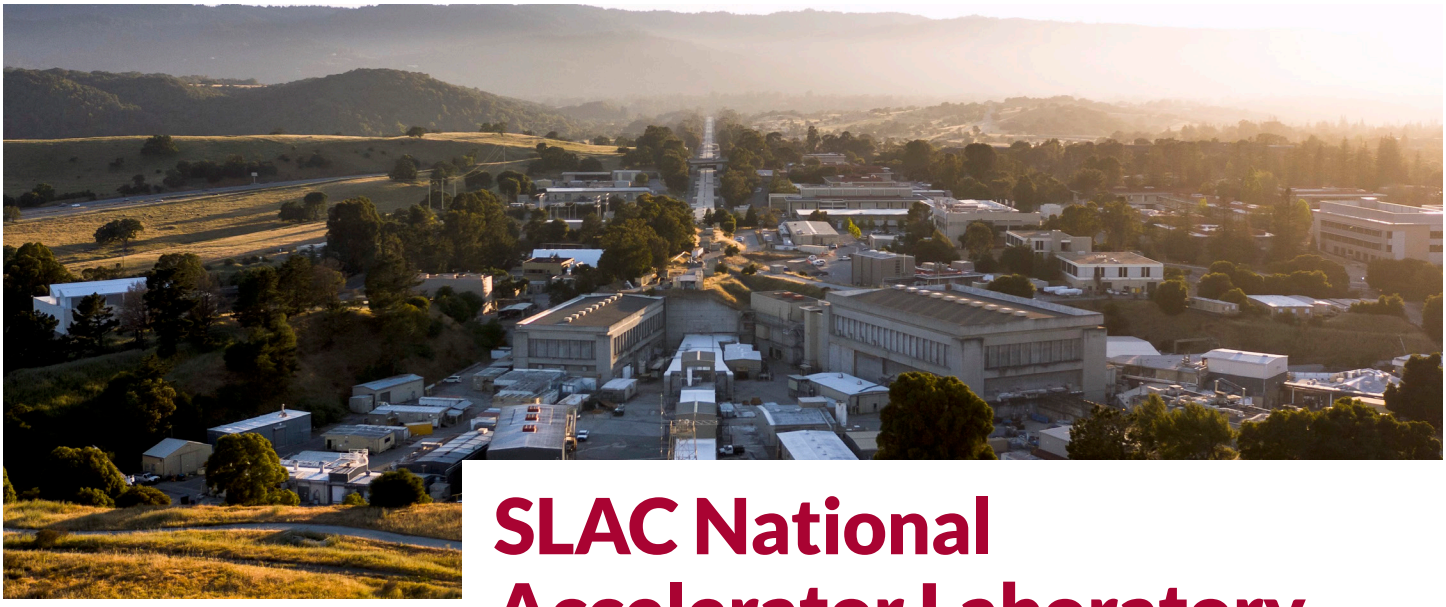


slac.stanford.edu

SLAC National Accelerator Laboratory

Facts

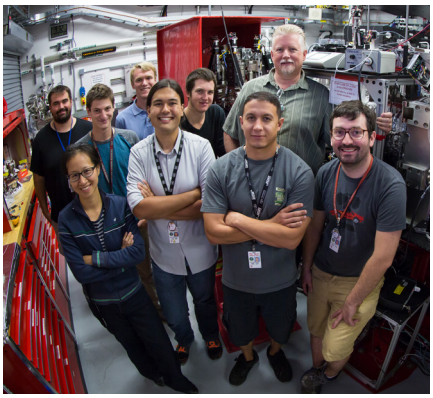
- Explores the universe at the largest and smallest scales
- Large-scale facilities used by thousands of researchers for X-ray experiments
- Stanford University operates SLAC for the DOE Office of Science

As one of 17 Department of Energy national labs, SLAC pushes the frontiers of human knowledge and drives discoveries that benefit humankind. We invent the tools that make those discoveries possible and share them with researchers all over the world.

X-rays reveal the atomic world

Our 2-mile-long particle accelerator is the lab's backbone. Once the scene of major discoveries in particle physics, today it generates the world's brightest X-rays for our revolutionary X-ray laser, the Linac Coherent Light Source (LCLS).

Thousands of researchers come to SLAC to use LCLS and the Stanford Synchrotron Radiation Lightsource to probe matter in atomic detail. These X-ray studies help scientists understand the fundamental workings of nature and find solutions to real-world problems.



From top: SLAC's 2-mile-long linear accelerator; researchers at the Linac Coherent Light Source X-ray laser

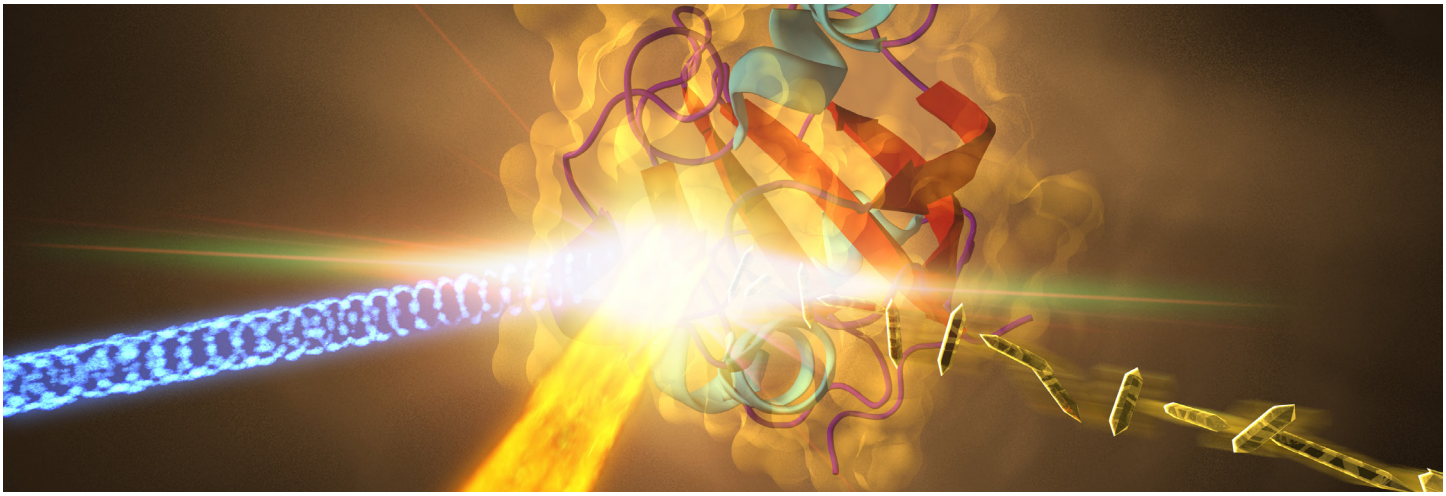
Fundamental science, practical benefits

When researchers delve into basic details of the world around us, practical benefits often follow. This is true of research at SLAC.

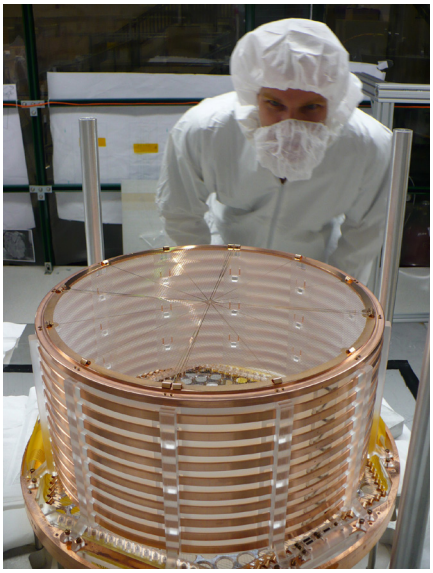
In chemistry, "molecular movies" made with our X-ray laser are capturing all the tiny steps of chemical reactions for the first time. This new understanding will help improve reactions that give us fuels, fertilizers and a host of other products.

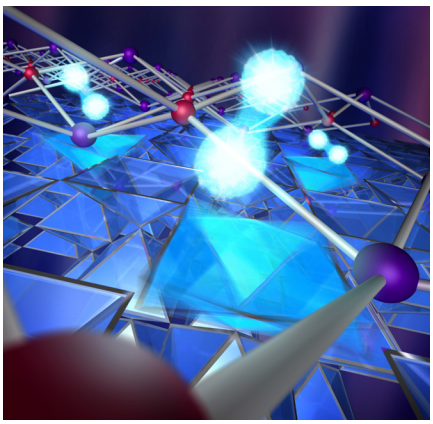
In biology, X-rays reveal how proteins – one of the key molecules of life – function in our bodies and in nature. This research has contributed to the development of medications for melanoma, flu and HIV and is aiding the fight against COVID-19, Ebola, high blood pressure and other ills.

Scientists use our X-ray beams for experiments to improve materials for computer chips, jet planes, refinery operations and "smart windows" that



Above: A protein from a photosynthetic bacterium changes shape in response to laser light. SLAC X-ray studies reveal how proteins work in our bodies and in nature. Below: A SLAC engineer with a detector he engineered for an experiment that looks for rare phenomena involving ghostly neutrinos. (EXO-200 Collaboration) Bottom: X-rays probe futuristic materials like this one, whose electrons pair up to conduct electricity with perfect efficiency.





automatically adjust the amount of light coming in, to name a few. SLAC studies of exotic materials with quirky traits could have a profound impact on society, although it may be far in the future.

Even the accelerator technology developed for basic physics experiments has had a huge impact in medicine and industry, where it shrinks tumors, sterilizes medical supplies and hardens materials, among many other things. SLAC researchers are working to make accelerators much smaller and cheaper so they can accomplish even more.

Solving energy challenges

Many threads of SLAC research come together in the quest for clean, sustainable energy sources. We study how plants make energy from sunlight with an eye to doing the same, and customize chemical reactions for generating clean fuels. Our specialized X-ray equipment allows scientists to watch batteries, solar cells and fuel cells in operation, a crucial step in improving how they work.

An eye on the cosmos

SLAC started more than 60 years ago as a place to discover fundamental particles and forces. Today, our researchers still explore the universe at the largest and smallest scales. At the tiniest scale, we help search for new particles and forces at the Large Hadron Collider in Europe, where the Higgs boson was discovered. At the most sweeping scale, we led the design and construction of the world's biggest digital camera for the widest, deepest survey of the night sky ever undertaken.

Our longstanding expertise in building particle detectors is being put to use in experiments that search for dark matter and dark energy, probe the secrets of ghostly neutrinos, look for signs of cosmic inflation and capture high-energy particles from the most powerful events in the universe.

Key partnerships

Stanford University operates SLAC for the DOE Office of Science. Our joint research centers and facilities with Stanford focus on cosmology and astrophysics, materials and energy science, catalysis, batteries, ultrafast science and cryogenic electron microscopy.

SLAC's location in Silicon Valley and our connections with DOE, Stanford and other leading research centers speed our progress. We also look for ways to work with industry to solve problems and spread the benefits of research out into society.