



OAK RIDGE NATIONAL LABORATORY

National Security Sciences

From climate change and cyber attacks to nuclear proliferation and critical infrastructure vulnerabilities, the threats to America's national security continue to evolve and emerge at a rapid pace. To effectively counter those threats—and protect our nation—we must increasingly turn to science, to the technologies and innovations that underpin our defenses.

Oak Ridge National Laboratory's (ORNL's) National Security Sciences Directorate (NSSD) is rapidly advancing the science of resilience, security, and analytics to solve critical challenges in nuclear security, cybersecurity, and human security. Our world-leading researchers engage in collaboration across the Laboratory—in areas such as nuclear and chemical sciences, applied materials, advanced manufacturing, biosecurity, transportation, and supercomputing—to protect the nation today while identifying and addressing future threats.

Our Science Secures the Nation

Nuclear Nonproliferation Division—We develop and implement nuclear collection and detection technologies, advance scientific understanding of the nuclear fuel cycle, and strengthen international safeguards and nonproliferation regimes. From basic and applied research to technology development and operational tradecraft, our science enables the peaceful use of nuclear materials around the globe.

Cyber Resilience and Intelligence Division—We research innovative methods to identify, analyze, and defend against vulnerabilities in critical infrastructure—from the energy grid and manufacturing supply chains to the Internet of Things devices—while developing advanced sensors and software tools to help intelligence analysts better understand and characterize our adversaries.

Geospatial Science and Human Security Division—We integrate human dynamics, geoinformatics, data sciences, autonomous systems, and resilient communications to advance human security in communities around the world. Our research provides decision-makers with timely information on critical situations arising from geopolitical instability, natural disasters, resource scarcities, and health crises.

Field Intelligence Operations Division—We conduct, support, and oversee all classified, intelligence-related research at ORNL. Our researchers and analysts provide government officials with insights on the nuclear and uranium fuel cycles, and our operations teams sustain ORNL's classified research infrastructure to enable a wide variety of national security R&D.

"We leverage ORNL's core capabilities to deliver the full spectrum of basic science, applied research, and operational expertise needed to address our nation's most critical security challenges."

**Jennifer Niedziela, Nuclear Security Scientist,
National Security Sciences Directorate**

16

National security
research labs
and testbeds

60+

Federal partners

20

US critical
infrastructure
datasets

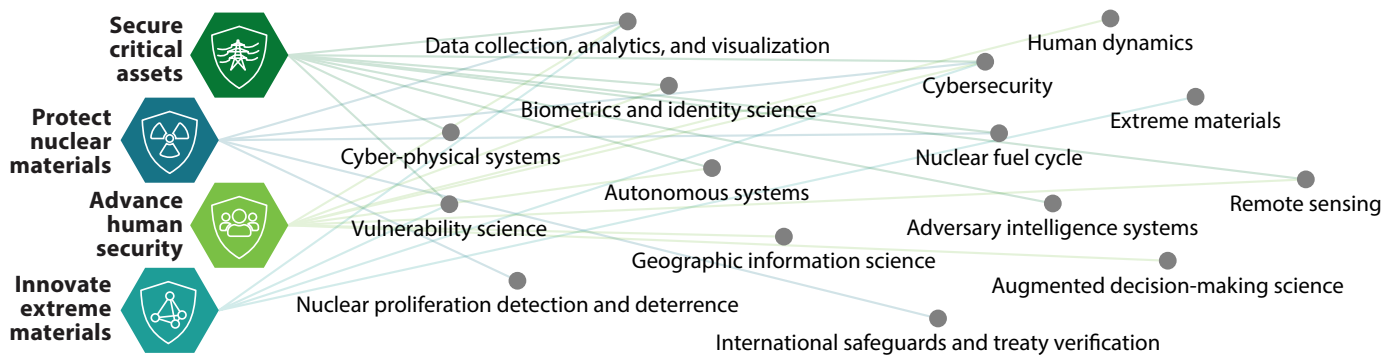
100+

Countries aided
in nuclear
nonproliferation
activities



Mission-Oriented Science and Technology

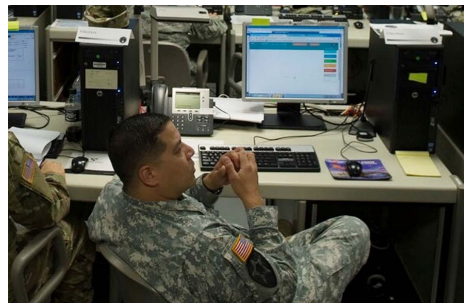
We focus our research in support of vital national security missions.



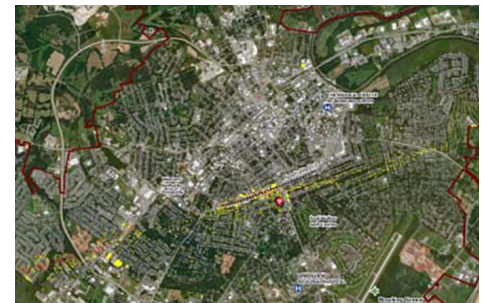
Real-World Impacts



We pioneered a data fusion approach that makes it easier to **monitor nuclear reactors for nonproliferation and safety purposes**, ensuring nuclear materials are used only for peaceful power. Our novel approach characterizes reactor power levels using a suite of external sensor modalities involving radiation, acoustic, seismic, biota, and imagery.



We're making it easier for security analysts to more quickly **monitor, identify, assess, and respond to cyberattacks on critical economic and national security systems**. Our Cyber Operations Research Range for validation of machine learning-based cyber defense methods reduces crucial analysis time from months to days.



Our data analysis, modeling, and forecasting capabilities provide **near-real-time information to support effective responses to disasters and threats**. We assisted federal agencies during the 2021 Texas power outages and when hackers disrupted the Colonial Pipeline. We also helped officials across the country understand and respond to the COVID-19 pandemic.

Multidisciplinary Solutions to Complex Challenges



The complex and increasingly sophisticated threats our nation faces require innovative, multidisciplinary solutions. NSSD's **National Security Program Office** and **Nonproliferation Program Office** collaborate with partners across ORNL to manage national security R&D projects. We leverage the Laboratory's core capabilities in materials, physical sciences, advanced manufacturing, energy, neutrons, and high-performance computing to deliver solutions to the National Nuclear Security Administration, the Intelligence Community, and the Departments of Energy, Defense, and Homeland Security.

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