

# Careers in Computing & Computational Sciences

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at Oak Ridge  
National Laboratory

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# Oak Ridge National Laboratory



AT A GLANCE

Established in **1943**  
as part of the Manhattan Project

**\$2.2B** annual budget

**9** national  
user facilities

**5,400** employees

**3,200** visiting  
scientists

**221** R&D 100 Awards

**2** Nobel Prize winners

**46** National Academy  
members

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

**9** university core  
research partners

**9** new elements discovered

## Contents

- 2 Big Science. Big Opportunities.
- 3 Building the World's Premier Research Institution
- 4 About the Computing & Computational Sciences Directorate
- 6 Pioneers of Leadership Computing
- 7 Lab of the Future
- 8 Community and Culture
- 9 How to Apply



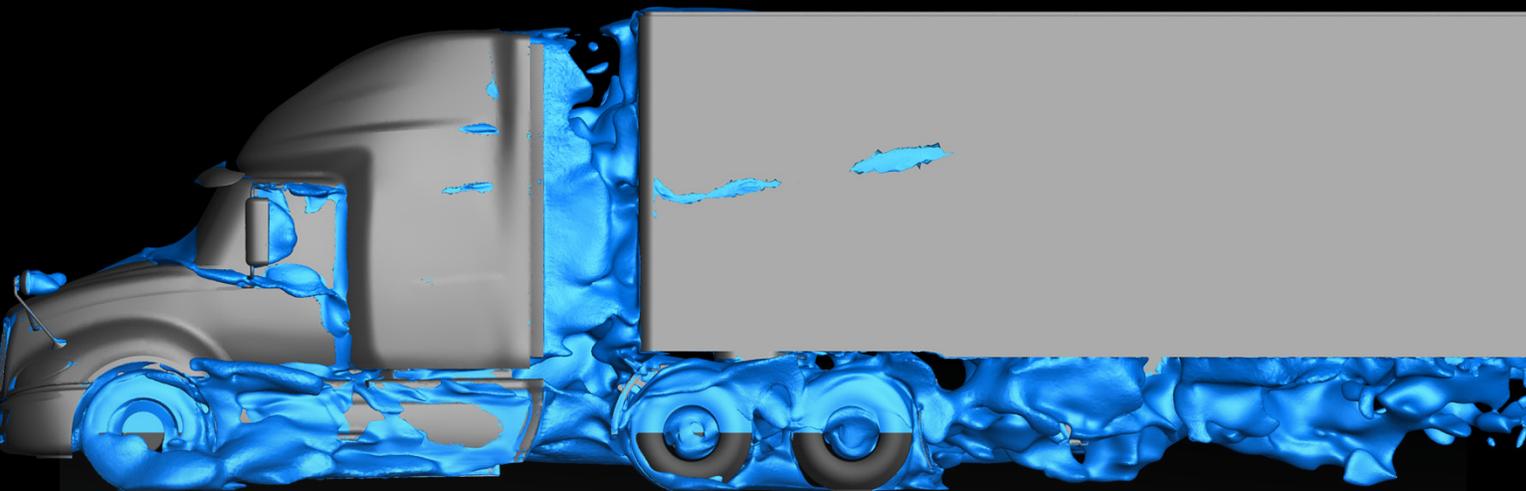
## Big Science. Big Opportunities.

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**

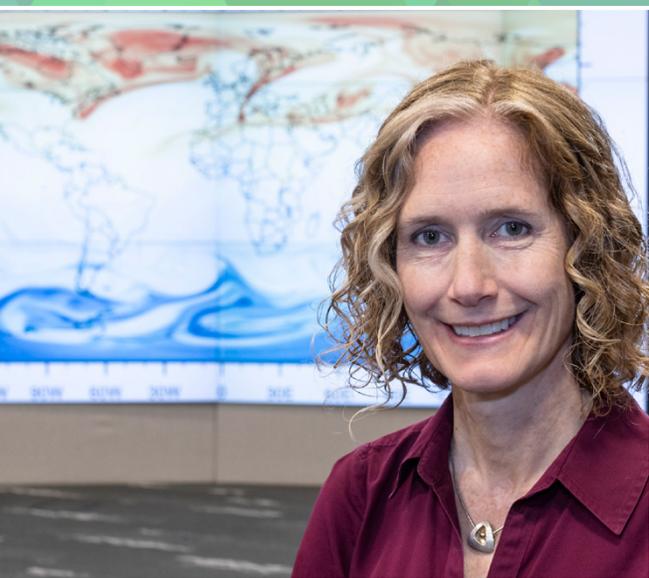
We produce unique medical isotopes for life-saving treatments and diagnoses, including actinium-227, a critical material for making a highly effective prostate cancer drug.

### **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 Computing & Computational Sciences Directorate

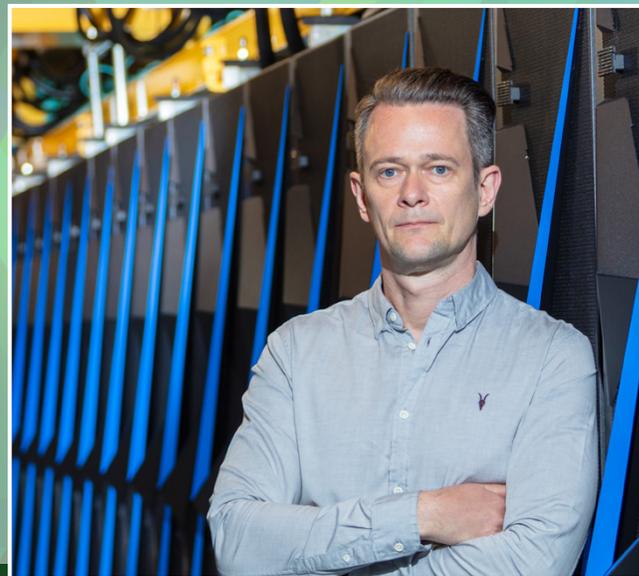
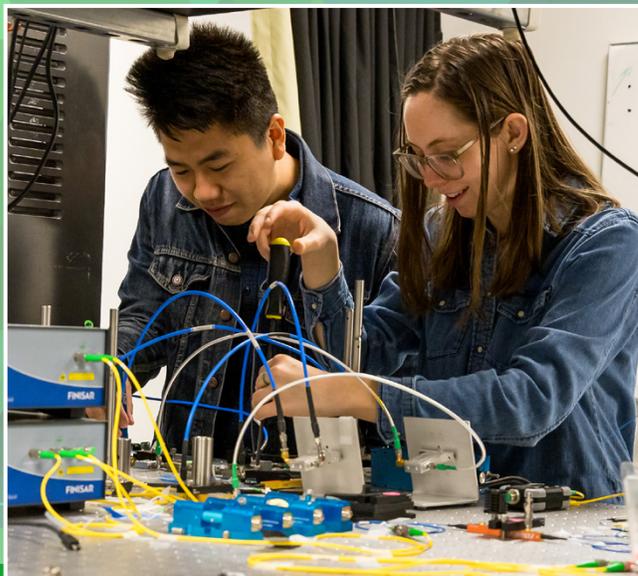
The Computing and Computational Sciences Directorate (CCSD) oversees ORNL's immense store of computing power and its talented staff of computational scientists and mathematicians, conducting state-of-the-art research and development in support of DOE's missions and programs.

The directorate stewards the Oak Ridge Leadership Computing Facility (OLCF), home to the nation's most powerful supercomputer, Summit, which enables us to address, with greater complexity and higher fidelity, questions concerning who we are, as well as our place on earth and in our universe. The OLCF will also be home to Frontier, ORNL's upcoming exascale supercomputer scheduled for delivery in 2021.

CCSD contains the institutional knowledge needed to transform basic science into cutting-edge energy and security applications critical to national interests. Our organization is committed to research and development in the data sciences, including the modeling, simulation, and analysis of rapidly growing data sources. The directorate is also a premier source for high-performance computing, applied mathematics, quantum information science, and artificial intelligence research.

### BREAKTHROUGH SCIENCE AT EVERY SCALE

Researchers from around the world use the Oak Ridge Leadership Computing Facility to solve problems so challenging they require the world's most powerful computers. OLCF's high-performance computing systems—supercomputers—coupled with the expertise of our scientific and technical staff help solve challenges in diverse fields. These challenges include improving the safety and performance of nuclear power plants, designing new materials that can revolutionize industries, and modeling the origins of the universe.



The research portfolio for Computing and Computational Sciences spans three research divisions to advance key science, technology and engineering abilities while building a competitive, world-class workforce to meet our future mission needs.

- The **Computer Science and Mathematics Division** delivers fundamental and applied research capabilities in a wide range of areas, including applied mathematics and computer science, experimental computing systems, scalable algorithms and systems, artificial intelligence and machine learning, data management, workflow systems, analysis and visualization technologies, programming systems and environments, and system science and engineering.
- The **Computational Sciences and Engineering Division** focuses on transdisciplinary computational science and analytics at scale to enable scientific discovery across the physical sciences, engineered systems, and biomedicine and health. It provides foundations and advances in quantum information sciences to enable quantum computers, devices, and networked systems. It also develops community applications, data assets, and technologies and provides assurance to build knowledge and impact in novel, crosscut science outcomes.
- The **National Center for Computational Sciences** provides state-of-the-art computational and data science infrastructure, coupled with dedicated technical and scientific professionals, to accelerate scientific discovery and engineering advances across a broad range of disciplines. NCCS hosts the Oak Ridge Leadership Computing Facility, one of DOE's National User Facilities.

## AT A GLANCE



426 staff



\$300 million budget



44 research groups



3 supercomputers (Jaguar, Titan, *Summit*) ranked No. 1 in the world at deployment



474 journal articles and conference papers in 2019



1000+ petaflops—speed of the *Frontier* exascale system coming in 2021



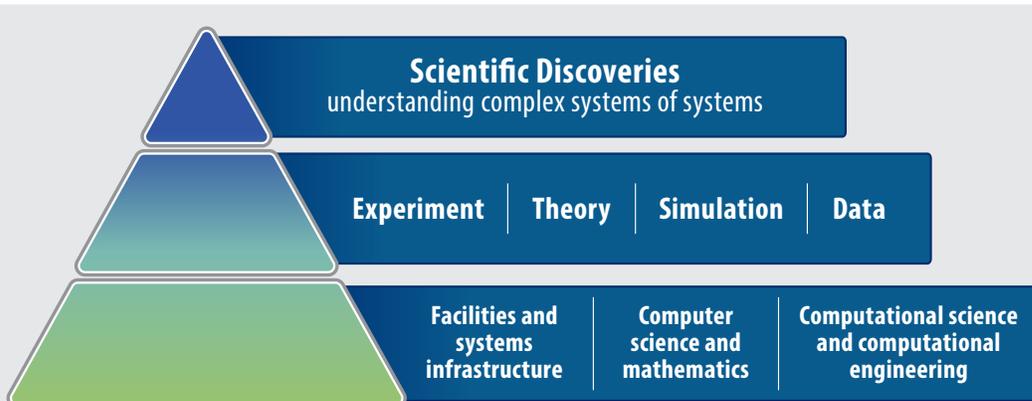
## Pioneers of Leadership Computing

We advance scientific knowledge through modeling and simulation on powerful supercomputers, the development and application of advanced data-intensive science analytics, and foundational investments in applied mathematics and computer science. Our strategy intentionally converges the four paradigms of scientific discovery: theory, experiment, data, and simulation.

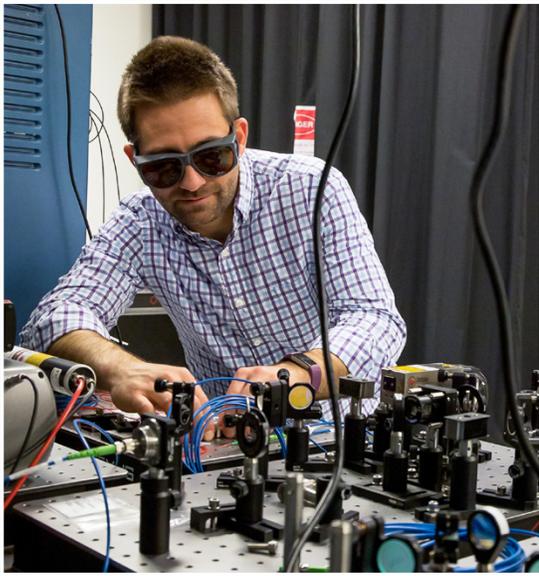
Over the past decade we have deployed three of the world's most powerful supercomputers, all ranked fastest in the world at the time of deployment. The installation of the Frontier supercomputer system will be the next step in fielding unsurpassed computational capabilities. Through the accompanying foundational research in Mathematics and Computer Science, coupled with domain science expertise, we will create applications that fully utilize our unique computational infrastructure, enabling scientific discoveries previously thought impossible.

### Ten-Year Vision

Over the next decade we will be evolving our approach to move from a system-level to an ecosystem-level—where we will maximize the convergence of theory, experiment, data and simulation. We will accelerate innovation for science and technology through advanced computing, including: mission driven advances in computer science, mathematics and computational science; AI and data science from foundations to applications; developing community applications, data assets, and technologies; and foundations and advances in quantum information sciences. Our vision of the Lab of the Future includes the R&D necessary to deploy the use of computing at the edge, federated instruments, autonomy and the Internet of Things (IOT).



*Leading the nation in using computing methodologies to accelerate innovation in science, technology and engineering*



## 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 Computing & Computational Sciences

- Advanced Computing Methods for Physical Sciences, Engineered Systems, and Health Sciences
- Mathematics in Computation
- Computing Technologies, Tools, and Systems
- Data Technologies and Data Lifecycle
- Application of Advanced HPC Technologies to Science and Engineering
- Quantum Information Science
- Artificial Intelligence
- HPC Systems and Operations R&D

*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](http://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.

## CONTACT

Gary Worrell  
Director, Talent Acquisition  
worrellgs@ornl.gov  
1 Bethel Valley Road  
Oak Ridge, TN 37831  
jobs.ornl.gov

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