The National User facilities contribute to improvements in health care in myriad ways, from innovative drug therapies to advances in medical imaging.

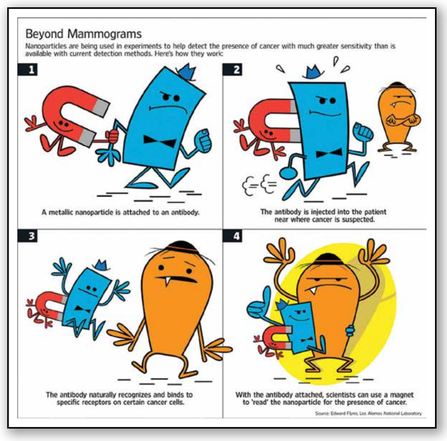
HEALTH SCIENCE & MEDICINE at National User Facilities

Center for Advanced Microstructures and Devices

Macromolecular Crystallography and Health Sciences

X-rays are used at CAMD by the Gulf Coast Protein Crystallography Consortium – a regional organization of 8 universities and medical schools – to unravel the structure and function of proteins and enzymes, and to develop new drug therapies. X-rays are also used to develop new, more-effective, radiation therapies to specifically target malignant cells via an Auger electron cascade method.

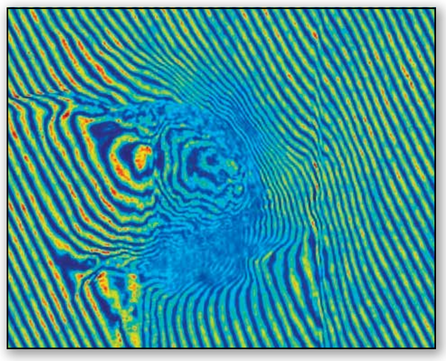
The Center for Integrated Nanotechnologies



Hope for Cancer Detection

Inspired by his wife's breast cancer diagnosis, CINT Industrial User Ed Flynn has developed a less invasive and more precise method for detection of breast cancer as compared to a mammogram. Instead of producing an image of a large mass of cancer cells, Flynn's technology produces a magnetic signal when the the nano-particles attach to cancer cells. This allows physicians to see not only where the cancer is, but also how many cells there are. Flynn's nano-particle technique reduces the threshold of detection by 100 times compared to standard mammography. The method offers the potential to detect cancer before even stage one.

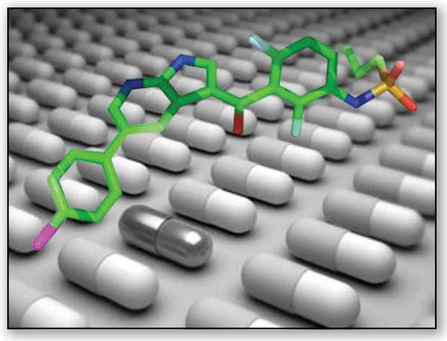
Brookhaven Accelerator Test Facility



Ion Generation

The generation of high-energy ions by lasers at the ATF has the potential to be used in such areas as medical imaging (positron emission tomography) and cancer therapy. The ions are generated by interaction of a hydrogen gas jet with a CO_2 laser, giving new insight into the physics of laser-plasma interactions.

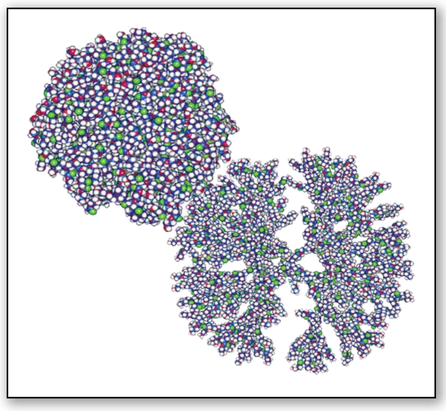
Stanford Synchrotron Radiation Lightsource



Saving Lives

Research conducted at SSRL and two other Department of Energy facilities led to the development of a new drug, Vemurafenib, that successfully treats patients with late-stage or inoperable melanoma. Using the labs' powerful X-ray facilities, scientists were able to determine the precise structure of a mutated protein involved in this dangerous type of skin cancer—and designed a powerful drug that stops its spread.

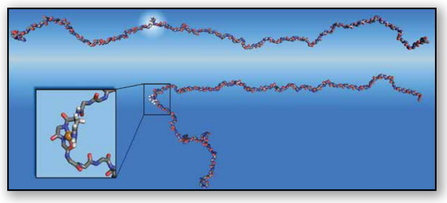
Spallation Neutron Source



Targeted Drug Delivery Systems

A pervasive problem in the medical industry is the use of drugs that destroy invasive agents, such as cancer, but that are toxic to other areas of the body. At SNS, researchers are studying the unique structure and behavior of synthetic molecules in solutions that simulate those in the body. Understanding how these molecules function in different situations is helping in the development of drugs that can target diseased areas of the body without harming healthy tissue.

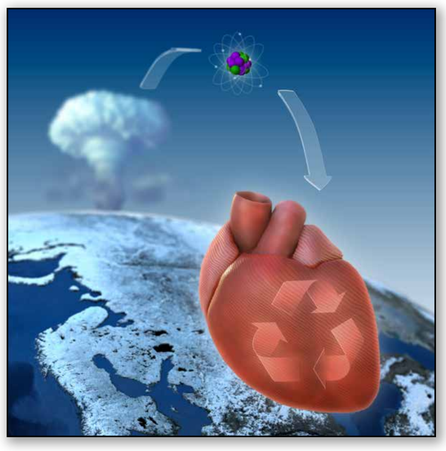
Oak Ridge Leadership Computing Facility



Pinpointing Parkinson's

Researchers have determined how copper induces misfolding in the protein associated with Parkinson's disease, leading to creation of the fibrillar plaques which characterize the disease. This finding has implications for both the study of Parkinson's progression, as well as for future treatments.

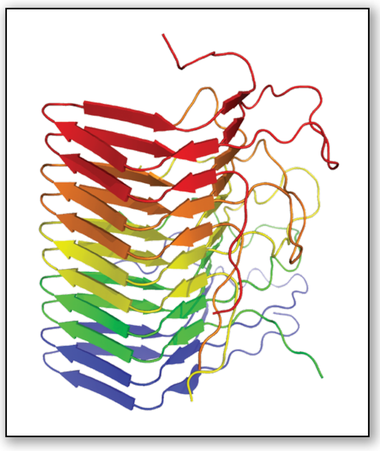
Center for Accelerator Mass Spectrometry



Isotope Dating By Mass Spectrometry

Accelerator mass spectrometry (AMS) measures minute quantities of long-lived radioisotopes. The technique counts rare atoms, rather than the products of radioactive decays. AMS is used to quantify these isotopes in research on the carbon cycle, biomedical tracing, forensics and paleoclimate reconstruction. The technique has been used to measure the age of DNA in heart cells using excess carbon-14 produced by atmospheric nuclear testing in the 1950's and 60's.

Molecular Foundry



A Diagnostic Tool for Proteins

Scientists at the Molecular Foundry and Novartis Diagnostics have engineered a universal, highly sensitive technique for detecting misfolded proteins in biological fluids. This groundbreaking nanoscience capability could help pinpoint Alzheimer's in its early stages and enable researchers to discover new therapies for this devastating disease.