> "I found my life's work when I figured out that I could combine being a scientist with protecting this nation."
>
> Paula Cable-Dunlap,
> Nuclear Forensics Chemist

The Science behind National Security

Oak Ridge National Laboratory (ORNL) is a global leader in science-based solutions for complex security threats that put public safety, national defense, and the economy at risk. Through a multidisciplinary approach, ORNL applies signature strengths in nuclear science, high-performance computing (HPC), energy, advanced materials and processing, neutron science, and other areas to enduring and emerging threats to national security. The results are state-of-the-art technological solutions, critical scientific input to decision makers, and vital training for federal agencies and international partners.

Exploiting Basic and Applied Sciences to Counter WMDs

One of ORNL's primary contributions to global nuclear security is its basic and applied nuclear research. The Lab fulfills an international role in advancing scientific and technical capabilities to detect illicit nuclear activities, secure fissile and radiological materials, and counter the threat of weapons of mass destruction (WMDs).

- **Forensic sciences**—ORNL's forensic experts analyze high-risk materials to identify sources, track transit routes, and provide evidence for attribution.
- **Nuclear fuel cycles**—ORNL has unparalleled facilities, resources, and expertise in understanding nuclear fuel cycles.
- **Safeguards and protection**—ORNL develops next-generation technology for safeguarding nuclear materials on site and for detecting illicit movement of sensitive materials on public roads, railroads, and waterways.

Integrating Computing, Cyber, and Energy Technologies to Protect Critical Infrastructure

The combination of world-class facilities and staff expertise in cybersecurity and energy systems enables ORNL to improve the resiliency and security of critical US infrastructure. Signature strengths include robust power systems design, reliability engineering, and cybersecurity for physical systems. The Lab's software and hardware advances allow rapid vulnerability discovery that enables utilities to defend against emerging and previously unseen threats, including both cyberattacks and extreme events.

30%
Of ORNL staff engaged in national security work

8
Major federal departments that support ORNL national security work

84
Countries where ORNL enhances nuclear nonproliferation

$275 million
In 2018 national security work

OAK RIDGE National Laboratory

U.S. DEPARTMENT OF ENERGY | Office of Science
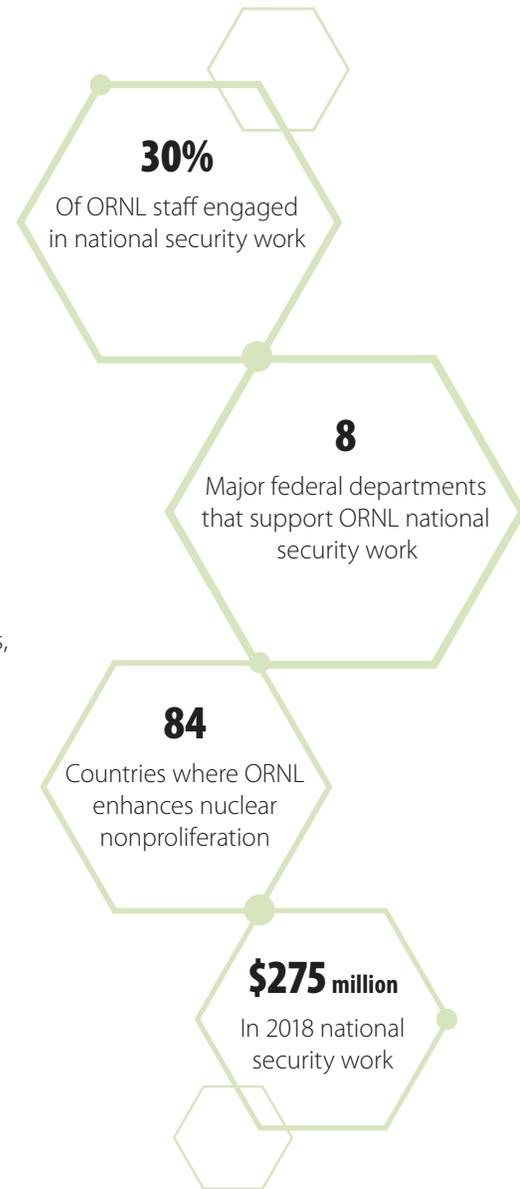
Applying Materials Science to Defense Missions

ORNL researchers apply materials science discoveries to national defense missions. One example is ORNL's breakthrough process for producing graphite foam with heat transfer capabilities, which is used to cool soldiers and their weapons in hot climates and to increase the longevity of satellite radiators. Other research has led to anticorrosion coatings and novel materials used in additive manufacturing for military applications.

Using Data Sciences to Develop Intelligence Information

ORNL applies its world-leading research and development in data science to help defense and intelligence agencies triage overwhelming volumes of data into actionable information based on in-depth analysis, often in real time. The Laboratory is home to the Extreme-Scale Systems Center, a national center of excellence in HPC infrastructure, software, and data analytics funded by the US Department of Defense.

# Applying Biometrics and Optical Sciences to Enhance Border Security

Working closely with federal agencies, ORNL researches and develops identification systems that capture biometrics such as facial features for use in homeland security missions. ORNL researchers have customized algorithms and have characterized the key challenges involved in designing the optimum optical and image-processing solutions.

Using Computational Sciences to Develop Specialized Risk Managent Tools

ORNL researchers have developed vital software applications that enable government agencies to track high-risk materials and respond more quickly to incidents.

- ORNL assists federal agencies in safeguarding and tracking high-risk nuclear and radiological materials—monitoring thousands of projects and inventories around the world, enabling proactive responses to threats before incidents occur.
- ORNL works closely with the US Department of Homeland Security to secure the nation's chemical facilities. ORNL has helped develop software to identify and safeguard high-risk chemicals from terrorist threats and better protect facilities from natural disasters.
- ORNL assists first responders in managing disasters and emergencies in real time with the Laboratory-developed all-hazards planning and situational awareness tool.

ORNL FY 2018 Expenditures

$275 MILLION National Security

$1.36 BILLION All Other
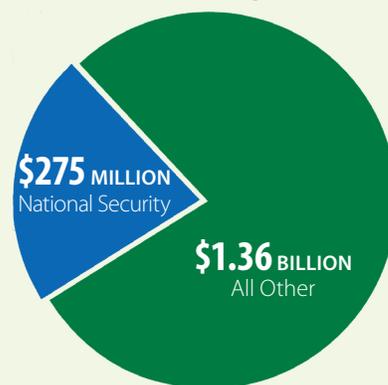
Total: $1.6 billion

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