

Lujan Neutron Scattering Center

Academic and national security researchers work side by side on fundamental science.



The Lujan Neutron Scattering Center is a high-power, spallation neutron source equipped with instrumentation for neutron-scattering studies and nuclear physics. Users come from all over the world to do materials science and nuclear physics experiments at the Center. More than a dozen instruments are available to them, and more than half are new or have recently been upgraded. Researchers working on national security and basic science projects can learn from each other because the science is often the same.

Neutron scattering is indispensable in establishing where atoms lie and how they move. Because of their high penetration, isotopic selectivity, and magnetic sensitivity, neutrons are uniquely suited to probe materials in special, powerful ways.

Neutrons created by spallation and slowed down by scattering from hydrogen move down a "flight path" to a sample in an instrument. There they scatter from the sample's atomic nuclei into a detector. The neutrons' time of flight accurately measures their velocity and, therefore, their energy and wavelength. By combining this information with the angle at which the neutrons scatter, one can determine the arrangement of the atoms as well as their thermal motion. In some experiments, the neutrons' spin polarization is also used to detect magnetism. By using information from such experiments, researchers design new materials with desirable properties.



Scientists perform upgrades to one of the instruments used at the Lujan Center.



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Outstanding work in stockpile stewardship and homeland security is done at the center.

The Lujan Center plays an important role in weapons science research crucial to annual certification of our nation's nuclear stockpile. Indeed, the Center was already equipped to handle science-based problems associated with chemical and biological weapons, defense technologies, and energy independence when global terrorism struck the United States on September 11, 2001.

Lujan Center scientists and their stockpile stewardship collaborators study materials-processing and aging issues that can affect weapons performance. For example, they investigate plutonium behavior under extreme conditions; they study how uranium-alloy strength and texture change with age; they research the behavior of high explosives in simulated accidents and abnormal environments; and they study the molecular structure of materials in neutron generators and tubes.

Nanoscience—the study of features that are only a few percent of the diameter of a human hair—has growing importance at the Lujan Center. Scientists at the Lujan Center, the Center for Integrated Nanotechnology, and the National High Magnetic Field Laboratory collaborate on nanoscience problems.

The Lujan Center also serves as a major portal for the recruitment of talented staff members into the Laboratory's national security programs.



At the Lujan Center, scientists from all over the world use the instruments shown here.



The photograph above shows Asteris, one of the instruments located at the Lujan Center. At right is an intensity image of scattered neutrons plotted versus scattering angle and wavelength.



The photo shows the protein crystallography station at the Lujan Center. The top left image shows neutron diffraction data of a protein crystal pictured immediately below.