

A scientist loads a sample into an aberration-corrected scanning transmission electron microscope at EMSL. This state-of-the-art instrument enables high-resolution imaging of structural and chemical information for nanomaterials, catalysts, and minerals, and will help in the design of new materials for energy production and storage.

Committed Leadership

Our proud heritage of engagement and leadership improves lives.

Seeding the technology economy. PNNL economic development programs have helped hundreds of technology businesses develop products, acquire new customers and contracts, obtain access to funding sources and strategic partners, and secure specialized facilities and staff.

Making a difference. Since 1965, Battelle, which operates PNNL, has invested more than \$22 million to improve science education and quality of life in the communities where PNNL resides. Staff volunteered more than 100,000 hours in educational and community projects over the last ten years.

Workforce of the future. PNNL works with the educational community from kindergarten through post-graduate levels to equip the future workforce. In 2007, *Fortune Magazine* included PNNL in a list of 20 great employers for new college graduates.

Intellectual Powerhouse

PNNL is a DOE Laboratory under DOE's Office of Science. Our quest for innovation is powered by 4,900 researchers and staff, more than 800 of them Ph.D.s.

Our researchers have earned more than 1,920 U.S. and international patents. Licensing patent rights to commercial companies creates more jobs and generates marketplace growth. Science journals publish more than 800 peer-reviewed articles from PNNL annually, demonstrating our leadership in advancing science worldwide.

Our strength is in our roots. Our "family tree" shows more than 150 companies that use technology or leadership originating from the Laboratory.

Treasure trove. Considered a national treasure in the Pacific Northwest and beyond, the Laboratory is headquartered at the main campus in Richland, Washington. Other offices include the Marine Sciences Laboratory in Sequim, Washington, and offices in Seattle, Washington; Portland, Oregon; College Park, Maryland; and Washington, DC. Battelle, a global science and technology enterprise headquartered in Columbus, Ohio, manages the Laboratory for DOE.

Business facts. Our research expenditures were approximately \$1.1 billion in the 2010 fiscal year. About 70 percent supports DOE missions in science, energy, the environment, and national security. About 25 percent comes from other federal agencies in security, defense, and other areas. We also collaborate with universities to advance science and with industry to move technology into the marketplace.



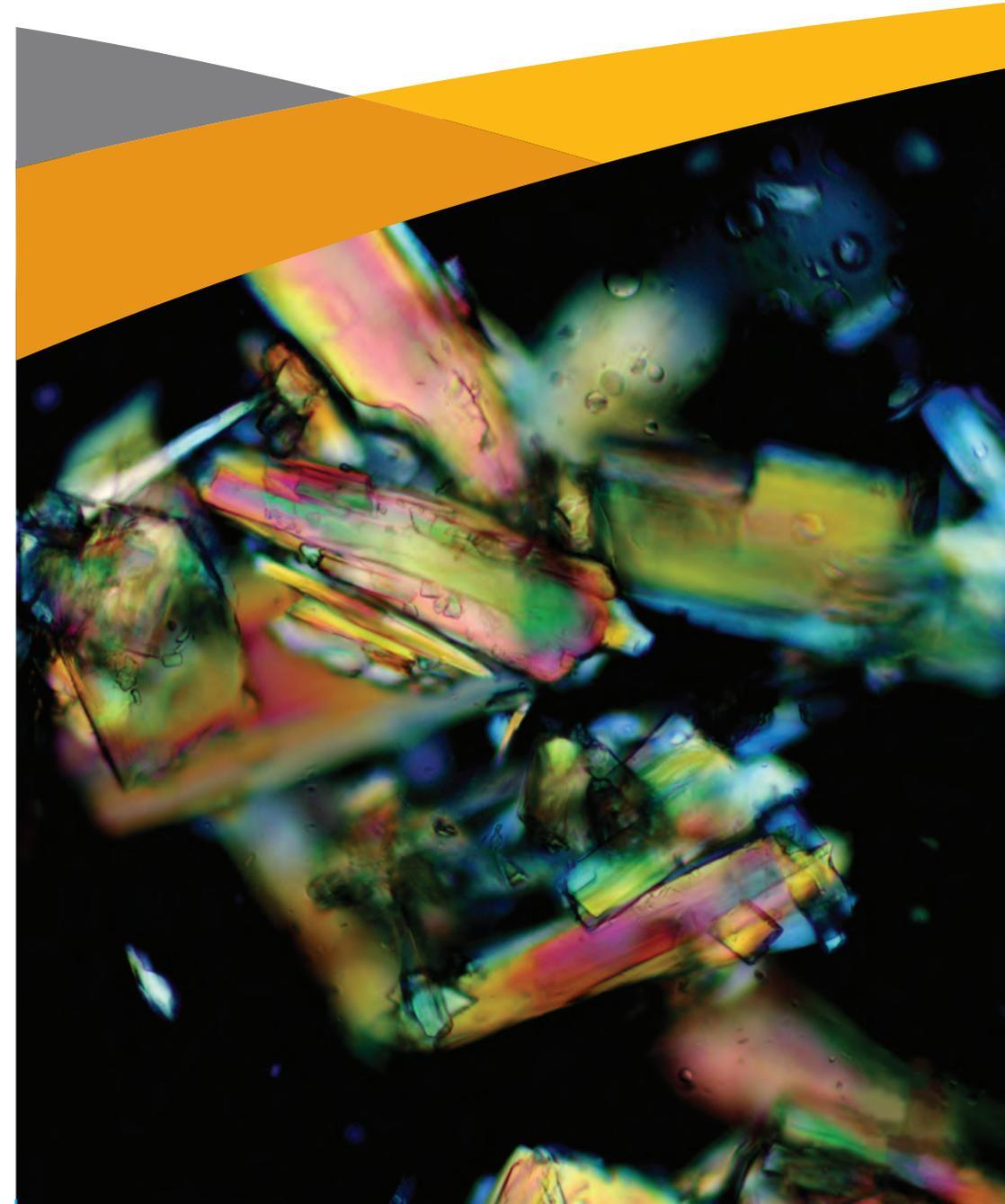
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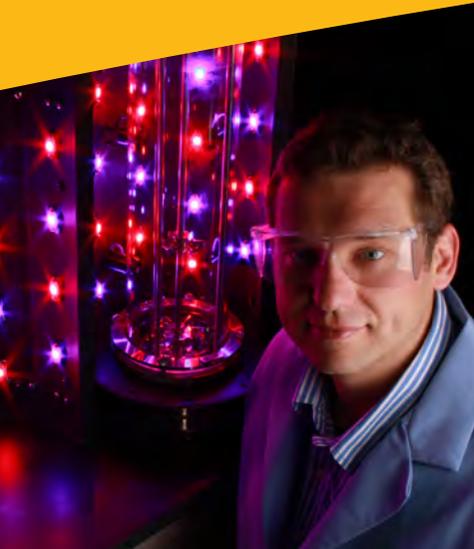
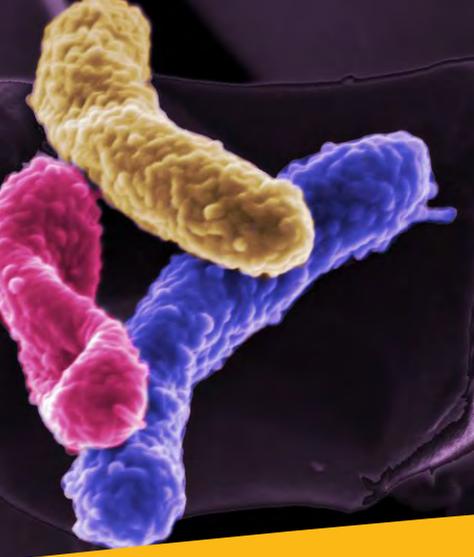


At A Glance



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Top: This color-enhanced, microscopic view shows bacterial cells on a metal oxide in groundwater. The results are revealing new insights about microbiological activity and contaminant movement below the ground's surface.

Above: PNNL scientists invented this patent-pending photobioreactor for converting organic materials such as algae into bio-based fuel. The red and blue lights help organisms turn carbon dioxide into sugar by acting as a more effective form of sunshine.

Cover: Finding tiny crystals of thorium nitrate and uranyl sulfate is a clue that nuclear weapons may have been produced in the area where the crystals were found. The polarized light microscope that "sees" these crystals is a powerful tool for identifying and understanding materials of all kinds.

Big Problems, Big Results

Energy demands, environmental impacts, and national security are some of America's toughest challenges. At the Pacific Northwest National Laboratory, we are driven to provide science and solutions to meet these challenges. We accomplish this mission through the power of our interdisciplinary teams, bringing together experts from multiple disciplines to tackle complex problems.

- Through fundamental research, PNNL is advancing scientific frontiers in biological systems science, chemical and materials sciences, atmospheric and climate science, computational science, subsurface science, and weak interaction physics.
- PNNL is driven to help increase U.S. energy capacity and reduce our dependence on imported oil. Collaborating with our partners, we are developing ways to use today's energy sources more cleanly and efficiently while helping shift our nation to more renewable resources.
- Our world-leading expertise in subsurface science is reducing the environmental impacts of human activities. Environmental innovations from PNNL are being used to protect water sources, clean up underground contamination, and explore how greenhouse gases can be stored in deep geologic formations.
- PNNL is enhancing America's security by discovering, assessing, and mitigating complex threats and responding to disruptive elements. Our focus is on threat signature discovery, information analytics from multi-source data, cyber infrastructure protection, fuel cycle security, and countering nuclear trafficking systems.

Unique Facilities

As a national laboratory, we combine award-winning expertise with more than 40 years of government and private investment in advanced equipment and facilities—examples of which are described here.

Bringing grand challenges down to size. EMSL, the Environmental Molecular Sciences Laboratory, a U.S. Department of Energy national scientific user facility located at PNNL, offers integrated experimental and computational resources in the biological, chemical, and environmental sciences to the global scientific community. EMSL and its 700 annual users provide innovative solutions to the nation's greatest challenges. Beyond instruments and facilities, EMSL is breaking through traditional approaches by catalyzing "teams of teams" to deliver game-changing science in emissions sequestration, biofuels, and bioenergy.

PNNL scientists at EMSL pioneered the concept of building a working lithium ion battery using a single nanowire as an electrode. More recently, scientists used sophisticated instruments to "see" the electrochemistry process that occurs when the battery is operating. The resulting insights could improve the design and assembly of advanced batteries that operate more efficiently over a wider temperature range than traditional batteries.

Meeting national needs. PNNL has some of the nation's most specialized facilities for conducting research involving radioactive materials, to support national needs in nuclear energy, environmental management, and national security.

For example, scientists in the Radiochemical Processing Laboratory develop and characterize fuel cycle

chemistry using numerous state-of-the-art tools, such as mass spectrometers, x-ray diffraction tools, optical spectrometers, and sophisticated equipment for precisely measuring radioactivity in materials. In the Physical Sciences Facility, an underground laboratory shields against cosmic radiation so that scientists can produce pure materials for radiation detection research.

Outdoors on a test track about the size of a high-school football field, a series of mock port-of-entry configurations are used to evaluate the performance of integrated detection and interdiction systems for enhanced border security.

"Assembling a great team of international experts, Pacific Northwest National Laboratory effectively created a new field called visual analytics. The National Visualization and Analytics Center, which PNNL leads for the U.S. Department of Homeland Security, has had a major impact on improvements to the way government intelligence communities do their work."

George G. Robertson
Principal Researcher
Microsoft Research

Recognition

Our researchers are frequently recognized for their outstanding achievements.

The Oscars of invention. *R&D Magazine* annually selects the year's top 100 technical advancements worldwide. PNNL has earned 85 R&D 100 Awards, ranging from scientific instruments and novel materials to information analysis systems that help ensure the nation's security and provide a competitive advantage to industry.

Discoveries that change lives. Our researchers have won more than 200 awards and honors since 2005, including at the Presidential level, for scientific achievement and leadership in their fields.

Marketplace transformation. PNNL has received 74 Laboratory Consortium awards for Excellence in Technology Transfer—by far the most of any DOE national laboratory.



Scientists and engineers are helping protect our nation by creating better ways to predict, detect, and counter threats regionally, nationally, and globally.