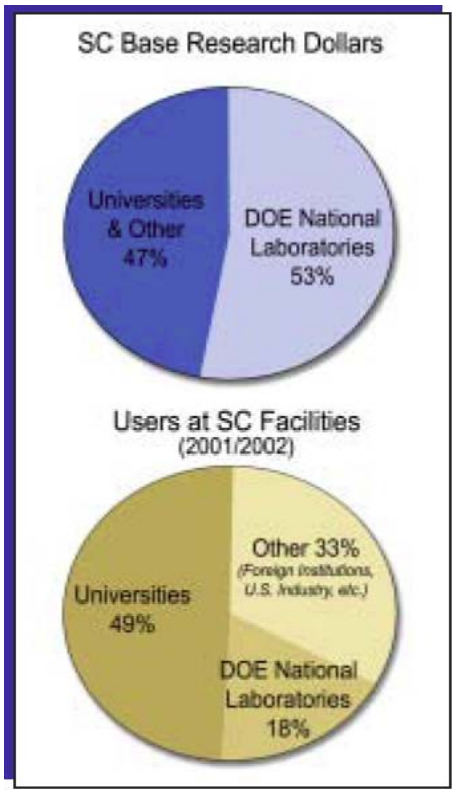
Science at the U.S. Department of Energy

Steward of World Class National Laboratories

Science at the U.S. Department of Energy

The U.S. Department of Energy's Office of Science is the single largest supporter of basic research in the physical sciences in the United States, providing more than 40 percent of total funding for this vital area of national importance. It oversees – and is the principal federal funding agency of – the Nation's research programs in high-energy physics, nuclear physics, and fusion energy sciences.

The Office of Science manages fundamental research programs in basic energy sciences, biological and environmental sciences, and computational science. In addition, the Office of Science is the federal government's largest single funder of materials and chemical sciences, and it supports unique and vital parts of U.S. research in climate change, geophysics, genomics, life sciences, and science education.



The Office of Science manages this research portfolio through six interdisciplinary program offices: Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research, Fusion Energy Sciences, and High Energy Physics, and Nuclear Physics. In addition, the Office of Science sponsors a range of science education initiatives through its Workforce Development for Teachers and Scientists program.

The Office of Science makes extensive use of peer review and federal advisory committees to develop general directions for research investments, to identify priorities, and to determine the very best scientific proposals to support.

The Office of Science is a principal supporter of graduate students and postdoctoral researchers early in their careers. About 50 percent of its research funding goes to support research at 250 colleges, universities, and institutes nationwide.

The Office of Science also reaches out to America's youth in grades K-12 and their teachers to help improve students' knowledge of science and mathematics and their understanding of global energy and environmental challenges.

Steward of 10 National Laboratories

The Department of Energy's Office of Science is the steward of 10 world-class laboratories, which often are called the "crown jewels" of our national research infrastructure. The national laboratory system, created over a half-century ago, is the most comprehensive research system of its kind in the world.

These laboratories perform research and development that is not well suited to university or private sector research facilities because of its scope, infrastructure, or multidisciplinary nature, but for which there is a strong public and national purpose.

A high level of collaboration among all of the national laboratories in the use of world-class scientific equipment and supercomputers, facilities, and multidisciplinary teams of scientists increases their collective contribution to DOE and the Nation, making the laboratory system more valuable as a whole than as the sum of its parts.

Five of the Office of Science national laboratories are multi-program facilities:

- Argonne National Laboratory
- Brookhaven National Laboratory
- Lawrence Berkeley National Laboratory
- Oak Ridge National Laboratory
- Pacific Northwest National Laboratory.

The other five Office of Science national laboratories are single-program facilities:

- Ames Laboratory
- Fermi National Accelerator Laboratory
- Thomas Jefferson National Accelerator Facility
- Princeton Plasma Physics Laboratory
- Stanford Linear Accelerator Center.

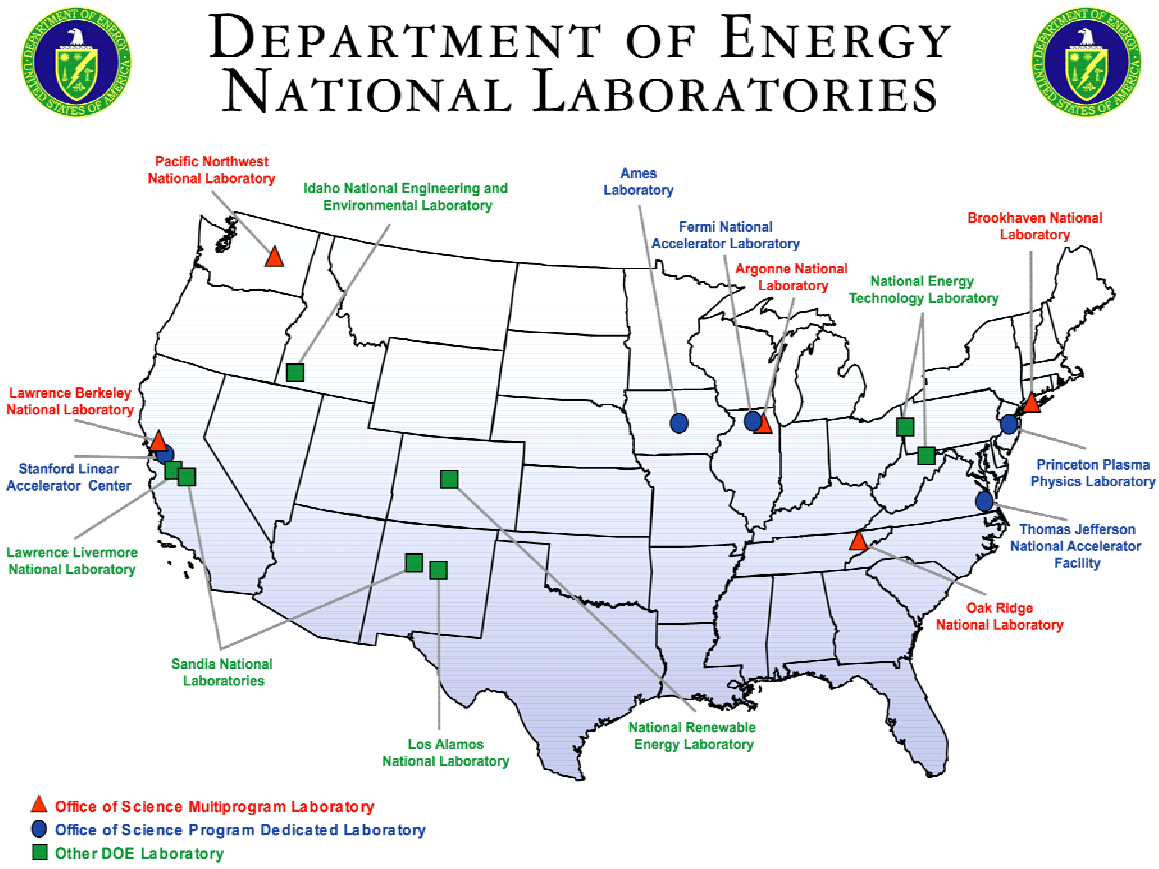
The Office of Science also funds research and development projects conducted at these additional national laboratories, which are overseen by other DOE offices:

- Idaho Engineering and Environmental Laboratory (DOE's Office of Nuclear Energy, Science and Technology)
- Lawrence Livermore National Laboratory (DOE's National Nuclear Security Administration)
- Los Alamos National Laboratory (DOE's National Nuclear Security Administration)
- National Energy Technology Laboratory (DOE's Office of Fossil Energy)
- National Renewable Energy Laboratory (DOE's Office of Energy Efficiency and Renewable Energy)
- Sandia National Laboratory (DOE's National Nuclear Security Administration).

User Facilities

The Office of Science also oversees the construction and operation of some of the Nation's most advanced research and development user facilities, located at these national laboratories and universities.

These state-of-the-art facilities are shared with the science community worldwide and contain some technologies and instrumentation that are available nowhere else. They include particle and nuclear physics accelerators, synchrotron light sources, neutron scattering facilities, supercomputers, and high-speed computer networks. Each year, these facilities are used by more than 19,000 researchers from universities, other government agencies, and private industry.



National Laboratories Map: The 10 Office of Science national laboratories are labeled in blue and red. National laboratories overseen by other Department of Energy offices that also conduct Office of Science research and development projects are labeled in green.

Argonne National Laboratory is operated by the University of Chicago as part of the U.S. Department of Energy's national laboratory system. ANL scientists conduct basic and applied scientific research across a wide spectrum of disciplines, ranging from high-energy physics to climatology and biotechnology. Since 1990, Argonne has worked with more than 600 companies and numerous federal agencies and other organizations to help advance America's scientific leadership and prepare the nation for the future.

ANL was founded in 1943 when Enrico Fermi and his staff moved Chicago Pile One (CP1) from the University of Chicago to "Site A" near Palos Hills, Illinois, and reassembled it as CP2. ANL was designated the nation's first national laboratory in 1946. ANL has 4,000 employees, including 1,400 scientists and engineers, and a budget of about $475 million. ANL is located on two sites: One is 25 miles southwest of downtown Chicago, Illinois, and the other is 35 miles west of Idaho Falls, Idaho.

Multiprogram National Laboratory

ANL's wide-ranging research advances all Office of Science program areas plus energy, environment, and national security.

Mission

ANL's mission is to serve DOE and national security by advancing the frontiers of knowledge; creating and operating forefront scientific user facilities; and providing innovative and effective solutions to energy, environmental, and security challenges to national and global wellbeing.

Core Competencies

- Fundamental science and engineering expertise in materials sciences; chemistry; atomic, high-energy and nuclear physics; multidisciplinary nanoscience and nanotechnology; structural biology, functional genomics, and bioinformatics; environmental science and technology; and applied mathematics and computer science.
- Design, construction, and operation of accelerator-based user facilities the enable world-class research.
- Design, development, and evaluation of advanced nuclear energy systems and proliferation-resistant nuclear fuel cycle technologies for a safe, environmentally sound energy future.

Major User Facilities

Advanced Photon Source, DOE's brightest hard x-ray source for multidisciplinary research.

Argonne Tandem-Linac Accelerator System, an important tool for research in

nuclear physics and astrophysics.
Intense Pulsed Neutron Source, a workhorse of the international neutron-scattering community.

During fiscal year 2002, these three facilities served more than 2,300 users from universities, national labs, industry, and other research institutions.

Recent Scientific Achievements

- Development of novel techniques for self-assembly of nanoscale two-dimensional networks, one-dimensional nanowires and nanotubes, and zero-dimensional nanodots of many materials including superconductors, magnets, metals, and semiconductors; and for linking nanostructures to biological molecules.
- The Globus Toolkit, a collection of software services and libraries that are the basis of collaborative science and engineering projects worldwide.
- Determination of the structures of 235 proteins at the Advanced Photon Source over the last few years. These include edema factor, one of the molecules that enable anthrax bacteria to cause disease in humans.

Awards

ANL has been home to winners of:

- one Nobel Prize
- two Fermi Awards
- nine Lawrence Awards
- 82 R&D 100 Awards

Operated by Brookhaven Science Associates for the U.S. Department of Energy, Brookhaven National Laboratory's broad mission is to produce excellent science and advanced technology in a safe, environmentally sound manner with the cooperation, support, and appropriate involvement of its many communities. BNL employs 3,000 scientists, engineers, technicians, and support staff and hosts more than 4,000 guest researchers annually. The laboratory operates on an annual budget of approximately $435 million. BNL is located in New York, in Upton on Long Island.

Multiprogram National Laboratory

DOE's Office of Science provides about 70 percent of BNL's funding. The majority of BNL's research programs fall within various program offices within the Office of Science, as follows:

- Office of High Energy and Nuclear Physics: Includes support for the operation of the Relativistic Heavy Ion Collider, Alternating Gradient Synchrotron, and Accelerator Test Facility.
- Office of Basic Energy Sciences: Includes support for the operation of the National Synchrotron Light Source and research on nanotechnology, catalysis, and condensed matter physics.
- Office of Biological and Environmental Research: Includes support for medical imaging studies, medical isotope development and production, structural biology, and molecular genetics.

Mission

BNL supports DOE's strategic missions in carrying out basic and applied research in long-term programs at the frontiers of science.

Core Competencies

- Design, engineering, and operation of accelerators, detectors, and superconducting magnets.
- The physics of energy and matter, the chemistry and physics of materials and condensed matters, chemical energy sciences, bio-medical and imaging sciences, energy and environmental sciences and technologies, and systems analysis and modeling.

Major User Facilities

Relativistic Heavy Ion Collider, the world's newest accelerator for nuclear physics.
National Synchrotron Light Source, which provides researchers with intense light spanning the electromagnetic spectrum from the infrared through x-rays.
Alternating Gradient Synchrotron, home of three Nobels and pivotal physics discoveries.
Scanning Transmission Electron Microscope, used to reveal the structure and function of proteins, nucleic acids, and other macromolecules, and to image single heavy atoms.

Accelerator Test Facility, the U.S. proving ground for new concepts in accelerator physics. **Booster Applications Facility**, designed to use heavy ion beams for space radiation studies. **Center for Functional Nanomaterials**, scheduled for construction starting in 2005, will provide researchers with state-of-the-art capabilities to fabricate and study nanoscale materials.

Recent Scientific Achievements

- 2003 Nobel Prize in chemistry awarded to biophysicist Roderick MacKinnon, M.D., for structural and mechanistic studies of ion channels
- 2002 Nobel Prize in physics given to chemist Raymond Davis Jr. for solar neutrino research
- Tantalizing hints that the Relative Heavy Ion Collider is producing the kind of hot, dense matter it was designed to create.
- Brain imaging studies that have gained international recognition.
- Development of strains of bacteria able to live in harsh environments while digesting potentially harmful pollutants found in coal and oil, yielding more efficient, cleaner-burning fuels.

Awards

BNL researchers have won:

- six Nobel Prizes
- the 1985 and 2001 National Medal of Science, and the 1991 and 2000 Wolf Prize
- the 1986, 1987, 1988, and 2003 Fermi Award
- more than 10 Lawrence Awards
- many R&D 100 Awards.

Lawrence Berkeley National Laboratory, managed by the University of California and funded mostly by the U.S. Department of Energy's Office of Science, has been a leader in science and engineering research for more than 70 years. LBNL was founded in 1931 by Ernest O. Lawrence, whose invention of the cyclotron opened the door to the age of particle physics. It is one of the oldest of the national laboratories. LBNL has a budget of approximately $480 million, with a staff of about 4,300, including 1,000 University of California-Berkeley students. LBNL is located in Berkeley, California.

Multiprogram National Laboratory

LBNL is a multiprogram DOE research institute that receives most of its funding from the Office of Science in the following programs: Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research, Fusion Energy Sciences, High Energy Physics, and Nuclear Physics. LBNL also is funded by DOE's Office of Energy Efficiency and Renewable Energy; Office of Civilian Radioactive Management; Office of Fossil Energy; Office of Environment, Safety and Health; and Office of Nonproliferation and National Security.

Mission

LBNL's mission advances four distinct goals for DOE and the nation:

- To perform leading multidisciplinary research in the computing sciences, physical sciences, energy sciences, biosciences, and general sciences in a manner that ensures employee and public safety and protection of the environment.
- To develop and operate unique national experimental facilities for qualified investigators.
- To educate and train future generations of scientists and engineers to promote national science and education goals.
- To transfer knowledge and technological innovations and to foster productive relationships among LBNL's research programs, universities, and industry in order to promote national economic competitiveness.

Core Competencies

- Computational science and engineering.
- Particle and photon beams.
- Bioscience and biotechnology.
- Characterization, synthesis, and theory of materials.
- Advanced technologies for energy supply and energy efficiency.

- Chemical dynamics, catalysis, and surface science.
- Advanced detector systems.
- Environmental assessment and remediation.

Major User Facilities

LBNL is home to four DOE national user facilities:

Advanced Light Source, a synchrotron radiation facility that generates intense light for scientific and technological research.
National Center for Electron Microscopy, a facility housing several of the world's most advanced microscopes and tools for microcharacterization of materials.
National Energy Research Scientific Computing Center, a world leader in providing high-performance computing tools and expertise that enable computational science of scale.
88-Inch Cyclotron, a variable-energy cyclotron that can produce heavy-ion beams of elements throughout the periodic table.

Recent Scientific Achievements

- Discovery of a mysterious "dark energy" that acts like an antigravity force compelling the universe to expand forever.
- Demonstration of an important link between the development of breast cancer and a network of proteins surrounding breast cells called the extracellular matrix.
- Key roles in the Sudbury Neutrino Observatory and KamLAND neutrino experiments.
- Invention of the asymmetric collider concept used as the basis for the B factory to help determine why matter supplanted antimatter in the creation of our universe.
- Development of permanent magnetic insertion devices which make third-generation synchrotron light sources such as the Advanced Light Source possible.
- Observation of hot and cold ripples in the microwave radiation afterglow of the Big Bang which are thought to be the primordial seeds from which our present-day universe grew.
- Discovery of a gene linked to high triglyceride levels and heart disease through the comparison of the mouse genome to the human genome.
- Creation of the world's smallest electrical switch consisting of a single Buckyball molecule.
- Construction of the world's strongest magnet, a niobium-tin dipole electromagnet that reached a field-strength of 14.7 Tesla or 300,000 times the strength of Earth's magnetic field.

Awards

LBNL researchers have garnered every top award in all of the scientific fields, including:

- nine Nobel Prizes
- 12 National Medals of Science
- three Fermi Awards
- 25 Lawrence Awards.

OAK RIDGE NATIONAL LABORATORY

MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

Oak Ridge National Laboratory is the U.S. Department of Energy's largest science and energy laboratory, managed by a partnership of the University of Tennessee and Battelle. ORNL is now in the midst of a $300 million building campaign to provide a modern campus for the next generation of great scientists. ORNL is also home of the soon-to-be-completed Spallation Neutron Source. ORNL was established in 1943 as part of the Manhattan Project. After World War II, isotopes from the reactor were applied to peaceful uses, including medicines and neutron analysis. Upon that groundwork, ORNL became an international center of nuclear science research and related research in the physical and life sciences. ORNL is a multipurpose, multidisciplinary science laboratory with a current budget of $1 billion, more than 3,800 employees, and approximately 3,000 guest researchers. ORNL is located in eastern Tennessee near the city of Oak Ridge.

Multiprogram National Laboratory

As a multiprogram laboratory, ORNL's funding comes from many sources, including the Office of Science and its Fusion, Basic Energy Sciences, Advanced Scientific Computing, High Energy Physics, and Nuclear Physics, and Biological and Environmental Research programs; Energy Efficiency and Renewable Energy programs along with the Fossil Energy and Nuclear Energy programs; and Environmental Management, National Security and Work for Others programs.

Mission

ORNL is an international leader in a range of scientific areas that support DOE's missions in science and technology, energy, and national security.

Core Competencies

- Neutron science
- Energy
- High-performance computing
- Complex biological systems
- Advanced materials
- National security

Major User Facilities

Buildings Technology Center, for research in energy-efficient building technologies and systems.
High Flux Isotope Reactor, which was recently upgraded for neutron research.
High Temperature Materials Laboratory, for advanced materials research.
Holifield Radioactive Ion Beam Facility, for nuclear physics and astrophysics research.
Mouse Genetics Research Facility
National Transportation Research Center, for transportation technologies research.

Recent Scientific Achievements

- Graphite Foam, a lightweight carbon-based material with superlative heat-transfer properties.
- Fluorine-17 beam, a powerful radioactive ion beam of fluorine17 providing insight into processes that occur in the cataclysmic interstellar events that have ultimately resulted in life on Earth.
- Lab on a Chip, glass microchips etched to form channels and chambers, which have been a boon to industries that must experiment with hard-to-get, expensive samples.
- RABiTS**,** ORNL's Rolling-Assisted Biaxial Textured Substrates, which is a major step toward lengths of superconducting cable.
- Super-Efficient Water Heater**,** a "drop-in" replacement for a conventional 50- or 80-gallon water heater that could cut the nation's energy use by 1 percent.

Awards

- Nobel Prizes: Clifford Shull, 1994; Eugene Wigner, 1963.
- Fermi Awards: Sheldon Datz (2000), Liane Russell (1994), Alexander Hollaender (1983), Alvin Weinberg (1980), William L. Russell (1976), Eugene P. Wigner (1963).
- R&D 100 Awards: ORNL leads the national labs in R&D 100 awards, adding four in 2003.
- Presidential Early Career Award Scientists and Engineers: Ian Maclean Anderson (2001), Vincent Cianciolo.

Pacific Northwest National Laboratory

Operated by Battelle for the U.S. Department of Energy

The Pacific Northwest National Laboratory is operated by Battelle for the U.S. Department of Energy. PNNL is managed by the DOE Office of Science, but performs work for many DOE offices as well as other government agencies. PNNL was created in 1965 to manage the government's research laboratory at DOE's Hanford Site, with the original focus on nuclear technology and the environmental and health effects of radiation. PNNL expanded into a multiprogram laboratory in the early 1980s. PNNL's 3,850 staff members deliver science-based solutions that are meeting the nation's most critical needs. PNNL's annual business volume is more than $600 million. PNNL is located in Richland, Washington.

Multiprogram National Laboratory

PNNL is a multiprogram national laboratory that delivers breakthrough science and technology to meet key national needs. PNNL also applies its capabilities to meet selected environmental, energy, health, and national security objectives; strengthen the economy; and support the education of future scientists and engineers.

Mission

PNNL's mission is to create new knowledge and deliver comprehensive solutions to meet DOE's needs in science, energy, national security, and environmental quality. Core competence in molecular-scale sciences and complementary strengths in engineering enable the advancement of fundamental knowledge in the biological, physical, and information sciences.

Core Competencies

- Chemical and molecular sciences
- Computational science and information sciences technology
- Materials science and engineered applications
- Environmental and climate science
- Environmental microbiology, geochemistry, and subsurface science
- Process science and engineering
- Nuclear science and engineering technology
- Advanced energy systems science and engineering
- Advanced scientific instrumentation

Major User Facilities

William R. Wiley Environmental Molecular Sciences Laboratory, which offers users a comprehensive collection of enabling solutions to problems in the environmental molecular sciences.

Applied Process Engineering Laboratory, an Eastern Washington technology business startup center with engineering-and manufacturing-scale space, as well as wet labs, bio labs, and electronic laboratories.

Recent Scientific Achievements

- Identification of approximately 85 percent of *Deinococcus radiodurans'* possible predicted set of proteins, the most complete protein coverage to date of any organism.
- Identification or confirmation of 490 proteins in human blood serum – nearly doubling the amount of known serum proteins.

Awards

PNNL staff has been recognized nationally and internationally for significant achievements in science and technology, receiving more than 100 awards, including:

- R&D 100 Awards
- Federal Laboratory Consortium awards
- *Discover* awards
- American Chemical Society national awards.

AMES LABORATORY

Ames Laboratory is operated for the U.S. Department of Energy's Office of Science by Iowa State University. Ames conducts research into various areas of national concern, including energy resources, high-speed computer design, environmental cleanup and restoration, and the synthesis and study of new materials. Uniquely integrated within a university environment, the laboratory stimulates creative thought and encourages scientific discovery, providing solutions to complex problems and educating tomorrow's scientific talent.

Ames Laboratory is a single-program laboratory that was founded in 1947, following work to produce purified uranium for the Manhattan Project. Ames Laboratory now pursues much broader priorities than the materials research that has given the laboratory international credibility. Responding to issues of national concern, laboratory scientists are actively involved in innovative research, science education programs, the development of applied technologies, and the quick transfer of such technologies to industry.

Ames Laboratory operates on a budget of about $30 million. With its annual payroll of approximately $15 million, the laboratory employs more than 450 full- and part-time staff, including more than 250 scientists and engineers. Graduate students make up approximately 20 percent of the work force, and another approximately 200 are non-paid associates in departments across Iowa State University. The laboratory supplies roughly 17 percent of the federal research funding received by Iowa State University. Ames Laboratory is located in Ames, Iowa, on the campus of Iowa State University.

Single-Program Laboratory

Ames Laboratory primarily conducts research that is supported by the DOE Office of Science. Ames Laboratory also is funded by the Office of Energy Efficiency and Renewable Energy; the Office of Environmental Management; the Office of Fossil Energy; and the Office of Defense Nuclear Nonproliferation.

Mission

The mission of Ames Laboratory is to conduct basic and applied research in the chemical, materials, mathematical, engineering and environmental sciences, and physics in support of DOE's mission and vision; to transfer technologies to improve industrial competitiveness; and to educate the next generation of scientists and engineers.

Core Competencies

- Advanced materials synthesis, characterization and processing
- Chemical and analytical sciences
- Computational and theoretical sciences

Recent Scientific Achievements

- Material for magnetic refrigeration that improves refrigerator efficiency by an estimated 40 percent in large-scale refrigeration units and air conditioners.
- Lead-free solder that is stronger, easier to use, stands up better in high-heat conditions, and is environmentally safe. Three licensing agreements have been signed on the lead-free solder.
- A biosensor technology that helps to determine an individual's risk of getting cancer from chemical pollutants.
- A capillary electrophoresis unit that can analyze multiple chemical samples simultaneously. This unit has applications in the pharmaceutical, genetics, medical, and forensics fields. This technology has been the basis of a spin-off business.
- The design and demonstration of photonic band gap crystals, a geometrical arrangement of dielectric materials that allows light to pass except when the frequency falls within a forbidden range. These materials would make it easier to develop numerous practical devices, including optical lasers, optical computers, and solar cells.

Major User Facilities

Materials Preparation Center (MPC) provides advanced materials to industry, university, and government research centers.

Iowa Companies Assistance Program, a specialized service of the MPC, provides technical expertise to Iowa companies.

Awards

Ames Laboratory has received fourteen R&D 100 Awards since 1984, the latest in 2001 for the multiplexed capillary electrophoresis technology. This technology was also named R&D Editor's Choice for Most Promising New Technology for 2001.

Fermi National Accelerator Laboratory is managed by Universities Research Association for the U.S. Department of Energy. It was founded in 1967 as a "truly national laboratory" where, in the words of former director and Nobel laureate Leon Lederman, particle physics researchers from across the nation and around the world would be "at home and loved." Fermilab is a program-dedicated laboratory whose mission is to advance "the understanding of the fundamental nature of matter and energy by providing leadership and resources for qualified researchers to conduct basic research at the frontiers of high energy physics and related disciplines"—the science of matter and energy, space, and time.

Fermilab was commissioned under a bill signed by President Lyndon B. Johnson on November 21, 1967. Founding Director Robert R. Wilson committed the laboratory to principles of scientific excellence, esthetic beauty, stewardship of the land, fiscal responsibility, and equality of opportunity. Universities Research Association built the laboratory, and has operated the facility under those principles since its founding. On May 11, 1974, the laboratory was renamed in honor of 1938 Nobel Prize winner Enrico Fermi, a preeminent physicist of the atomic age.

Fermilab has a staff of 2,100 and an annual budget of about $300 million. It operates the world's highest energy particle accelerator, the Tevatron, on a 6,800-acre site. Approximately 2,500 scientists from 229 universities and laboratories in 35 states and 29 countries carry out research at the "energy frontier," the highest-energy environment for discovery of particle physics in the world today. Fermilab scientists also pursue research in particle astrophysics and cosmology, exploring the convergence of the inner space of the tiniest elementary particles and the outer space of the structure, and evolution of the universe. Fermilab is located in Batavia, Illinois, about 45 miles west of Chicago.

Single-Program Laboratory

Fermilab is a single program laboratory funded by the DOE Office of Science's Office of High Energy and Nuclear Physics.

Mission

Fermilab advances the understanding of the fundamental nature of matter and energy by providing leadership and resources for qualified researchers to conduct basic research at the frontiers of high-energy physics and related disciplines.

Core Competencies

- Operation of the world's highest-energy physics user facility.
- Accelerator research, design, construction, and operation.
- Superconducting magnet research, design, and development.
- Particle detector design and operation.

- High-performance computing and networking.
- International scientific collaboration.

- Construction and management of scientific and technical projects.
- Scientific training and education.

Major User Facilities

The **Tevatron**, the world's highest-energy particle accelerator. The Tevatron creates millions of high-energy proton-antiproton collisions per second to allow physicists to study the smallest things human beings have ever seen—and their relationship to the evolution and structure of the universe.

MiniBooNE, a 65-member neutrino oscillation experiment. MiniBooNE's results will either confirm the Standard Model view of neutrino physics—or stand it on its head.

NuMI/MINOS, a long-baseline neutrino oscillation experiment, scheduled to begin operation in 2004. The MINOS neutrino detector is now under construction in the Soudan Iron Mine, half a mile underground in northern Minnesota. When the MINOS experiment begins operations, it will use a beam of neutrinos from Fermilab, more than 400 miles away, to study the phenomenon of neutrino mass. In addition, Fermilab is the host laboratory for US/CMS, the U.S. section of the Compact Muon Solenoid Collaboration that will build and operate one of two large detectors at the Large Hadron Collider at CERN. When the LHC begins operations during the next decade, experiments at the new energy frontier will provide profound new insight into the mystery of why particles have mass.

Recent Scientific Achievements

Discoveries at Fermilab during the 35 years of its history have helped to define the growing understanding of the fundamental nature of the universe and how it works. The discovery of the bottom quark in 1977 and the top quark in 1995, and the first observation of the Tau neutrino in 2000, have shaped the current picture of the basic structure of matter, known to physicists as the Standard Model of Fundamental Particles and Forces. Now the stage is set for new discoveries and new physics at the Tevatron in the months and years ahead.

Awards

- Presidential Medal of Technology, presented to four Fermilab scientists for development and construction of the Tevatron.

Jefferson Lab is managed and operated for the U.S. Department of Energy by the Southeastern Universities Research Association. It is a world-class research facility offering unique capabilities to explore and understand the subnuclear realm of quarks and gluons. Serving 2,000 users from universities and institutions worldwide, Jefferson Lab provides an electron beam of unprecedented quality, complementary particle detection systems in each of three experimental halls, and computational and theoretical support. The continuous wave, 6 billion electron volt (GeV) polarized beam is made possible through the application of radiofrequency superconductivity, a core competency that provides the basis for the lab's partnership with the Spallation Neutron Source; a proposed energy upgrade of the lab's accelerator to 12 GeV; and its record-breaking, energy-recovering Free Electron Laser. The Continuous Electron Beam Accelerator Facility (now Jefferson Lab), constructed from 1987 to 1992 for a cost of $600 million, has been delivering physics for its user community since 1995. Jefferson Lab employs 600 full-time staff and has an annual operating budget of about $73 million. Jefferson Lab is located in Newport News, Virginia.

Single-Program Laboratory

Jefferson Lab is a single program laboratory funded by the High Energy and Nuclear Physics program in DOE's Office of Science.

Core Competencies

- Delivering insights into the quark-gluon structure of nuclei, nucleons, and mesons, in particular, the strong interaction confinement regime.
- Research, development, and production of superconducting radiofrequency, energy-recovery linacs, polarized beams and related accelerator technologies, including free-electron lasers.
- Developing unique scientific/ technical tools, including computing of the scale needed to support demanding theoretical calculations (Lattice Quantum ChromoDynamics calculations).
- Applying the lab's particle detection capabilities to new types of medical instrumentation and diagnostic technology.
- Implementing innovative community outreach programs to enhance K–12 science and math education.

Recent Scientific Achievements

- Determining the transition from the nucleon region to the quark-gluon region in the deuteron.
- Determining the charge distribution of the neutron, providing further insights into Hadron structure.
- Elucidating a dramatic, unexpected difference between the charge and magnetization distribution of the proton
- Resolving the question of how strange quarks cooperate in constructing the proton through a rich, unprecedented electroweak program.

- Development and demonstration of a (comparatively) high-production, low-cost method of generating carbon nanotubes.
- Production of 20 watts of terahertz radiation with the IR Demo FEL—a high output record for this potentially very useful form of radiation.

Major User Facilities

Continuous Electron Beam Accelerator Facility, a continuous-wave, upgradeable 6 billion electron volt (6 GeV) beam capable of delivering an apolarized electron beam to three separate end stations simultaneously.

Free-Electron Laser (FEL), a superconducting radio-frequency-(srf)-based laser that has delivered 2.7 kilowatt (kW) of infrared light and provided proof of principle for srf energy-recovered linacs. The FEL is currently undergoing an upgrade that will deliver 10 kW of infrared and 1 kW of ultraviolet light.

The Princeton Plasma Physics Laboratory is managed by Princeton University for the U.S. Department of Energy. Magnetic fusion research at Princeton began in 1951 under the code name Project Matterhorn. Professor Lyman Spitzer conceived of a hot ionized gas, or plasma, being confined in a figure-eight-shaped tube by an externally generated magnetic field. He called his concept "the stellarator," and took this design before the Atomic Energy Commission. As a result of this meeting and a review of the invention, Princeton University's controlled fusion effort was born. PPPL has an annual budget of about $74 million and a staff of approximately 425. The PPPL is sited on 88 acres of Princeton University's James Forrestal Campus in Plainsboro, New Jersey.

Single-Program Laboratory

The PPPL is a single-program laboratory supported by DOE's Office of Science's Fusion Energy Sciences program.

Mission

PPPL is a collaborative national center for plasma and fusion science. Its primary mission is to develop the scientific understanding and the key innovations that will lead to an attractive fusion energy source. Associated missions include conducting world-class research along the broad frontier of plasma science and providing the highest quality of scientific education.

Core Competencies

- Experimental analysis of stability and confinement of fusion plasmas.
- Plasma theory and computational physics for fusion and other applications.
- Physics and engineering design and operation of experimental plasma fusion facilities.
- Computer engineering, including data acquisition, instrumentation, and control systems.
- Physics and technology of plasma applications to advance industrial technologies.
- Environmental, safety, and health aspects of the operation and removal of experimental fusion devices.

Major User Facilities

National Spherical Torus Experiment (NSTX), advancing knowledge for the spherical torus plasma confinement concept.
National Compact Stellarator Experiment (NCSX), a device to study a compact stellarator confinement concept, for which a preliminary design is under way. Construction is slated to begin in early 2004.
Current Drive Experiment-Upgrade (CDX-U), investigating plasma interactions with

liquid lithium for fusion reactor technology.
Magnetic Reconnection Experiment (MRX), studying the breaking and reconnection of magnetic field lines in plasmas.

Recent Scientific Achievements

- NSTX achieves its plasma current design specification (1 MA) nine months ahead of schedule.
- NSTX achieves 25 percent beta 15 months ahead of schedule. Beta relates to the economics of fusion power production.
- NSTX achieves 35 percent beta three months ahead of its original 25 percent target date.
- NSTX achieves plasma current 50 percent above design specification.
- NSTX neutral-beam system achieves heating power 40 percent above design specification.
- MRX experiments provide a comprehensive picture of driven magnetic reconnection, significantly impacting theory for both laboratory and space plasmas.
- CDX-U conducts the world's first demonstration of tokamak plasma performance improvement with large area liquid lithium plasma-facing components.
- NCSX completes successful Physics Validation and Conceptual Design Reviews.

The Stanford Linear Accelerator Center, one of the world's leading research laboratories, is operated by Stanford University for the U.S. Department of Energy. Established in 1962, SLAC has made major contributions to the understanding of the three families of matter: Quarks were discovered at SLAC by Richard Taylor, Charm particles were discovered by Burton Richter, and the Tau lepton was discovered by Martin Perl. In addition, the first American website was established at SLAC, and the BaBar collaboration is a significant contributor to our current understanding of the dominance of matter in the universe. SLAC has an operating budget of about $184 million. It employs approximately 1,300 staff members and accommodates more than 3,000 visiting scientists each year. SLAC is located west of Stanford University, 40 miles south of San Francisco in Menlo Park, California.

Single-Program Laboratory

SLAC is a DOE Office of Science laboratory. Some programs are joint initiatives with other agencies, such as the Stanford Synchrotron Radiation Laboratory, with the National Institutes of Health, and the Gamma Ray Large Areas Space Telescope, with the National Aeronautics and Space Administration.

Mission

SLAC's mission is to perform and support world-class research in high-energy physics, particle astrophysics, and disciplines using synchrotron radiation. SLAC provides accelerators, detectors, instrumentation, and support for national and international research programs in particle physics and scientific disciplines that use synchrotron radiation. SLAC advances the art of accelerators and accelerator-related technologies and devices through the development of new sources of high-energy particles and synchrotron radiation, plus new techniques for their scientific utilization. Finally, SLAC transfers practical knowledge and innovative technology to the private sector, and contributes to the education of the next generation of scientists and engineers, and to the scientific awareness of the public.

Core Competencies

- High-energy physics
- Advanced accelerator research
- Synchrotron radiation research
- Astroparticle physics
- Technology and education

Major User Facilities

- **Stanford Synchrotron Radiation Laboratory**, which provides synchrotron radiation, a name given to x-rays or light produced by electrons circulating in a storage ring at nearly the speed of light.

- **BaBar collaboration**, which consists of approximately 600 physicists and engineers from 75 institutions in 10 countries. The project includes a detector that was built at SLAC to study the millions of B mesons produced by the PEP-II storage ring.

Recent Scientific Achievements

- Measurement of sin2ba key measurement in the investigation of CP violation.

Awards

SLAC staff have been recognized nationally and internationally, receiving prestigious awards including:

- three Nobel Prizes
- multiple DOE E.O. Lawrence Awards
- numerous other awards.

The Idaho National Engineering and Environmental Laboratory serves as the "nation's leading center for nuclear energy research and development," as assigned by the Secretary of Energy. But as one of the U.S. Department of Energy's nine multiprogram labs, INEEL is also much more. From bio-energy and boron neutron capture therapy to critical infrastructure assurance research, INEEL works hand-in-hand with other DOE labs, academia, and industry to advance our collective interests in enhanced energy, environmental, and national security – through application of world-leading science.

INEEL has the distinction of being the place where the first usable amount of electricity was generated from nuclear power back in 1951. Other notable achievements from its early years include the development of the propulsion system for the Navy's first nuclear-powered submarine and the design and construction of 52 mostly first-of-their-kind nuclear reactors between 1951 and 1973. INEEL is sponsored by the DOE Office of Nuclear Energy, Science, and Technology. It leads the nation's Generation IV and Advanced Fuel Cycle research, and offers critical infrastructure assurance technology development and testbed services, specialized support for the Navy and Army, and broad support for other environmental, science, and energy security research needs. Total staff is more than 5,000, and the composite budget stands at just over $730 million. INEEL's 890-square-mile operations and testing site is located in eastern Idaho's high desert, some 200 miles east of Boise. The INEEL Research Center campus, other specialized laboratory facilities, and administrative support facilities are located in Idaho Falls.

Multiprogram National Laboratory

The major sponsors at INEEL are the DOE Offices of Environmental Management and Nuclear Energy, Science and Technology. Other offices and programs supporting work at INEEL include, but are not limited to, Energy Efficiency and Renewable Energy; Fossil Energy; Science; Defense Programs; Counterintelligence; and Environment, Safety and Health.

Mission

INEEL's mission is to strengthen U.S. national security by developing, testing, and demonstrating energy, environmental, and critical infrastructure protection science and technologies.

Core Competencies

- Processing and managing radioactive and hazardous materials
- Development, modeling, testing, and validating engineered systems and processes
- Science capabilities in subsurface geo-science and geochemistry
- Nuclear reactor design, reactor demonstration, and reactor safety

Recent Scientific Achievements

- Characterization of advanced reactor coolants.
- Development by INEEL's university partner, Washington State University, of a new epithermal neutron beam facility at the school's TRIGA research reactor.
- Development of commercially available ion simulation coding now used by multiple industries for instrument design.

Major User Facilities

Safety and Tritium Applied Research Facility is a multipurpose research and development laboratory serving the needs of the fusion community for bench-scale and engineering-scale experiments in the area of fusion energy reactors.

Geocentrifuge Research Laboratory offers a 2-meter geocentrifuge that enables more accurate modeling of a wide range of complex porous media and advances the understanding of subsurface contaminant transport.

Awards

- 28 R&D 100 Awards since 1986

Lawrence Livermore National Laboratory is managed by the University of California for the U.S. Department of Energy's National Nuclear Security Administration. LLNL is one of the world's premier scientific centers, where cutting-edge science and engineering in the interest of national security is used to break new ground in other areas of national importance, including energy, biomedicine, and environmental science.

LLNL was founded in September 1952 as a second nuclear weapons design laboratory to promote innovation in the design of the nation's nuclear stockpile through creative science and engineering. Researchers at the laboratory designed the first compact, powerful warheads for submarine-launched missiles and the first multiple independently targeted reentry vehicles for nuclear missiles. In addition, the world largest and most powerful lasers were built and operated at LLNL. LLNL employees a staff of approximately 8,900 and has an operating budget of about $1.5 billion. The programs within this laboratory are supported by a technical base of more than 1,000 Ph.D. scientists and engineers and many specialized centers of excellence. LLNL recently established a Homeland Security Organization to guide its work in counterterrorism, and this spring is anticipating "First light," the first firing of a laser to the target chamber in the National Ignition Facility LLNL is located in California's Tri-Valley region east of San Francisco.

Multiprogram National Laboratory

Primarily supported by DOE's National Nuclear Security Administration, LLNL's contribution to society ranges from advances in national security (nuclear and conventional defense) and energy (fusion power), to health (medical technologies), environment (groundwater cleanup), and national industrial competitiveness (next-generation computer chip manufacture).

Mission

LLNL's mission is to ensure national security and apply science and technology to the important issues of our time.

Core Competencies

- Physics
- Computing
- Biology
- Engineering
- National Security
- Lasers and Optics
- Chemistry and Materials Science
- Energy and Environment

Major User Facilities

National Ignition Facility is the largest, most energetic laser in the world—with 60 times more energy than any laser in existence.
Center for Applied Scientific Computing conducts collaborative scientific investigations that require the power of high-performance computers and the efficiency of modern computational methods.
Center for Microtechnology, where a broad spectrum of microtechnologies are used to develop microsystems for specific applications ranging from communications to field instrumentation to medicine.
Forensic Science Center houses a variety of state-of-the-art analytical tools ranging from gas chromatograph–mass spectrometers to ultratrace chemical and DNA techniques.
Center for Accelerator Mass Spectrometry houses the most versatile and productive accelerator mass spectrometry facility in the world. It provides an exceptionally sensitive technique for measuring concentrations of isotopes in small samples, typically less than 1 milligram, and the relative abundance of isotopes at low levels.
Site 300 Experimental Test Facility is a high-explosives firing facility.

Recent Scientific Achievements

- Development of several technologies to prevent and mitigate terrorist attacks.
- Development of a microelectrode array toward construction of an artificial retina.
- Development of the highest resolution global climate simulations to date.
- Development of a miniature glucose sensor for use in treatment of diabetes.

Awards

LLNL researchers have garnered:

- one Nobel Prize
- four Fermi Awards
- 24 Lawrence Awards
- 97 R&D 100 Awards.

Los Alamos National Laboratory is operated by the University of California for the U.S. Department of Energy's National Nuclear Security Administration. LANL is one of the largest multidisciplinary institutions in the world. Established in 1943 as a secret Manhattan Project laboratory, LANL had responsibility for developing the first nuclear weapon. During the Cold War, Los Alamos became a multidiscipline, multiprogram laboratory, applying capabilities from its original dual mission of developing nuclear weapons for national security and meeting other national and civilian security needs. LANL's workforce of more than 12,000 serves the nation by developing and applying the best science and technology to make the world a better and safer place. LANL's annual budget is approximately $2.2 billion. LANL is located in Los Alamos, New Mexico.

Multiprogram National Laboratory

LANL is a multiprogram national laboratory under DOE's National Nuclear Security Administration. LANL receives additional funding from a variety of DOE offices and other government agencies.

Mission

LANL enhances global security by ensuring the safety and reliability of the U.S. nuclear stockpile; developing technologies to reduce threats from weapons of mass destruction; and solving problems related to energy, environment, infrastructure, health, and national security concerns.

Core Competencies

- High-performance computing
- New and exotic advanced materials
- Bioscience and biotechnology
- Earth and environmental science
- Physics and theory

Major User Facilities

LANL is home to more than 50 cross-disciplinary user facilities including:

Los Alamos Neutron Science Center, the nation's most powerful source of pulsed particles.
National High Magnetic Field Laboratory, a general user facility open to all researchers, on a proposal review basis, who wish to perform experiments in high magnetic fields.

Recent Scientific Achievements

- Development of proton radiography, a powerful new technique that provides motion picture-like images of the extremely fast forces inside high-explosive detonations.
- Quantum computing and quantum cryptography breakthroughs.
- Development of improved methods for detecting beryllium sensitivity and diseases.
- Development of computer-modeled data for the origin of HIV.
- DNA forensics expertise that supported federal agencies involved in responding to anthrax attacks.

Awards

LANL researchers have won numerous awards, including:

- 89 R&D 100 Awards since 1978.
- In addition, many LANL scientists have been recognized as fellows of leading scientific societies in the United States and abroad.

The National Energy Technology Laboratory (NETL) is the only government owned and operated laboratory in the Department of Energy's national laboratory system, and is one of the largest fossil-energy research laboratories in the world. For nearly a century, NETL and its predecessor laboratories have conducted research and developed technologies to use and produce our Nation's fossil resources more safely, cleanly, and efficiently. With fossil energy providing more than 85 percent of our Nation's energy supply, NETL's work is more important today than it has ever been.

NETL has more than 1,100 employees at its four sites. In addition to conducting cutting-edge research and development on site, NETL shapes, funds, and manages contracted research in all 50 states and more than 40 foreign countries. NETL's research portfolio includes nearly 1,100 projects, with a total award value of $8 billion and private sector cost-sharing of almost $4 billion. NETL has sites in Fairbanks, Alaska; Morgantown, West Virginia; Pittsburgh, Pennsylvania; and Tulsa, Oklahoma. Together, these sites have 68 buildings and 14 major research facilities on nearly 200 acres.

Single-Program Laboratory

As the research laboratory for DOE's Office of Fossil Energy, NETL is a world leader in the development of advanced fossil-energy technologies. NETL also conducts broad-based energy and environmental research for other organizations, receiving additional funding from DOE's Offices of Energy Efficiency and Renewable Energy, Science, Energy Assurance, and Environmental Management—as well as the National Nuclear Security Administration, U.S. Department of Defense, U.S. Department of Homeland Security, and U.S. Environmental Protection Agency.

Mission

NETL's mission is to implement a science and technology development program to resolve

the environmental, supply, and reliability constraints of producing and using fossil resources. NETL supports DOE's mission to advance the national, economic, and energy security of the United States.

Core Competencies

- Expertise in the science and engineering of technologies to produce and use coal, oil, and natural gas.
- Proven capability to work effectively with the private sector to structure and implement cost-shared energy and environmental research, development, and demonstration programs leading to significant improvements in fossil-energy production and use.
- In-depth knowledge of the chemistry and physics of solid, liquid, and gaseous fuels and their transformations.

Recent Scientific Achievements

- NETL and ADA-ES have developed an award-winning activated carbon injection technology for controlling mercury emissions from power plants.
- A new high-tech, modular elevated drill rig developed with NETL assistance is now drilling for methane hydrates on Alaska's North Slope, and could reduce concerns over whether oil and gas operations impact fragile ecosystems.
- A recently completed full-scale field test at the federal Rocky Mountain Oilfield Testing Center has confirmed the capability of the NETL-funded IntelliPipe™ technology to transmit downhole data more than 200,000 times faster than technology commonly in use today.
- Strata Production Company has completed the first domestic field test of carbon sequestration technology in an abandoned oil field in Hobbs, New Mexico, with NETL's assistance.
- GE Power System's H-Class turbine, developed under NETL's Advanced Turbine Systems Program, passed start-up tests at the Baglan Bay Generating Station near Cardiff, Wales, in the United Kingdom. The advanced turbine is capable of achieving 60 percent combined-cycle efficiency and single-digit NOx emissions.

Awards

NETL is routinely recognized for its advancements in energy and environmental technology. Recent awards received by NETL employees and NETL-funded projects include:

- Three "R&D 100 Awards from *R&D* magazine in 2003.
- "Top Plants of 2003" from *Power* magazine.
- "Most Innovative Commercial Technology of the Year" from Platts Global Energy in 2003.
- "2003 Projects of the Year" from *Power Engineering* magazine.

Major User Facilities

- Gas Cleaning Process Development Unit, a large-scale site for evaluating processes and sorbents for removing contaminants from a gasification gas-product stream.
- High Pressure Water Tunnel, a unique facility which simulates deep-ocean conditions for carbon sequestration research.
- Hydrogen Testing Research Facility, a facility with unique capabilities to evaluate membranes under conditions of high temperature and pressure.
- Mercury Capture Research Facility, an important research tool to eliminate mercury emissions from power plants.
- Modular Carbon Dioxide Capture Facility, a recently completed facility for investigating carbon capture technologies.
- SimVal High Pressure Combustion Facility, a facility designed to investigate physical processes needed to model low-emission turbine combustion flames, including hydrogen.
- Turbine/Fuel-Cell Hybrid Systems Research Facility, an important facility to study interaction between fuel cells and turbines.

The National Renewable Energy Laboratory is managed for the U.S. Department of Energy by Midwest Research Institute, Battelle Memorial Institute, and Bechtel National, Inc. NREL is DOE's premier laboratory for renewable energy research and development, and a lead laboratory for energy-efficiency research and development. NREL's research capabilities fall within a range of renewable energy technologies including photovoltaic and solar thermal power, wind, alternative fuels, biomass, hydrogen, and geothermal. NREL was established by the Solar Energy Research Development and Demonstration Act of 1974 in response to the Middle Eastern oil crisis. Originally named the Solar Energy Research Institute, NREL began operating in July 1977 and was designated a DOE national laboratory in September 1991. NREL's staff of 1,100 is dedicated to advancing renewable energy and energy efficiency, and the scientific underpinnings of each. The annual budget is about $218 million. NREL is located in Golden, Colorado, which is part of the greater Denver-Boulder metropolitan area.

Single-Program Laboratory

NREL is a DOE Office of Energy Efficiency and Renewable Energy laboratory, which funds work in applied energy research and development. The DOE Office of Science's Basic Energy Sciences program funds basic research that underpins future renewable energy technologies.

Mission

NREL develops renewable energy and energy efficiency technologies and practices, advances related science and engineering, and transfers knowledge and innovations to address the nation's energy and environmental goals.

Core Competencies

- Biological sciences
- Chemical sciences
- Computational materials sciences
- Electrocatalysis
- Energy conversion and storage
- High-temperature superconductivity
- Nanoscience
- Optoelectronic technologies
- Solid-state spectroscopy
- Solid-state theory

Recent Scientific Achievements

- Fabrication of a 34 percent-efficient photovoltaic cell (III-V materials, triple junction), the first solar cell to convert more than one-third of the sun's energy it

receives into electricity.

- Organic molecular semiconductors, potentially useful as low-cost and efficient photovoltaic materials, were doped successfully and properly for the first time.
- Group III-V semiconductor quantum dots were successfully produced as colloids and as solid-state arrays, and the charge-carrier relaxation dynamics were established for the first time.

Awards

NREL's research has won:

- 35 R&D 100 Awards
- numerous honors from *R&D*, *Discover*, and *Popular Science* magazines.
- In addition, Arthur Nozik and Alex Zunger, both team leaders in NREL's Center for Basic Sciences, received individual honors. Nozik earned the 2002 Research Award of the Energy Technology Division of The Electrochemical Society; Zunger received the 2001 Rahman Award from the American Physical Society and the 2001 Bardeen Award from the Minerals, Metals, and Materials Society.

Sandia National Laboratories is a national security laboratory managed by Lockheed Martin, Corp., for the U.S. Department of Energy. Sandia's core purpose is "Helping Our Nation Secure a Peaceful and Free World Through Technology."

Sandia was created in 1945 as the ordnance design, testing, and assembly division of Los Alamos Laboratory, and soon moved to Sandia Base in Albuquerque, New Mexico, to be near an airfield and work closely with the military. In 1948, the division was renamed Sandia Laboratory and became a separate branch of Los Alamos. Both labs were born out of America's World War II atomic bomb development effort – the Manhattan Project. In 1949, President Harry Truman asked AT&T to manage Sandia as a separate laboratory, which it did for nearly 44 years until Lockheed Martin took over managing Sandia in 1993. In 1956, Sandia opened new facilities in Livermore, California, to support the nuclear weapons work of the new Lawrence Livermore Laboratory. Sandia became a national laboratory in 1979. Today, Sandia employs about 7,900 staff members and operates on a total annual budget of about $1.8 billion. The lab has two primary facilities: a large laboratory and headquarters in Albuquerque, New Mexico, and a smaller laboratory in Livermore, California.

Multiprogram National Laboratory

Sandia is a multiprogram national laboratory that works primarily for all program offices within DOE's National Nuclear Security Administration. Sandia also conducts national security work for other federal agencies, including the Department of Defense, Department of Homeland Security, and all of the following DOE Program Offices: Environmental Management, Renewable Energy, Nuclear Energy, Fossil Energy, Civilian Radioactive Waste Management, and Science.

Mission

Sandia's primary mission is to ensure the safety, security, and reliability of the U.S. nuclear arsenal. Other missions include nonproliferation and materials control, energy and critical infrastructure research and development, and developing responses to emerging national threats, including terrorism and chemical/biological warfare.

Core Competencies

- Computational and information sciences
- Microelectronics and photonics sciences
- Materials and process sciences
- Engineering sciences
- Pulsed-power sciences

Major User Facilities

Sandia has 25 user facilities available for use by approved U.S. industry, universities, academia, other laboratories, state and local governments, and the scientific community. They include:

Combustion Research Facility, which conducts a broad range of basic and applied research and development in combustion science and technology, aimed at improving the nation's ability to use and control combustion processes.
Explosives Components Facility, a state-of-the-art facility that provides a full range of chemical, material, and performance analysis capabilities for energetic materials and explosive components.
Intelligent Systems and Robotics Center, which contains the Robotic Manufacturing Science and Engineering Laboratory, a 73,000-square-foot facility built to bring together all of Sandia's robotics researchers in an environment conducive to technology transfer.
Primary Standards Facility, which develops and maintains primary standards that are traceable to national standards and calibrates and certifies customer reference standards.
Shock Technology and Applied Research Facility, a state-of-the-art facility which can provide a full range of projectile/ target interactions.

Recent Scientific Achievements

- Development of a chemical and biological decontamination formulation that is now available commercially and that the U.S. military has adopted and is stockpiling in large quantities.
- Development of a MicroChemLab for rapidly detecting biological and chemical contamination in the field.
- Development of technology to blow apart bombs without detonating them.
- Development of a blast-mitigating foam that greatly reduces the damage that can be caused by bombs if discovered before they explode.
- Development of semiconductor light-emitting diodes that could eventually replace incandescent and fluorescent lighting, saving huge amounts of electricity.
- Development of a unique back-support system to relieve lower back pain in quadriplegics and other people immobilized by reasons of health or occupation.

Awards

Sandia and its employees have received hundreds of national awards. Particularly notable are:

- seven E.O. Lawrence award winners, most recently Senior Scientist Jeffrey Brinker in 2002 for innovations in nanostructured materials
- more than 50 R&D 100 Awards since 1976
- the Presbyterian Healthcare Foundation presented to Sandia, in 2002, a special Award of Excellence recognizing the laboratory's technological advancements and unrivaled contributions to the security of well-being and the world.

Directors of U.S. Department of Energy Office of Science National Laboratories

Thomas Barton, Director
Ames Laboratory
311 TASF
Iowa State University
Ames, IA 50011
(515) 294-2770 Fax (515) 294-4456
barton@ameslab.gov
www.ameslab.gov

Hermann A. Grunder, Director
Argonne National Laboratory
9700 S. Cass Ave., Bldg. 201
Argonne, IL 60439
(630) 252-2481 Fax (630) 252-7923
grunder@anl.gov
www.anl.gov

Praveen Chaudhari, Director
Brookhaven National Laboratory
37 Brookhaven Ave., Bldg. 460
P.O. Box 5000
Upton, NY 11973
(631) 344-2772 Fax (631) 344-5803
chaudhari@bnl.gov
www.bnl.gov

Michael S. Witherell, Director
Fermi National Accelerator Laboratory
Pine and Kirk Rd.., P.O. Box 500
MS 105
Batavia, IL 60510
(630) 840-3211 Fax (630) 840-2900
witherell@fnal.gov
www.fnal.gov

Charles V. Shank, Director
Lawrence Berkeley National Laboratory
One Cyclotron Road
50A- 4133D
Berkeley, CA 94720
(510) 486-5111 Fax (510) 486-6720
cvshank@lbl.gov
www.lbl.gov

Christoph Leeman, Director
Thomas Jefferson National Accelerator Facility
12000 Jefferson Ave.
MS 12-C
Newport News, VA 23606
(757) 269-7553 Fax (757)
leeman@jlab.org
www.jlab.org

Jeff Wadsworth, Director
Oak Ridge National Laboratory
1 Bethel Valley Road
P.O. Box 2008
Oak Ridge, TN 37831-6255
(865) 576-2900 Fax (865) 241-2967
wadsworthj@ornl.gov
www.ornl.gov

Leonard Peters, Director
Pacific Northwest National Laboratory
902 Battelle Blvd.
P.O. Box 999
MS. K1-46
Richland, WA 99352
(509) 375-6600 Fax (509) 375-6844
len.peters@pnl.gov
www.pnl.gov

Rob Goldston, Director
Princeton Plasma Physics Laboratory
U.S. Route 1
P.O. Box 451 (Princeton)
Plainsboro, NJ 08543
(609) 243-3553 Fax (609) 243-2749
rgoldston@pppl.gov
www.pppl.gov

Jonathan Dorfan, Director
Stanford Linear Accelerator Center
2575 Sand Hill Road
MS 75
Menlo Park, CA 94025
(650) 926-8708 Fax (650) 926-8705
director@slac.stanford.edu
www.slac.stanford.edu

Directors of other DOE National Laboratories

Paul K. Kearns, Acting Director
Idaho National Engineering and Environmental Laboratory
1955 Fremont Ave.
P.O. Box 1625
Idaho Falls, ID 83415
(208) 526-4597 Fax (208) 526-4769
kearpk@inel.gov
www.inel.gov

Michael R. Anastasio, Director
Lawrence Livermore National Lab
7000 East Avenue
P.O. Box 808
Livermore, CA 94550
(925) 424-3952 Fax (925) 424-3625
anastasio1@llnl.gov
www.llnl.gov

G. Peter Nanos, Director
Los Alamos National Laboratory
MS C177 / P.O. Box 1663, TA-0
Bldg. 767
Los Alamos, NM 87545
(505) 667-5101 Fax (505) 665-2679
nanos@lanl.gov
www.lanl.gov

Rita Bajura, Director
National Energy Technology Laboratory
3610 Collins Ferry Rd.
P.O. Box 880, MS A05
Morgantown, WV 26507-0880
(304) 285-4511 Fax (304) 285-4292
rita.bajura@netl.doe.gov ,
rbajura@netl.doe.gov
www.netl.doe.gov

Adm. Richard H. Truly (U.S. Navy)
National Renewable Energy Laboratory
1617 Cole Blvd.
Golden, CO 80401-3393
(303) 275-3011 Fax (303) 275-3097
Richard_Truly@nrel.doe.gov
www.nrel.doe.gov

C. Paul Robinson, Director
Sandia National Laboratory
P.O. Box 5800
MS 0101
Albuquerque, NM 81785-0101
(505) 844-7261 Fax (505) 844-1120
cprobin@sandia.gov
www.sandia.gov