



# Careers in National Security Sciences

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at Oak Ridge  
National Laboratory

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# Oak Ridge National Laboratory





## Contents

- 2 Big Science. Big Opportunities.
- 3 Building the World's Premier Research Institution
- 4 About the National Security Sciences Directorate
- 6 Securing the Nation
- 7 Lab of the Future
- 8 Community and Culture
- 9 How to Apply

AT A GLANCE

Established in  
as part of the Manhattan Project

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**1943**

**\$2.2B** annual budget

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**9** national  
user facilities

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**5,400** employees

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**3,200** visiting  
scientists

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**221** R&D 100 Awards

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**2** Nobel Prize winners

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**46** National Academy  
members

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**17** UT-ORNL Governor's Chairs

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**9** university core  
research partners

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**9** new elements discovered



## Big Science. Big Opportunities.

Oak Ridge National Laboratory (ORNL) was created to help win a war and change the world. We have always adapted to meet national needs, developing expertise, tools, and even entirely new fields to solve the most difficult scientific and technical challenges.

- **We pioneered nuclear energy, science, and engineering**, developing techniques, technologies, and training programs that led to commercialization of nuclear power and creation of the nuclear navy.
- **We produce life-saving medical isotopes** and operate the National Isotope Development Center for the Department of Energy (DOE).
- **We developed neutron diffraction**, a scientific technique available to researchers who use two of the world's most powerful neutron sources at ORNL for studies of materials, medicines, disease progression, and more.
- **We create new materials** including alloys with billion-dollar impacts on industry and unique properties that enable NASA to explore outer space.
- **We build some of the world's most powerful supercomputers**, with three No. 1 systems since 2009 and one of the world's first exascale systems, Frontier, due in 2021.
- **We printed a car** (and a house, jeep, boat ...) to study methods for improving the efficiency and productivity of manufacturing processes that give American industry a competitive edge.
- **We secure the nation** with expertise from across our research portfolio, sending teams worldwide to keep nuclear materials safe, pursuing cybersecurity for the power grid, and more.
- **We discovered the sex-determining role of the Y chromosome** and make breakthroughs in biology from genes to ecosystems, providing insights benefiting biotechnology, biosecurity, and biofuels.
- **We invented radioecology** and lead large-scale experiments in the Arctic and other remote locations.

*Join us on  
our quest to  
deliver scientific  
impact that  
changes the  
world.*

We always ask, "What's next?" We stand ready for the unexpected. Today, we are applying our expertise in several areas in the global fight against COVID-19, and we are looking to the future.





## Building the World's Premier Research Institution

National labs are distinguished by their ability to assemble large teams of experts from a variety of scientific and technical disciplines to tackle compelling national problems. They also design, build, and operate powerful scientific facilities that are available to the international research community.

From the start, ORNL has applied scientific discoveries and new technologies to address pressing challenges in the areas of clean energy and global security and to create economic opportunity for the nation. Today, Oak Ridge is the most diverse of the Department of Energy's 17 national laboratories, providing leadership in energy research and technology, advanced materials, nuclear science and engineering, neutron science, isotope production, national security, environmental and biological sciences, and high-performance computing.

Resources like these enable the US to compete in what former ORNL Director Alvin Weinberg called the arena of "Big Science" and they empower our researchers to pursue knowledge that's fundamental to solving some of our world's greatest challenges.

### **Biology and Environment**

We sequenced the poplar genome and are leveraging these data with ORNL-developed algorithms and supercomputing to engineer better bioenergy feedstocks and more climate-resilient crops.

### **Fusion and Fission**

A multidisciplinary team is printing a microreactor to help industry address high costs and lengthy deployment timelines that threaten the future of nuclear energy—the nation's largest carbon-free energy source.

### **National Security**

The Mobile Uranium Facility equips ORNL staff members to characterize, process, package, and transport uranium materials anywhere in the world. We are using our scientific capabilities to counter enduring and emerging threats to national security.

### **Materials**

We developed a new class of affordable, lightweight superalloys that can withstand temperatures almost 100 degrees Celsius hotter than existing commercial alloys in complex engine parts.

### **Clean Energy**

Our magnetic coils and power electronics enable the extreme fast charging of electric vehicles—wirelessly. ORNL's expertise also supports industry and has set standards for energy efficiency.

### **Isotopes**

We produce unique medical isotopes for life-saving treatments and diagnoses, including actinium-227, a critical material for making a highly effective prostate cancer drug.

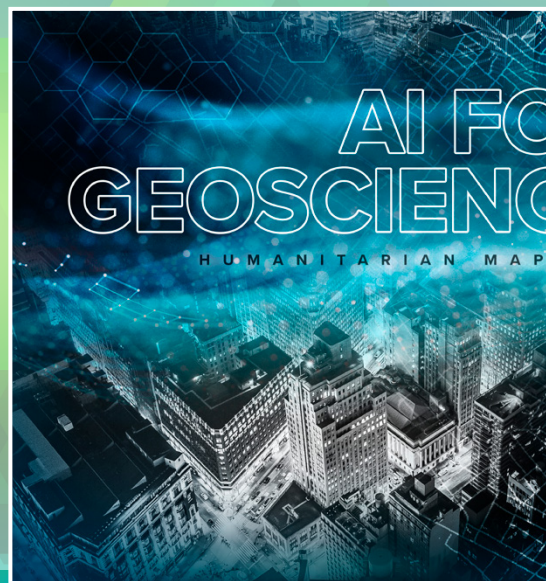
### **Neutron Science**

We use neutrons to directly observe battery behavior in pursuit of safer, more reliable energy storage and extended battery life, to study the behavior of drugs in combating disease, and much more.

### **Supercomputing**

Our scientists are cracking the code on opioid addiction using Summit, one of the world's fastest supercomputers, to perform immense calculations on genomic data. Summit provides unique multi-precision computing capabilities that are ideal for artificial intelligence and machine learning applications.





## About the National Security Sciences Directorate

The National Security Sciences Directorate (NSSD) leads scientific and technological breakthroughs to confront some of the nation's most difficult security challenges. We develop applications needed for the security of our nation today and target our vision on how these challenges may manifest themselves in a decade or more.

NSSD focuses on cybersecurity and cyber physical resiliency, data analytics, geospatial science and technology, nuclear nonproliferation, and high-performance computing for sensitive national security missions. We also enhance ORNL contributions to national security challenges by working closely with leading researchers at the lab in areas such as nuclear and chemical sciences and engineering, applied materials, advanced manufacturing, biosecurity, transportation, and computing.

Our multi-disciplinary teams are passionate about creating science-based solutions to complex security threats that put public safety, national defense, energy infrastructure, and the economy at risk. By joining with us, you gain the opportunity to be at the forefront of solving some of the most critical national security challenges facing our nation.

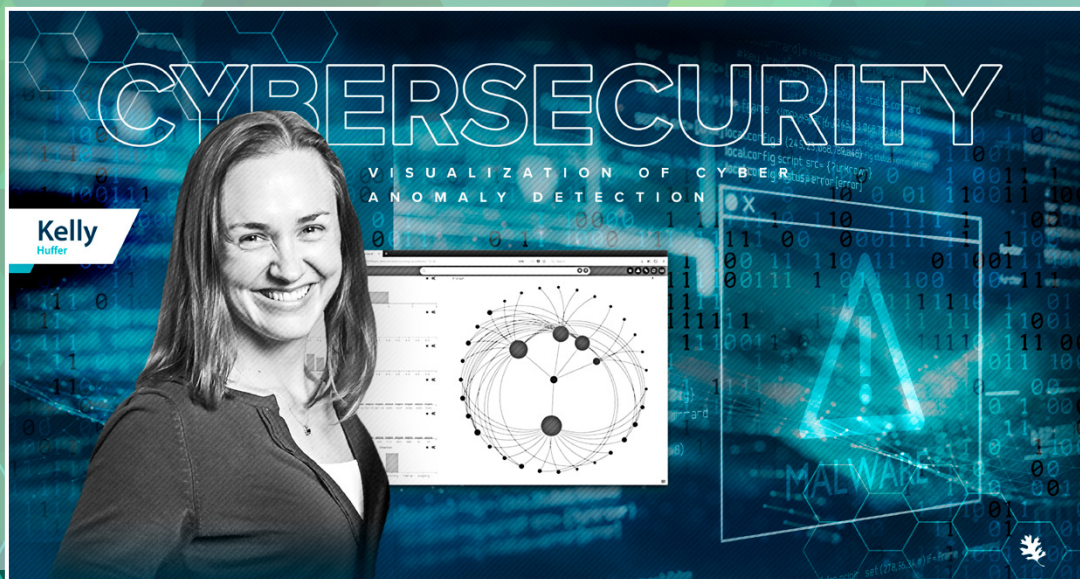
### CYBER PHYSICAL LABORATORY

Inside ORNL's Cyber Physical Laboratory (CPL), multi-disciplinary teams join together to innovate technologies, processes, and data analysis methods to ensure the resilience and security of critical infrastructure. These cybersecurity researchers, computer scientists, engineers, and mathematicians work together to advance the security of cyber physical systems by characterizing adversaries and security risks and developing mitigations for dynamic cyber threats. The CPL and the work of these teams is creating groundbreaking digital twin technology, advanced forensics, and automated vulnerability mapping capabilities for enhancing the security and resilience of the electric grid, transportation systems, manufacturing systems, and the nation's fastest supercomputer, Summit.





**Dalton**  
Lunga



**Kelly**  
Huffer

The National Security Sciences Directorate is home to scientific leadership in three critical areas:

- The **Cyber Resilience and Intelligence Division** enhances national security by advancing the resilience and security of critical cyber infrastructure, innovating advanced sensing and analytic ecosystems to characterize adversaries and security risks, and developing mitigations for dynamic cyber threats. To achieve this mission the team leverages multidisciplinary capabilities such as cyber security, computer/data science, engineering, and mathematics. We focus our research in two sections: Adversary Intelligence Systems and Resilient Complex Systems.
- The **Nuclear Nonproliferation Division** supports nonproliferation and security missions of the National Nuclear Security Administration, including development and implementation of technologies; engagements to strengthen nonproliferation regimes; and research and development to detect and monitor foreign nuclear fuel cycle and weapons development activities, movement or diversion of special nuclear material, and nuclear explosions. Our major research sections include Nuclear and Radiological Security, Proliferation Detection and Deterrence, Safeguards and Treaty Verification, and Mission Management Systems.
- The **Geospatial Science & Human Security Division** performs interdisciplinary research on how we observe, analyze, and visualize landscape and human dynamics. Utilizing data and computing at unprecedented scale, we shed light, often in near real-time, on critical situations arising from geopolitical instabilities, natural disasters, resource scarcities, and health crises that impact human safety and security.
- In addition, NSSD's **National Security Programs** work closely with researchers across the lab in nuclear and chemical sciences and engineering, applied materials, advanced manufacturing, biosecurity, transportation, and computing.

## AT A GLANCE



30% of ORNL staff engaged in national security work in 2019



\$304 million budget in 2019



21 core research groups in 2020



7 major federal departments and agencies supported in 2019



101 countries aided in nuclear nonproliferation





## Securing the Nation

Over the 75-year history of Oak Ridge National Laboratory, we have established global leadership in the sciences and technologies that underpin nuclear nonproliferation, counterproliferation, and counterterrorism. More recently we have pioneered applications based on geospatial sciences, cybersecurity, data analytics, advanced manufacturing, energy systems, and materials science to meet critical national security needs. We now seek to broaden our competencies in areas that include 5G mobile network technology, data privacy research, bias prevention in modeling, and software vulnerability science.

### Ten-Year Vision

Over the next decade we seek to become the world's premier research institution in the sciences and technologies that underpin critical national security missions. By integrating foundational national security sciences with the Laboratory's open science discoveries, we aim for groundbreaking advances in nuclear nonproliferation, cybersecurity and resilience of critical infrastructure, geospatial science, novel data and analytical technologies for national security challenges, protection of the integrity of broad-scale scientific data collection and resultant models, data-driven uncertainty- and deception-resilient synthesis and analytic frameworks for decision support, and protection against global biosecurity threats. We invite you to join us on our journey toward the scientific innovation and discovery necessary to strengthen, protect, and defend our nation.





**Hector**  
Santos-Villalobos



**Angie**  
Lousteau

## Lab of the Future

In May 2020, we launched an internal initiative to strategically expand opportunities for scientific leadership aligned with growth in key programs, mission needs, and emerging research areas. As part of the effort, ORNL's Leadership Team considered how to sustain global leadership in research and development, a relentless pursuit of operational excellence, and an inclusive environment that fosters innovation, creativity, and collaboration.

Our goal is to serve the nation as the world's premier research institution, empowering leaders and teams to pursue breakthroughs in an environment marked by operational excellence and engagement with the communities where we live and work.

### Join Us!

ORNL's research groups and sections are the building blocks of a premier research institution and will focus on the disciplines essential to our missions and to leadership in emerging fields. We're creating new, focused teams to accelerate leadership in core capabilities identified by our sponsors, partners, and research staff.

- New **Section Heads** will provide R&D leadership to groups in common thematic areas, set consistent expectations, coordinate across disciplines, and help to align the activities of groups with the vision of the directorate and the Lab as a whole.
- New **Group Leaders** will sustain individual excellence in research and development while building a group of peers who pursue global leadership and exemplify ORNL's commitment to solving some of the world's most difficult problems.

### Leadership Opportunities in National Security

- 5G mobile network technology
- Data privacy and bias prevention
- Vulnerability science
- Cybersecurity
- Cyber physical systems
- Biometrics data analytics
- Nuclear forensics
- Non-destructive analysis
- Nuclear safeguards and security
- Nuclear proliferation detection
- Geographic data science
- Human dynamics

*We're seeking  
passionate leaders who  
will help us become the  
world's premier  
research institution.*





## Community and Culture

The strong partnership between DOE and ORNL contractor UT-Battelle, LLC, has created a national resource that draws outstanding researchers in a wide range of disciplines to world-class facilities where they tackle fundamental scientific challenges, couple discoveries with applied research, and work with industry to translate results into commercial applications. The work of the laboratory is being performed safely and efficiently in a modern campus setting. Throughout the region, ORNL is regarded as a high-value asset for innovation, education, and economic development.

### Discover East Tennessee

East Tennessee offers a variety of resources and experiences ranging from mountains, rivers, lakes, and a full menu of outdoor adventures to championship college teams and minor-league baseball to the arts and culture of Knoxville, including the internationally recognized [Big Ears Festival](#). The city is recognized as one of the country's best places to live, in part thanks to its [Urban Wilderness](#) system linking residential and commercial areas with the great outdoors. ORNL is within a day's drive of 50 percent of the nation's population and all of the East Coast's major cities.

### Our Workforce

ORNL is a great place to chart your own research course, work with like-minded colleagues, and build an extraordinary career. With more than 5,400 employees representing more than 60 countries, we assemble teams of experts from diverse backgrounds, equip them with powerful instruments and research facilities, and address compelling national problems.

In addition, ORNL offers professional development training at no cost to employees, provides professional networking opportunities, and sponsors employee resource groups that support diversity and inclusion efforts across the lab.

### Diversity and Inclusion

ORNL's ability to build and sustain a highly skilled workforce in a rapidly changing competitive environment for talent is greatly influenced by our ability to plan and forecast workforce needs and promote diversity. Maintaining an inclusive environment is a business imperative that focuses on people in all areas of the laboratory and on maximizing the unique talents of individuals, teams, and business partners to pursue world-leading scientific impact.





## We Welcome Your Application

Our challenge now is to sustain our leadership and build on our success. Thank you for your interest in ORNL and how we are helping to address some of the big science challenges facing our nation and the world.

## Apply Today

Apply at [jobs.ornl.gov](https://jobs.ornl.gov)

### Equal Employment Opportunity

ORNL is an equal opportunity employer committed to a diverse and inclusive workplace that fosters collaborative scientific discovery and innovation. All qualified applicants, including individuals with disabilities and protected veterans, are encouraged to apply.





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