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# LDRD: Creating the Future of the Labs

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**Presented at Tri-Lab LDRD Symposium**

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Sandia National Laboratories

# Enhancing the Nation's Security While Advancing the Frontiers of Science and Engineering

## Mission Areas

Energy, Climate & Infrastructure

Nuclear Weapons

International, Homeland and Nuclear Security

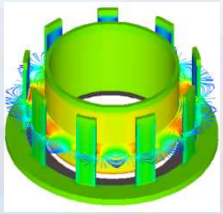
Defense Systems & Assessments

High Performance Computing & Simulation

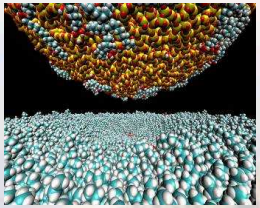
Nanotechnologies and Microsystems

Extreme Environments

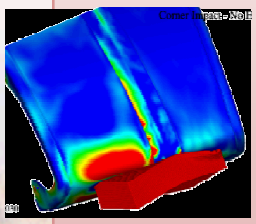
Computer Science



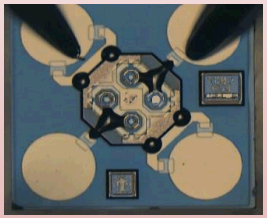
Materials



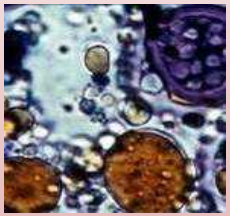
Engineering Sciences



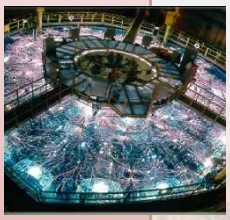
Micro Systems



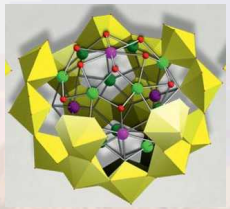
Bioscience



Pulsed Power



Geoscience



Combustion Chemistry


**Mission delivery while advancing the frontiers of science and engineering.**

Sandia National Laboratories

# What Do We Mean by "National Security"

- **Sandia is a multidisciplinary national security laboratory that develops technologies to:**
  - Sustain and modernize the nuclear deterrent,
  - Prevent the spread of weapons of mass destruction,
  - Protect the national infrastructure,
  - Defend the nation against terrorist threats,
  - Provide new capabilities to the armed forces, and
  - Ensure the stability of the nation's energy and water supplies.


**Sandia's science, technology, and engineering help ensure that the nation maintains technological superiority and preparedness, which are critical to national defense, homeland security, and the nation's economic well-being.**

# Investments in ST&E are made across the spectrum

Office of Science

NNSA

NIH

BES

DOE/Energy

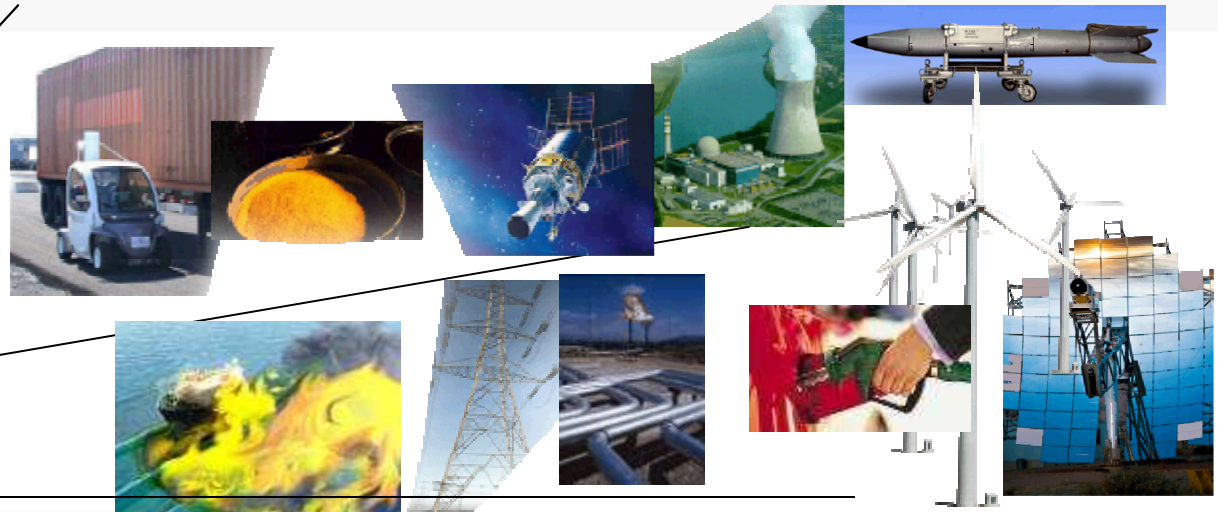
DoD/Research

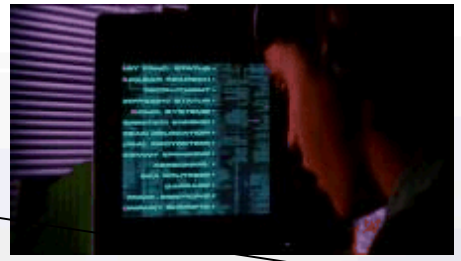
DHS

DARPA

Other Government Agencies

LDRD



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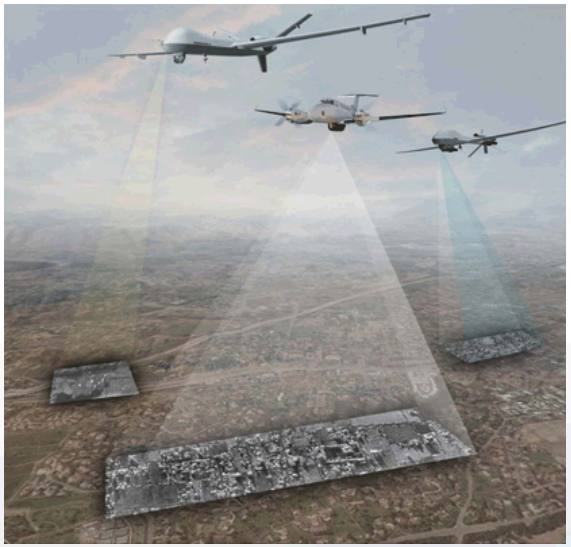
# Advancing the Frontiers of Science and Technology for Nuclear Security

- Stockpile maintenance and modernization for improved surety
- Weapons and materials security
- Missile warning and defense
- Counterintelligence and large datasets
- Proliferation sensing and verification
- Nuclear waste reprocessing


# Example LDRD Contributions to Nuclear Security

- **Synthetic Aperture Radar (SAR) – 6 projects over 10 years**



## Mission Delivery

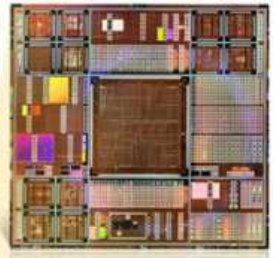
- High resolution imagery, day or night in any weather, for treaty verification and nonproliferation

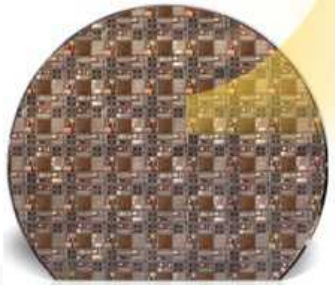
## Advancing the Frontiers of Science and Engineering

- Ultra-miniaturized radar circuitry, video-radar, moving target imaging, and 3-D SAR

# Example LDRD Contributions to Nuclear Security (cont.)

- **Rad Hard Electronics – 6 projects over 10 years**





Mission Delivery

- Forms the basis for ASICs produced for stockpile needs and nonproliferation

Advancing the Frontiers of Science and Engineering

- First mega-rad-hard, scalable integrated circuit

# Example LDRD Contributions to Nuclear Security (cont.)

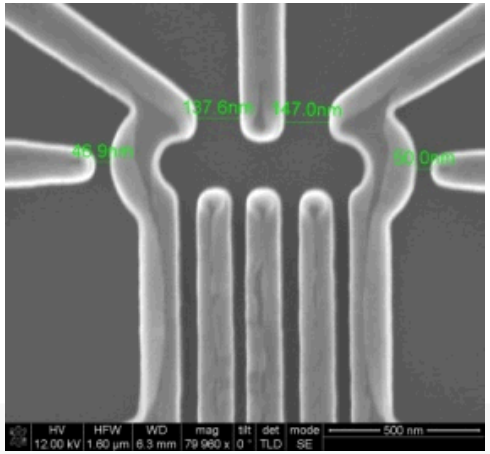
- **Quantum Information Processing (QIP) – 5 projects over 7 years**

  Mission Delivery

  - Information security and exponentially faster information processing

  Advancing the Frontiers of Science and Engineering

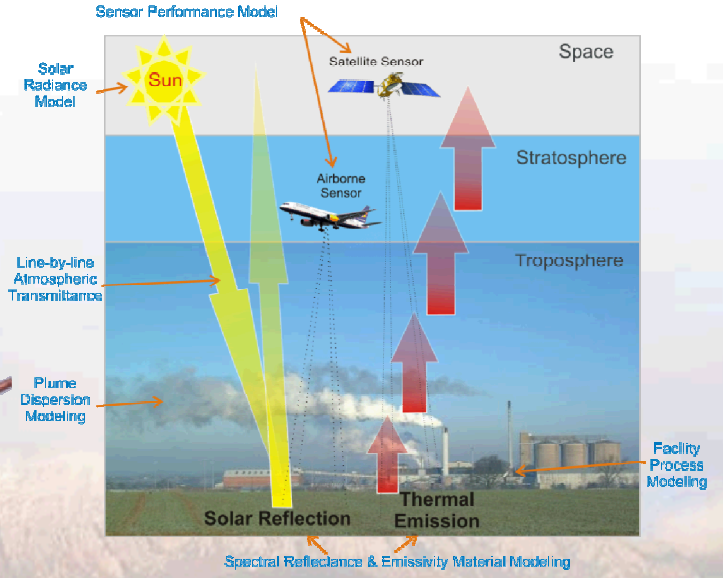
  - Silicon-based solid-state quantum bits (qubits)and trapped-ion quantum computation




**Silicon Double Quantum Dot**

# Example LDRD Contributions to Nuclear Security (cont.)

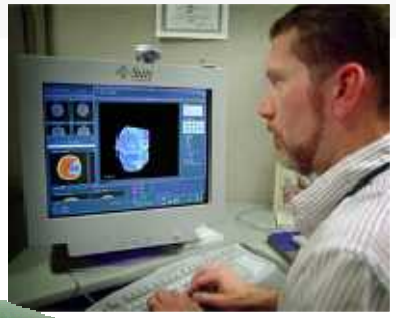
- **Specific Projects you can learn more about today**
  - Remote Sensing of Green House Gases
  - Field and Charge Penetration by Lightning Burnthrough
  - Hydrogen and Deformation/Fracture of Aluminum Alloys
  - MEMS-Based Sensor Coatings for Enhanced Surveillance
  - Modern Nuclear Waste Reprocessing
  - Lubrication for Very Small Mechanisms
  - Surface Mounted Neutron Generators

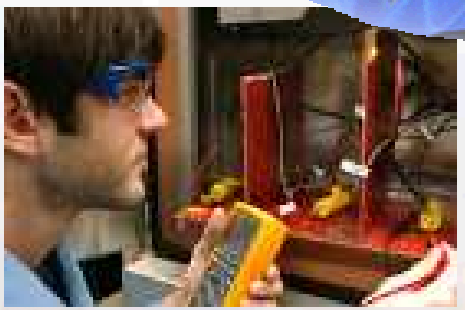



Sandia National Laboratories

# LDRD Creates the Future of the Labs

- LDRD supports the Labs' emerging world class research community
- LDRD projects represent the best innovation in science and technology at the Labs
- Through LDRD, the Labs advance the frontiers of science and technology for mission delivery





# Backup

# Sandia's LDRD Investment Areas

Energy, Climate & Infrastructure

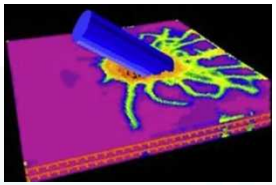
International, Homeland and Nuclear Security

Nuclear Weapons

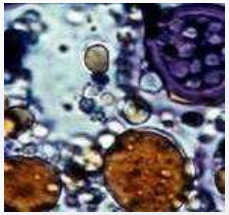
Defense Systems & Assessments

## Mission Technologies

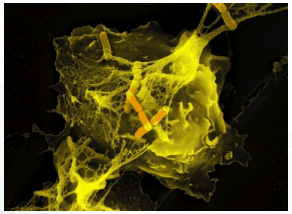
Nanoscience to Microsystems



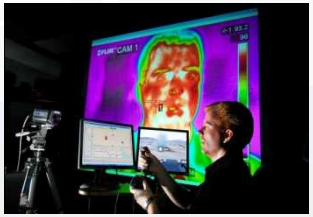
Predictive Simulation



Bio Fuels

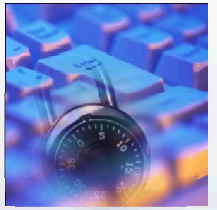


Bio Defense



Cognition

Extreme Environments



Cyber Security

## ST&E Foundations

Early Career R&D