National Synchrotron Light Source

A Beacon for Research

Purpose

To provide intense beams of infrared, ultraviolet, and x-ray light for basic and applied research in physics, chemistry, medicine, geophysics, materials and environmental sciences

Sponsor

U.S. Department of Energy Office of Science, Basic Energy Sciences

Operating Costs

$36 million per year

Features

- Two synchrotron storage rings producing x-ray, ultraviolet, and infrared beams
- 59 experimental beamlines
- An array of sophisticated imaging techniques

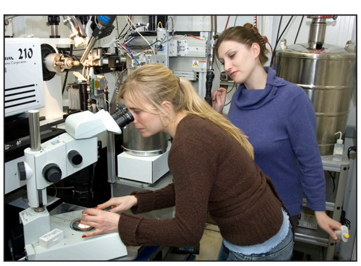
Users

2,400 per year from about 400 national and international universities, laboratories, and other research institutions

Complementary Facilities

- Advanced Photon Source at Argonne National Laboratory
- Advanced Light Source at Lawrence Berkeley National Laboratory
- Stanford Synchrotron Radiation Laboratory at SLAC National Accelerator Laboratory

www.bnl.gov/ps



Students prepare a biological crystal sample for study at an NSLS beamline

One of the world's most widely used scientific research facilities, the National Synchrotron Light Source (NSLS) hosts 2,400 researchers from about 400 universities, laboratories, and companies each year. Research conducted at NSLS has yielded advances in biology, physics, chemistry, geophysics, medicine, and materials science.

The National Synchrotron Light Source at Brookhaven Lab

Synchrotron light is produced by electrons when they are forced to move in a curved path at nearly the speed of light. At NSLS, beams of light in the x-ray, ultraviolet, and infrared wavelengths are produced by two synchrotrons for use in experiments.

Powerful Light, Diverse Research

Since the intensity of synchrotron light can be 10,000 times greater than beams generated in a laboratory, scientists use these beams to gain information about the electronic and atomic structures of materials, analyze very small samples, and study surfaces at the atomic level.

Researchers at NSLS use an array of sophisticated imaging techniques to get highly detailed "pictures" of a wide variety of materials, from biological molecules to semiconductor devices.

In conjunction with the Lab's Center for Functional Nanomaterials, NSLS provides researchers with state-of-the-art capabilities to probe the unique properties of matter at an extremely small scale — the nanoscale. Nanoparticles, particles with dimensions on the order of billionths of a meter, could have revolutionary impacts, from more efficient energy generation and data storage to improved methods for diagnosing and treating disease.

NSLS Experiments

Scientists have used NSLS to study:

- The inner workings of ribosomes, cellular "factories" that produce the thousands of proteins required for living cells — resulting in the 2009 Nobel Prize in Chemistry
- The crystal structure of new materials, such as high-temperature superconductors and "nanomaterials," that may lead to faster and more efficient electronic devices
- The cycling of batteries in action, with the aim of improving their performance
- How the size of gold nanoparticles affects their efficiency as a catalyst for fuel cells
- Material dredged from the Port of New York and New Jersey, to determine the nature of pollutants in the sediment
- The chemical composition of bones, which may aid in the understanding of arthritis and osteoporosis
- The chemical origins of nerve impulses, the electrical activity that underlies all movement sensation — work that led to the 2003 Nobel Prize in Chemistry

Upgraded Capabilities

In order to address the increasingly complex scientific challenges of tomorrow, plans to upgrade NSLS are under way. NSLS-II, now under construction, will be a state-of-the-art, medium-energy electron storage ring designed to deliver world-leading x-ray intensity and brightness, more than 10,000 times brighter than the current NSLS.

Scheduled for completion in 2015, NSLS-II is expected to lead to significant advances that will ultimately enhance national security and help drive the development of abundant, safe, and clean energy technologies.