OAK RIDGE NATIONAL LABORATORY

Solving Big Problems

Oak Ridge National Laboratory (ORNL) delivers scientific discoveries and technical breakthroughs needed to realize solutions in energy and national security and provide economic benefit to the nation. We address national needs through impactful research and world-leading research centers. Our wide range of partnerships with other US Department of Energy (DOE) laboratories and programs, universities, and industry allows us to pair our strengths with others for outstanding contributions to science.

Conducting R&D with Impact

ORNL researchers apply unique facilities, sophisticated tools, and signature strengths in neutron science, high-performance computing, advanced materials, biology and environmental science, nuclear science and engineering, isotopes, and national security research to benefit science and society, making it possible for us to:

- Advance understanding, design, and use of new materials and chemical processes
- Reveal unmatched insights through computing and data
- Ensure safe, clean nuclear power and secure nuclear materials
- Produce rare isotopes for medicine, industry, security, research, and space exploration
- Increase and exploit understanding of biological and environmental systems, from genes to ecosystems

Addressing National Needs

Established in 1943 as part of the Manhattan Project, ORNL is building on a legacy of discovery and innovation to continually address our most urgent R&D needs.

- The Proton Power Upgrade and Second Target Station will open new frontiers in materials research at the Spallation Neutron Source
- Frontier, ORNL's exascale computer, will deliver world-leading performance in 2021
- ORNL assets are being focused on national artificial intelligence and quantum initiatives
- New materials, software, and systems for advanced manufacturing developed at ORNL are transforming nuclear energy technology
- Cybersecurity technologies developed by ORNL are improving the resilience of the nation's electric grid and other critical infrastructure
- Researchers are advancing biotechnology to convert plastics into valuable chemicals.

5,500+
Employees, representing over 60 nations

#1
World's most intense neutron source

3,200+
Guest researchers annually

#1
Nation's fastest supercomputer

2,200+
FY20 scientific journal publications

"What we do matters and makes a lasting impact on the world."

Thomas Zacharia, ***Laboratory Director***

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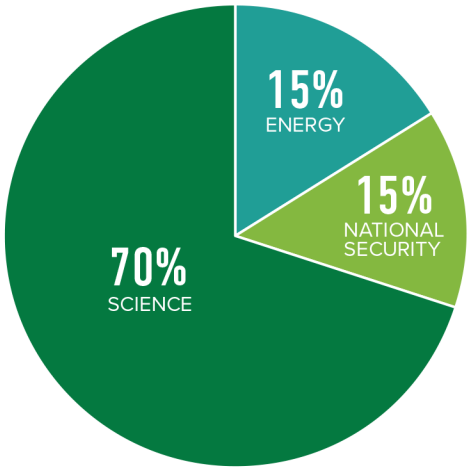
U.S. DEPARTMENT OF ENERGY | Office of Science

Recent R&D Highlights

- Using supercomputing and neutrons to create the most accurate 3D model of a major signaling protein in humans
- Inventing a cost-effective, environmentally friendly process to extract high-value rare earth elements from the scrapped magnets of used hard drives
- Harnessing the power of artificial intelligence to better match cancer patients with clinical trials
- Collaborating with Google to demonstrate the power of quantum computing
- Developing a process to convert ethanol into fuels suitable for aviation, shipping, and heavy-duty vehicles
- Restoring the nation's ability to produce plutonium-238 for deep space missions
- Applying human geography data and analytics for humanitarian, disaster response, and national security missions



Funding by DOE mission
FY20: $2.4B

225
R&D 100 Awards, more than any other national laboratory

825
US patents (2010–2020)

155
Active licenses

Partnerships and Collaborations

- Hosting the DOE/National Nuclear Security Administration Exascale Computing Project Office
- Managing US contributions to the international ITER fusion project and leading DOE's Innovation Network for Fusion Energy
- Leading the multi-institutional Center for Bioenergy Innovation, one of four DOE Bioenergy Research Centers
- Leading two DOE Energy Frontier Research Centers
- Partnering with academia to help build a robust pipeline of scientific and technical talent
- Partnering with industry to accelerate innovation
- Collaborating with other DOE laboratories and major universities on the Cybersecurity Manufacturing Innovation Institute
- Partnering with other national laboratories, universities, and industry on the National Alliance for Water Innovation, a DOE Energy–Water Desalination Hub

Major R&D Facilities

ORNL's world-class scientific user facilities are available to users from universities, industry, and other institutions.

- Building Technologies Research and Integration Center
- Carbon Fiber Technology Facility
- Center for Nanophase Materials Sciences
- Center for Structural Molecular Biology
- High Flux Isotope Reactor
- Manufacturing Demonstration Facility
- National Transportation Research Center
- Oak Ridge Leadership Computing Facility
- Spallation Neutron Source

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