



# ASU compact X-ray free electron laser

## The Biodesign/ASU advantage

Designed to unlock some of nature's tiniest and most fleeting mysteries, Arizona State University's compact X-ray free electron laser (CXFEL) is expected to be the first instrument of its kind.

The CXFEL can reveal the structure and dynamics of molecules and materials in ways that conventional X-rays cannot. It will help scientists create more effective drugs, find new sources of renewable energy, advance quantum computing and even gain deep insight into archeological and artistic treasures without damaging them.

## Revolutionizing research

The CXFEL is a compact version of the five XFELs that exist in the world today — instruments that are nearly 2 miles long. ASU is shrinking XFEL technology so that it fits into a traditional laboratory space.

The CXFEL has the potential to be a force-multiplier for discovery. The research team at the Biodesign Center for Applied Structural Discovery is creating an instrument that can give scientists and medical researchers throughout academia, industry and medicine access to brilliant X-rays in their own laboratories, accelerating and broadening scientific discovery like never before.

## Driving discovery

ASU researchers and their collaborators used XFEL technology to pioneer a groundbreaking technique for determining the 3D structure of proteins — femtosecond crystallography. The team has used this technique to:

- Reveal the structure and function of the protein that destroys red blood cells in sleeping sickness.
- Provide the first snapshots of photosynthesis in action as it split water into protons, electrons and oxygen.
- Capture snapshots of the crystal structures related to the biochemical pathways that allow us to breathe.
- Identify a riboswitch that opens up the possibility of using bacterial mechanisms to fight disease.
- Determine the structure of a molecular complex responsible for our sense of sight.
- Reveal the fine details of how an experimental drug works to regulate blood pressure.

One of the early applications of ASU's instrument is expected to be the delivery of phase contrast imaging, a technique capable of examining soft tissues in the body with unprecedented resolution. ASU is collaborating with Mayo Clinic to study and apply phase contrast imaging for next-generation diagnosis of disease.

To learn more, visit [biodesign.asu.edu/cxfel](https://biodesign.asu.edu/cxfel)

# #1 in the U.S. for innovation

ASU ahead of Stanford and MIT

— U.S. News & World Report, 5 years, 2016–2020

