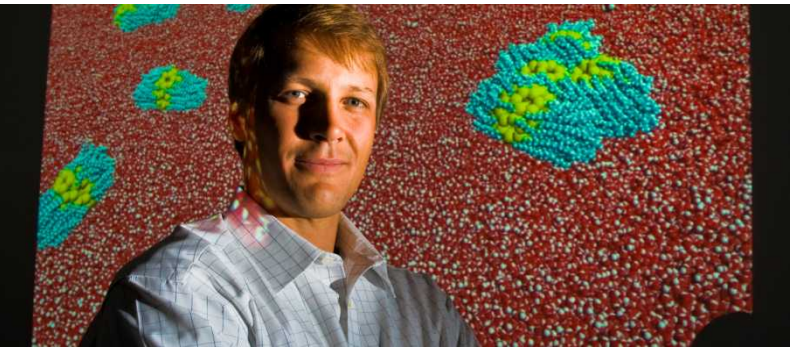
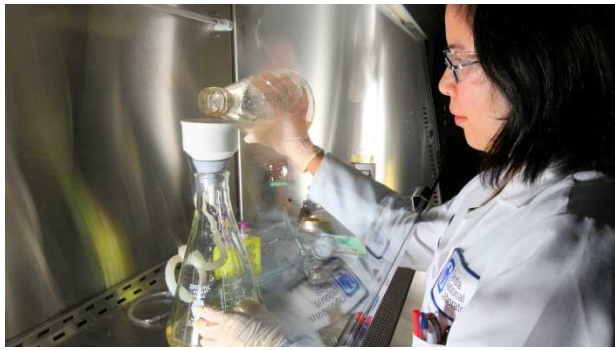
SAND2014-2140P

Exceptional service in the national interest

Sandia National Laboratories





Research at Sandia

Julia M. Phillips, Ph.D.

Vice President and Chief Technology Officer

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. SAND2013-1419P

Sandia's History

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 National Security Missions

Labs Foundation: Capabilities = People + Research + Facilities & Tools

Sandia's Foundation Underpins the Mission Areas

Sandia National Laboratories

People
- Highly educated workforce
- Strategically managed workforce of diverse skills and competencies
- Modern business practices and operations

Research
- Disciplined-based Research Foundations
- Multidisciplinary Research Challenges
- R&D Investments
  - Internal Laboratory-directed R&D
  - Customer-funded R&D

Capabilities
- High-reliability engineering
- Sensors and sensor systems
- Microsystems
- Natural and engineered materials
- Safety, risk, and vulnerability analysis
- Cyber technology
- Reverse engineering
- Modeling and simulation
- Pathfinders

Example Facilities and Tools
- Major Environmental Test Facilities
- Microsystems and Engineering Sciences Applications (MESA)
- High-Performance Computing
- Pulsed-Power Facility
- Center for Integrated Nanotechnologies (CINT)
- Combustion Research Facility (CRF)
- Ion Beam Laboratory
- …

Sandia's Research Objective

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





Sandia's Research Strategy Goals

- Provide critical differentiation in the delivery of mission through the research portfolio
- **Tackle ground-breaking interdisciplinary research challenges that create transformational opportunities in national security**
- Steward and nurture a vibrant, problem-rich research environment

Sandia's Research Challenges

Sandia National Laboratories

Research Challenge attributes:

- Advance state-of-the-art science and engineering
- Surmount a critical path technical obstacle for a mission challenge
- Bring together a cross section of Laboratory capabilities and research foundations
- Require an interdisciplinary approach and the engagement of expertise from fundamental science to technology application
- Provide opportunities to engage with the broader research community

Current Research Challenges:

- **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 & Engineering of Quantum Information Systems
- Revolutionary Approaches to the Stockpile

Beyond Moore Computing

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Background:

Indications are that Moore's Law is breaking down. Silicon CMOS transistors are reaching their physical limits

- Power efficiency—flattening out
- Processor speed—plateauing
- Circuit density—to follow suit as feature sizes are nearing atomic scales

Three broad thrusts:

- Design and prototype new subsystems and systems, built with post-CMOS technology, for classical digital computing
- Develop and demonstrate key components for realizing alternative models, with a focus on brain-inspired computing
- Characterize emerging device technologies and evaluate their potential for future, energy-efficient HPC systems

Beyond Moore Computing (Continued)

Sandia has differentiated expertise in

- Materials science with novel device expertise
- Microelectronics and nanoelectronics
- Computer architecture
- Design of operating system software and applications codes with major national security impact

Sandia's track record:

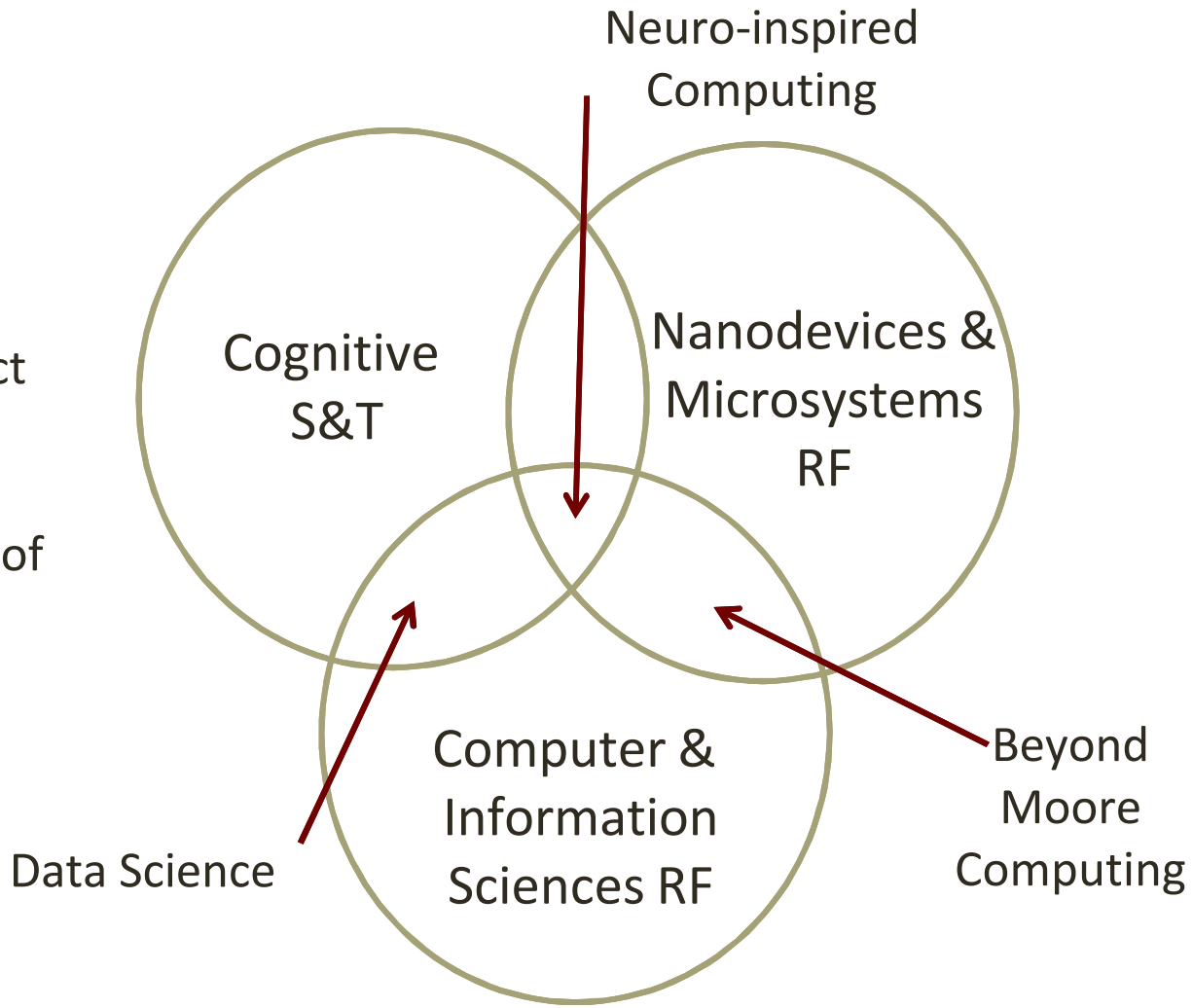
- Invented the clean room
- Adopted CMOS transistors and massively parallel processors
- Designed the Red Storm supercomputer built by Cray, Inc.

Neuro-inspired Computing at Sandia

Sandia National Laboratories

Why Sandia?

- National security impact
- Existing capability base
- Advances the frontiers of science & engineering



Charge to the Workshop

- Why would one invest in neuro-inspired / neuromorphic computing over other alternative computing technologies?
- What are the big wins?
- How long will it take to get there?
- What are the critical path objectives?