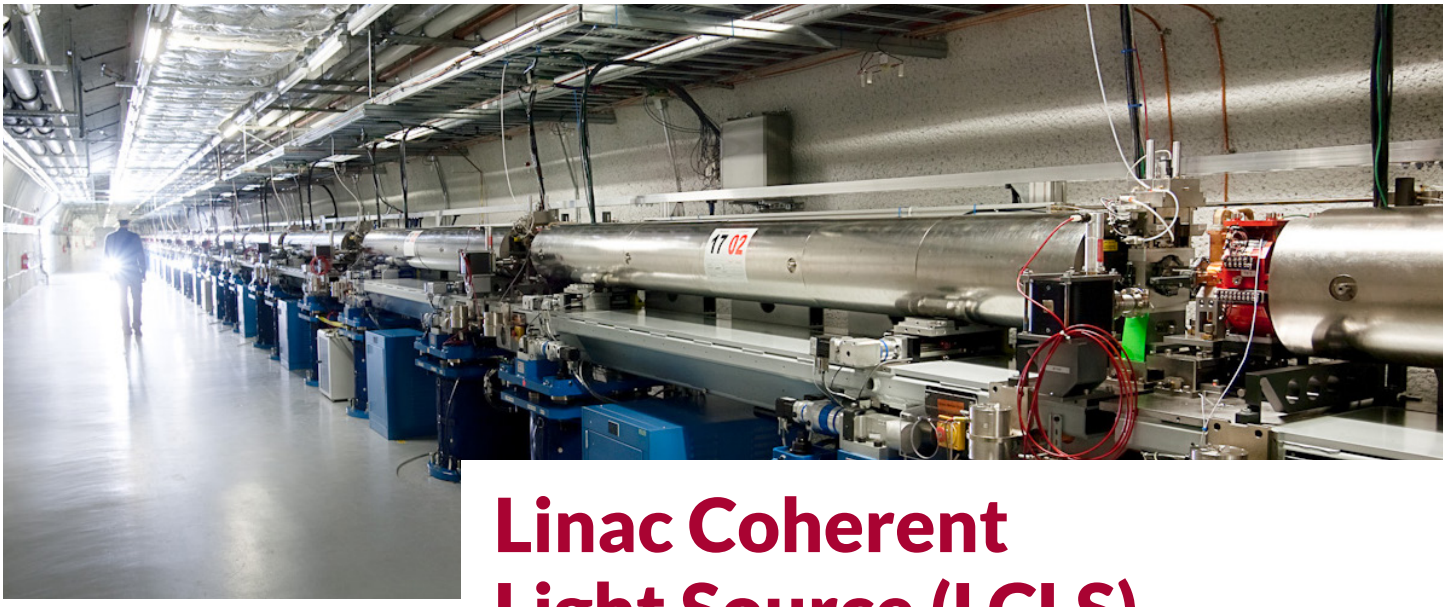


Linac Coherent Light Source (LCLS)

LCLS

slac.stanford.edu
lcls.slac.stanford.edu

Facts

- 326 staff run the facility
- 3,000 scientists have conducted experiments at LCLS
- Users from 37 US states and internationally
- Over 30% first time users each year
- 1,450 peer-reviewed publications
- 8 experimental instruments

The LCLS produces the world's brightest X-ray pulses. Like a high-speed camera with an incredibly bright flash, it takes X-ray snapshots of atoms and molecules at work, revealing fundamental processes in materials, technology and living things. These snapshots can be strung together into movies that show chemical reactions as they happen.

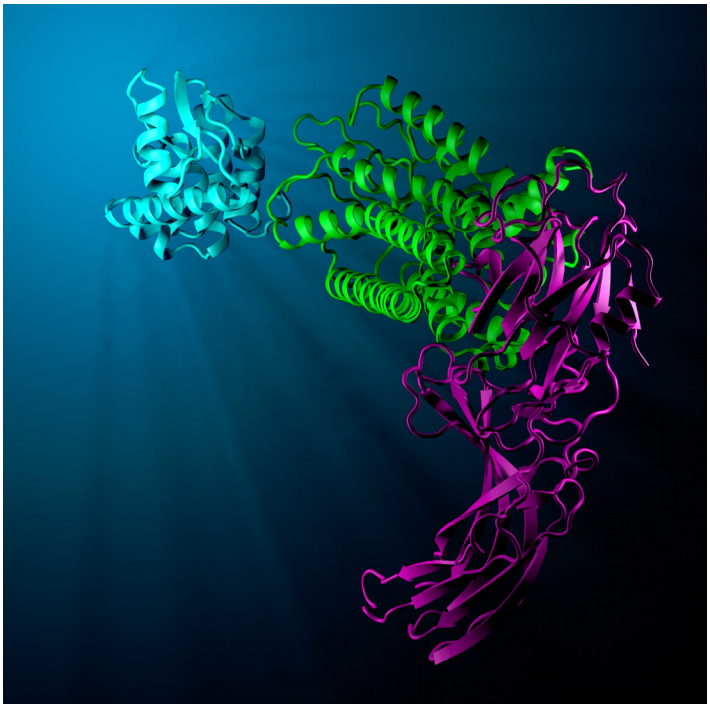
A Unique Tool for Science

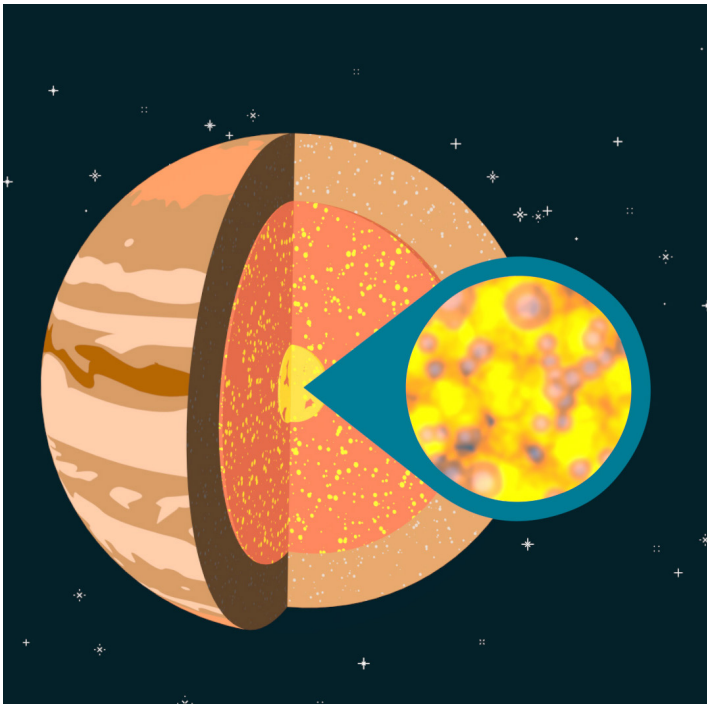
LCLS creates X-rays a billion times brighter than those available before. Its laser pulses probe samples more than 100 times per second, with each one lasting just quadrillionths of a second – short enough to study the formation of molecules and capture signals transmitted by living cells.

Catching Photosynthesis in the Act

Photosynthesis is one of the most important chemical reactions on Earth, yet most aspects are not fundamentally understood. With the LCLS, researchers can directly observe the natural processes that convert the sun's light into useable energy, with promising implications for America's energy future.

SLAC NATIONAL ACCELERATOR LABORATORY





These images illustrate LCLS experimental results. From left: The first 3-D atomic-scale map of arrestin docked with rhodopsin, important signaling proteins in the body; scientists created and measured "warm dense matter," an exotic form of matter thought to exist at the cores of giant planets like Jupiter.

Revealing Life's Secrets

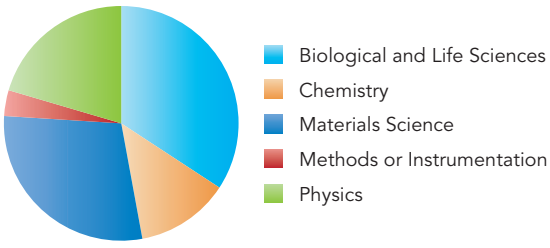
Scientists are using the LCLS to determine the structures of proteins from tiny nanocrystals. This unique capability opens the door to studying tens of thousands of biological structures that were out of reach before, including proteins important in disease and its treatment. One LCLS experiment, for instance, has provided important clues on how to combat African sleeping sickness.

Developing Future Electronics

Experiments at LCLS are exploring new ways to design and control the magnetic and electronic properties of an important class of electronic materials with ultrashort pulses of light. This could ultimately lead to extremely fast, low-energy computer memory chips or data-switching devices.

Studying Matter in Extreme Conditions

The LCLS gives scientists the right tools to investigate the extremely hot, dense matter at the centers of stars and giant planets. These experiments help researchers explore how materials respond to stress, design new materials with enhanced properties, and study the science that underpins the nuclear fusion process that powers the sun.



External User Experiments
(FY2017-2019)

The Linac Coherent Light Source at SLAC National Accelerator Laboratory is an Office of Science user facility operated for the Department of Energy by Stanford University.

INC0335911-10-2021