Solving Big Problems

Mission: Deliver scientific discoveries and technical breakthroughs needed to realize solutions in energy and national security and provide economic benefit to the nation.

Conducting R&D with Impact
ORNL researchers apply unique facilities, sophisticated tools, and signature strengths in neutron science, high-performance computing, advanced materials, nuclear science and engineering, and isotopes to benefit science and society.

- 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.

- 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
- Cyber security technologies developed by ORNL are improving the resilience of the nation’s electric grid and other critical infrastructure

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

Thomas Zacharia, Laboratory Director
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

Partnerships and Collaborations

- Hosting the DOE/NNSA 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

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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