INNOVATION at National User Facilities

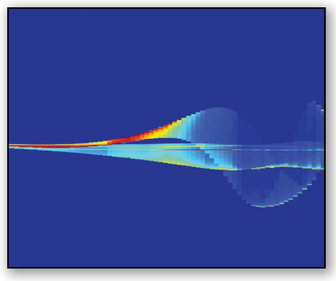
Scientists and engineers have used the National User Facilities to learn how to improve materials for the aerospace, trucking, and computer industries.

Cornell High Energy Synchrotron Source

Better Materials for Aerospace

CHESS users have developed sophisticated mechanical load equipment that permits engineers to use X-rays to study what causes materials to weaken, crack, and break. These studies will enable new materials for airplane wings that are stronger, lighter, and longer lasting. Advanced materials and new methods to evaluate their properties benefit a wide range of industrial and military applications.

Brookhaven Accelerator Test Facility



Advanced Methods of Electron Acceleration

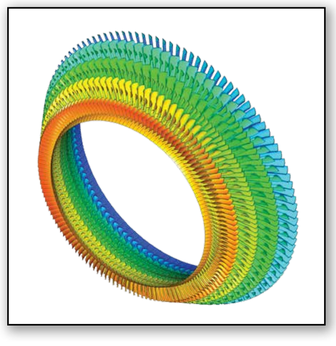
At ATF new methods for accelerating particle beams over a much shorter distance than traditional accelerators are under development. These methods will lead to more compact, energy-efficient production of high-energy particle beams. Successful acceleration of electrons by lasers has been demonstrated in the STELLA experiment at the ATF. Alternative plasma-based acceleration is underway.

DOE Joint Genome Institute

Symbiotic Microbes Nourish Plants

Researchers from the Joint Genome Institute and the University of North Carolina, Chapel Hill examined the interaction of microbes and the roots of plants. This symbiotic relationship helps plants fight pests and manage their nutrients. More than 750 distinct groups of microbes were identified. The findings are informing strategies for improved pest management and plant productivity.

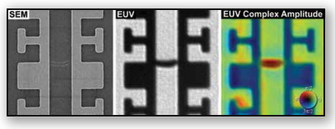
Oak Ridge Leadership Computing Facility



Tomorrow's Turbomachinery

Researchers at General Electric are simulating the design of next-generation turbines, to be used in aviation and power production. At OLCF GE ran their largest turbine simulation on the Jaguar high-performance computer.

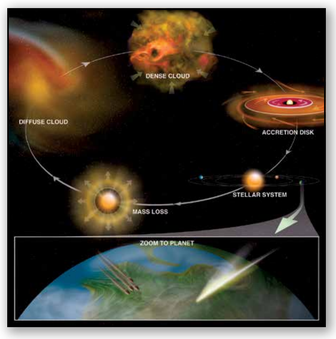
Advanced Light Source



A New Generation of Semiconductors

At the ALS, scientists from Berkeley Lab's Center for X-ray Optics work with SEMATECH, an industry consortium, to create smaller, faster, and less-expensive semiconductors. The work uses tools such as the extreme ultraviolet (EUV) microscope, which provides energy-specific information on the lithographic masks used to manufacture microchips.

National Radio Astronomy Observatory



Our Cosmic Origins

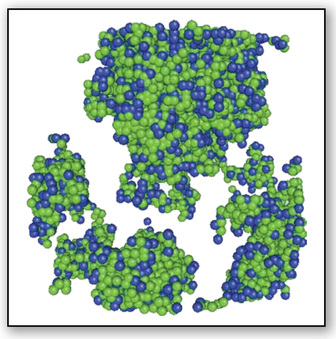
The study of the early dust-shrouded phases of star and planet formation is the exclusive domain of radio astronomy. Radio waves are little affected by the intervening dust and gas that obscure the optical radiation emitted by young stars and planets. NRAO telescopes are also enabling the discovery of increasingly complex organic molecules in space, the necessary precursors to life.

National Superconducting Cyclotron Laboratory

Gas Stopping Technology

While the NSCL usually creates rare isotopes that are moving at high (nearly light) speeds, there are certain experiments where the generated ions have to be slowed down. NSCL pioneered a "gas stopping technology" that reduces the speed of the ions. These beams can be reaccelerated to precise energies and used for direct measurement of nuclear reactions. They can also be trapped experimentally and their structure analyzed.

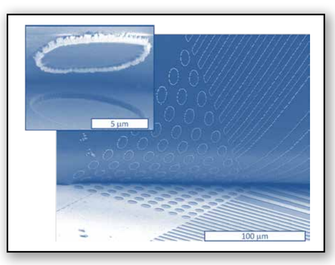
Spallation Neutron Source



Advanced Biotechnological Materials

Researchers at SNS are studying the properties and dynamics of polymers made from both natural and synthetic materials. Such materials are highly versatile because they possess properties of each type of constituent. The polymer mixtures hold promise as biocompatible films for human implants, semiconductors and durable, self-repairing materials for aircraft.

Center for Nanoscale Materials



Reusable Templates for the Production of Nanowires

A new technique for the synthesis of patterned nano-scale wires was discovered at CNM. With nanocrystallaline diamond used as a template, the technique quickly produces patterned nanostructures without vacuum or clean-room processing. The method will enable the development of a new generation of nanowire-based devices.

Relativistic Heavy Ion Collider

Benefits Beyond Physics

Research at RHIC has triggered innovations in accelerator technology that could greatly improve worldwide access to particle-beam-delivery systems used to treat cancer. Other advances at RHIC, including data distribution and analysis systems, will also benefit society at large. Many scientists and engineers trained at RHIC work in fields such as national security, medicine, energy generation, and space exploration.

NATIONAL USER FACILITY ORGANIZATION