

Health Science

Devices in Materials Research

National Defense

Energy Research

Nuclear Medicine

LANSCE is helping to address the leading cause of deaths in the U.S.—heart disease. Early detection of coronary problems can help save many lives. One method for detecting heart disease relies on imaging blood vessels for blockages using radioisotopes. LANSCE is the source of a number of radioisotopes, including those used in medical diagnostics and research. By exposing suitable, non-radioactive target elements to the proton beam, LANSCE is capable of producing a variety of radioisotopes through its Isotope Production Facility. One such radioisotope is strontium-82, used extensively in cardiac imaging for the detection of coronary disease. In just two weeks, LANSCE produces enough strontium-82 for 10,000 to 14,000 diagnostic procedures.

Medical Research

The Protein Crystallography Station at LANSCE is specifically designed and constructed to take advantage of the unique properties of neutrons to determine the detailed structures of large biological molecules. Determining the structure and function of these molecules has revolutionized the ability to develop drugs that specifically attack disease-causing molecules. Knowing the structure is of critical importance, since drugs are often designed to attack specific, active sites on the disease-causing substance.

Serving the Semiconductor Industry

The Earth is showered continuously by cosmic rays. When these cosmic rays enter the atmosphere, high-energy neutrons are produced. High-energy neutrons can cause semiconductor devices to malfunction.

LANSCE produces high-energy neutrons with nearly the same energy distribution as those from cosmic rays, but more than a million times as intense. Because of this, major semiconductor companies use LANSCE to test the robustness of their latest generation of chips against neutron-induced problems. These tests help the manufacturers of semiconductor devices ensure the quality, safety and reliability of their components that are used in all modern electronics including aircraft, automobiles and medical applications.

Better Materials

Many of the devices that we take for granted—your computer, your automobile GPS system, your MP3 player—rely on hard drives to store information. Hard drives use magnetic materials to store and retrieve information. Neutrons are well suited to studying magnetic materials and research at LANSCE has made numerous and important contributions to understanding them, leading to materials with improved properties and performance.

Maintaining the Nuclear Deterrent

Nuclear deterrence is a key element of the nation's defense posture. Historically, nuclear tests were conducted to verify the reliability of our nuclear arsenal. The U.S. suspended nuclear testing in 1992. Thus, a different approach is being used to assure the safety, security, and reliable performance of our nuclear deterrent. This approach relies on understanding the fundamental scientific processes inherent in the operation of a nuclear weapon and requires measuring the physical properties of weapon materials under the range of extreme conditions present during a nuclear weapon detonation. These measurements are then used in sophisticated computer models that simulate the full performance of nuclear devices.

LANSCE is the only high-intensity neutron facility in the U.S. nuclear weapons complex that has the ability to characterize many properties of nuclear weapons materials under the appropriate range of conditions. At our Weapons Neutron Research facility and Lujan Neutron Scattering Center, fundamental properties of weapons materials are investigated, providing important data used to simulate performance.

A revolutionary technology, called proton radiography or pRad, has been developed at LANSCE that allows us to make motion pictures of materials under dynamic and extreme conditions. pRad allows scientists and engineers to study, on timescales of less than one-millionth of a second, the detonation of high explosives and how explosives push, shock, or break materials under conditions similar to that in a nuclear device. Proton radiography plays an important role in understanding materials under extreme conditions.

Energy Security

As part of the nation's energy security strategy, there is renewed focus on nuclear energy. It is critical that fuel elements and the construction materials for new reactors be well characterized. LANSCE is developing the Materials Test Station, a facility enabling fuels and construction materials to be tested in a nuclear reactor-like environment. In addition, LANSCE is measuring the fundamental nuclear properties of both the primary nuclear fuel materials and the products that are generated from nuclear reactions. These measurements are important in predicting the performance of nuclear reactors.

Threat Preparedness

The impact of a nuclear event, whether the detonation of a rudimentary nuclear device or the dispersal of nuclear material, would be catastrophic. To mitigate this threat, LANSCE is involved in developing new technologies to detect concealed nuclear materials.

LANSCE's Future

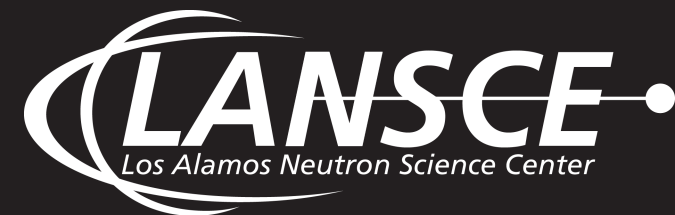
LANSCE has been the LANL's "signature" experimental research facility for over 30 years. During this time, the scientific research capabilities of LANSCE have evolved to provide the international science community state-of-the-art capabilities in materials, nuclear, and biological research and to meet LANL's evolving national security mission. LANSCE is continuously modernizing its facilities and linear accelerator to address future national and scientific challenges. LANSCE will continue to make contributions to the nation's well-being and help sustain LANL as a world-class, science-based multidisciplinary institution.

What Does LANSCE Do for Us Today?

The diversity of research enabled by LANSCE is rivaled by few facilities anywhere in the world. LANSCE helps researchers solve problems in fields from biological science to materials science to fundamental physics. Examples of how LANSCE can impact daily life, assure that we remain safe and secure from external threats, and help the nation's economic competitiveness are too numerous to list, so here we've selected a few that represent the best of what LANSCE offers.

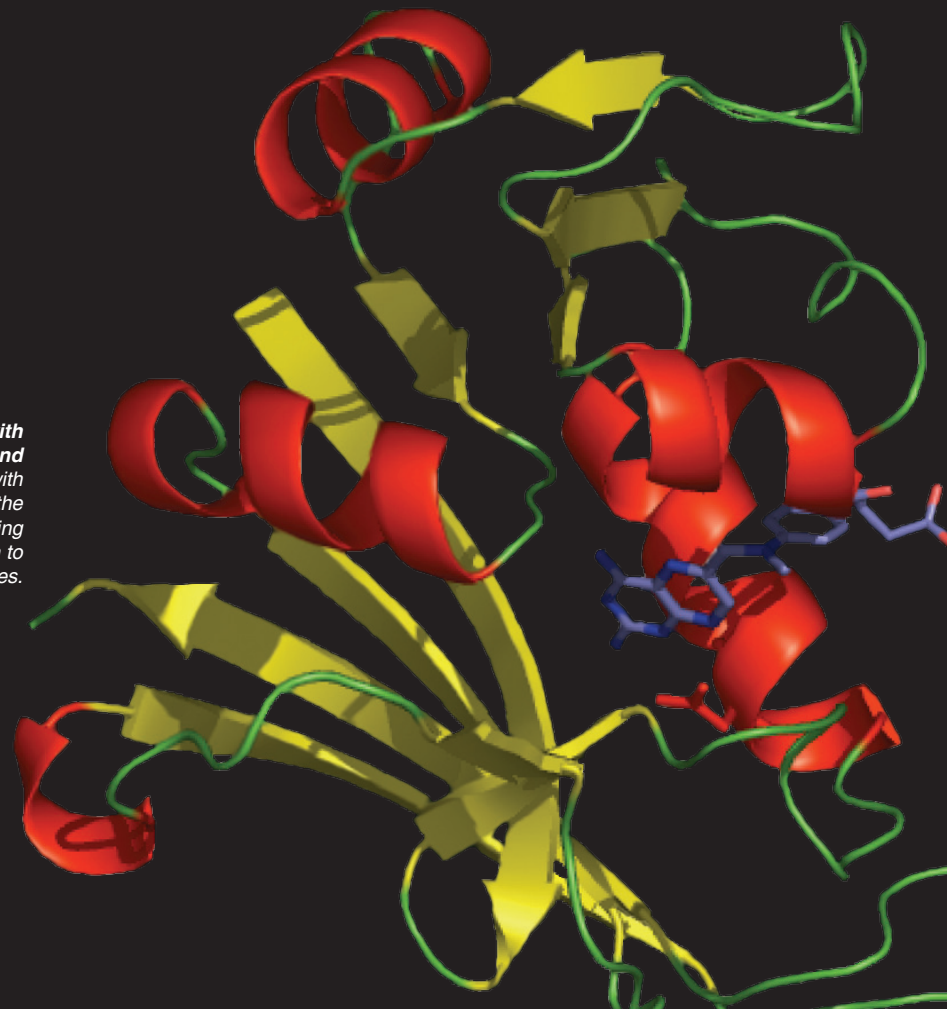
Who Uses LANSCE?

LANSCE facilities are available to qualified scientists and engineers through a competitive proposal process. Each year LANSCE receives many more worthy proposals than it can accommodate despite 24/7 operation. LANSCE users come from all over the world and represent a cross-section of the research community: universities, industry, and other national and federal laboratories in the U.S. and abroad.



The Los Alamos Neutron Science Center

Serving the Nation; Today and in the Future



Dihydrofolate Reductase with Methotrexate Bound

This diagram shows the structure of DHFR with the anticancer drug methotrexate bound to the active site. This structure was determined using neutron scattering and provides information to improve anti-tumor therapies.



What is LANSCE?

LANSCE is the major experimental science facility at Los Alamos National Laboratory (LANL), underpinning LANL as a world-class scientific institution. LANSCE is a national resource that supports basic and applied research for national security and civilian applications. At the heart of LANSCE is a powerful linear accelerator that accelerates protons to 85% the speed of light. When these protons strike a target of solid tungsten, neutrons are produced by spallation.

Protons and neutrons are used in a wide range of applications that help the nation maintain its leadership role in many areas of science and technology. Research conducted at LANSCE helps to maintain the nation's nuclear deterrent, improve medical science, address challenges in energy, and to counter the spread of weapons of mass destruction. LANSCE also lays the foundation for many of the products we use in our daily lives by supporting materials science and technology. A unique attribute of LANSCE is that its five major facilities can operate simultaneously, a unique capability of LANSCE.

Visit our website: <http://lansce.lanl.gov>

