OAK RIDGE NATIONAL LABORATORY

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Solving the big problems

Oak Ridge National Laboratory is the largest US Department of Energy science and energy laboratory, conducting basic and applied research to deliver transformative solutions to compelling problems in energy and security.

ORNL's diverse capabilities span a broad range of scientific and engineering disciplines, enabling the Laboratory to explore fundamental science challenges and to carry out the research needed to accelerate the delivery of solutions to the marketplace. ORNL supports DOE's national missions of:

- **Scientific discovery**—We assemble teams of experts from diverse backgrounds, equip them with powerful instruments and research facilities, and address compelling national problems;
- **Clean energy**—We deliver energy technology solutions for energy-efficient buildings, transportation, and manufacturing, and we study biological, environmental, and climate systems in order to develop new biofuels and bioproducts and to explore the impacts of climate change;
- **Security**—We develop and deploy "first-of-a-kind" science-based security technologies to make the world a safer place.

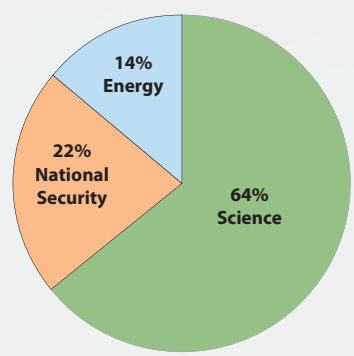
ORNL supports these missions through leadership in four major areas of science and technology:

- **Neutrons**—We operate two of the world's leading neutron sources, which enable scientists and engineers to gain new insights into materials and biological systems;
- **Computing**—We accelerate scientific discovery through modeling and simulation on powerful supercomputers, advance data-intensive science, and sustain US leadership in high-performance computing;
- **Materials**—We integrate basic and applied research to develop advanced materials for energy applications;
- **Nuclear**—We advance the scientific basis for 21st century nuclear fission and fusion technologies and systems, and we produce isotopes for research, industry, and medicine.

Inset image: Entrance to ORNL's main campus. Background image: ORNL researchers are using neutron scattering analysis and supercomputer simulations to reveal the molecular structure and workings of plant cell walls, with the goal of accelerating the development of cost-effective advanced biofuels.

Lab at a glance

- **Director:** Thomas E. Mason
- **Staff:** 4,400, including scientists and engineers in more than 100 disciplines
- **Users and visiting scientists, annually:** 3,200
- **Budget:** $1.4 billion
- **Location:** In eastern Tennessee, near Knoxville
- **Established:** 1943 as part of the Manhattan Project
- **US patents issued since 2004:** 594
- **Active licenses as of Sept. 30, 2014:** 130
- **Management and operating contractor:** UT-Battelle LLC



Composition of ORNL's research portfolio.

Contact

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ORNL is managed by UT-Battelle for the US Department of Energy

Collaborating across the nation and around the world

ORNL works with industry to move research to the marketplace and collaborates with other research institutions, universities, and the state of Tennessee to expand its capabilities, increase the availability of its facilities and expertise, and create research and educational opportunities for students and teachers.

ORNL leads two major multi-institutional partnerships: the BioEnergy Science Center (one of three DOE Bioenergy Research Centers) and the Consortium for Advanced Simulation of Light Water Reactors, a DOE Energy Innovation Hub. ORNL also hosts two DOE Energy Frontier Research Centers and manages the US contributions to ITER, the international fusion project.

Advancing science through university partnerships

ORNL partners with more than 250 universities in some capacity and includes several major Southeastern research universities on the UT-Battelle management team. Those core university partners—Duke, Florida State, Georgia Tech, North Carolina State, Vanderbilt, the University of Virginia and Virginia Tech, in addition to the University of Tennessee (UT) and Oak Ridge Associated Universities (ORAU)—ensure broad engagement of faculty and students in ORNL's science programs.

Five joint institutes under partnerships between ORNL, UT, Vanderbilt and the state of Tennessee combine distinct, complementary resources in select, high-priority scientific and engineering fields.

Joint Institute for Biological Sciences

The Joint Institute for Biological Sciences supports research in complex bioenergy and bioenvironmental systems and provides UT-ORNL faculty, staff, and students with access to state-of-the-art capability in the analysis of biological and environmental systems. It is the home of DOE's BioEnergy Science Center.

Joint Institute for Computational Sciences

The Joint Institute for Computational Sciences advances scientific discovery and state-of-the-art engineering and computational modeling and simulation. JICS takes full advantage of the petascale and beyond computers in DOE's National Center for Computational Sciences and UT's National Institute for Computational Sciences.

Joint Institute for Neutron Sciences

The Joint Institute for Neutron Sciences promotes worldwide neutron scattering collaboration among researchers in biological and life sciences, energy sciences, polymer science, condensed matter physics and computational sciences through neutron analysis at ORNL's Spallation Neutron Source and High Flux Isotope Reactor.

Joint Institute for Nuclear Physics and Applications

The Joint Institute for Nuclear Physics and Applications links ORNL, UT, and Vanderbilt University research to promote and support basic nuclear physics research and nuclear and radiological applications of common interest to the participants.

Joint Institute for Advanced Materials

The Joint Institute for Advanced Materials, located on UT's Cherokee Farm campus, promotes interdisciplinary research and education related to developing new materials with superior properties (such as greater toughness and high-temperature strength) or those that can be tailored to support new technologies (such as pocket-sized supercomputers).

Governor's Chairs

The Governor's Chair program attracts exceptionally talented, internationally recognized research scientists and engineers to joint appointments as ORNL distinguished research staff and tenured UT professors. Initiated by former Tennessee Governor Phil Bredesen, the program takes advantage of the synergy between the nation's leading multipurpose national laboratory and the state's flagship university.

Bredesen Center for Interdisciplinary Research and Graduate Education

Positioned at the college level within the University of Tennessee-Knoxville, the Bredesen Center's interdisciplinary Energy Science and Engineering Ph.D. program focuses on challenges such as clean and affordable energy, environmental sustainability, climate change, materials for extreme environments, and nuclear nonproliferation. Students are also trained in entrepreneurship and policymaking to ensure they develop concrete strategies to deploy their discoveries in the real world. More than 100 students have been enrolled since the program began in Fall 2011, and in Fall 2014 the **GO! (Graduate Opportunities)** program began expanding the model to other universities.

Providing the scientific community with access to unique research facilities

Nine of ORNL's major facilities are available to visiting scientists and engineers from around the world. Several thousand researchers come to Oak Ridge each year to conduct experiments with the support of ORNL R&D staff.

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