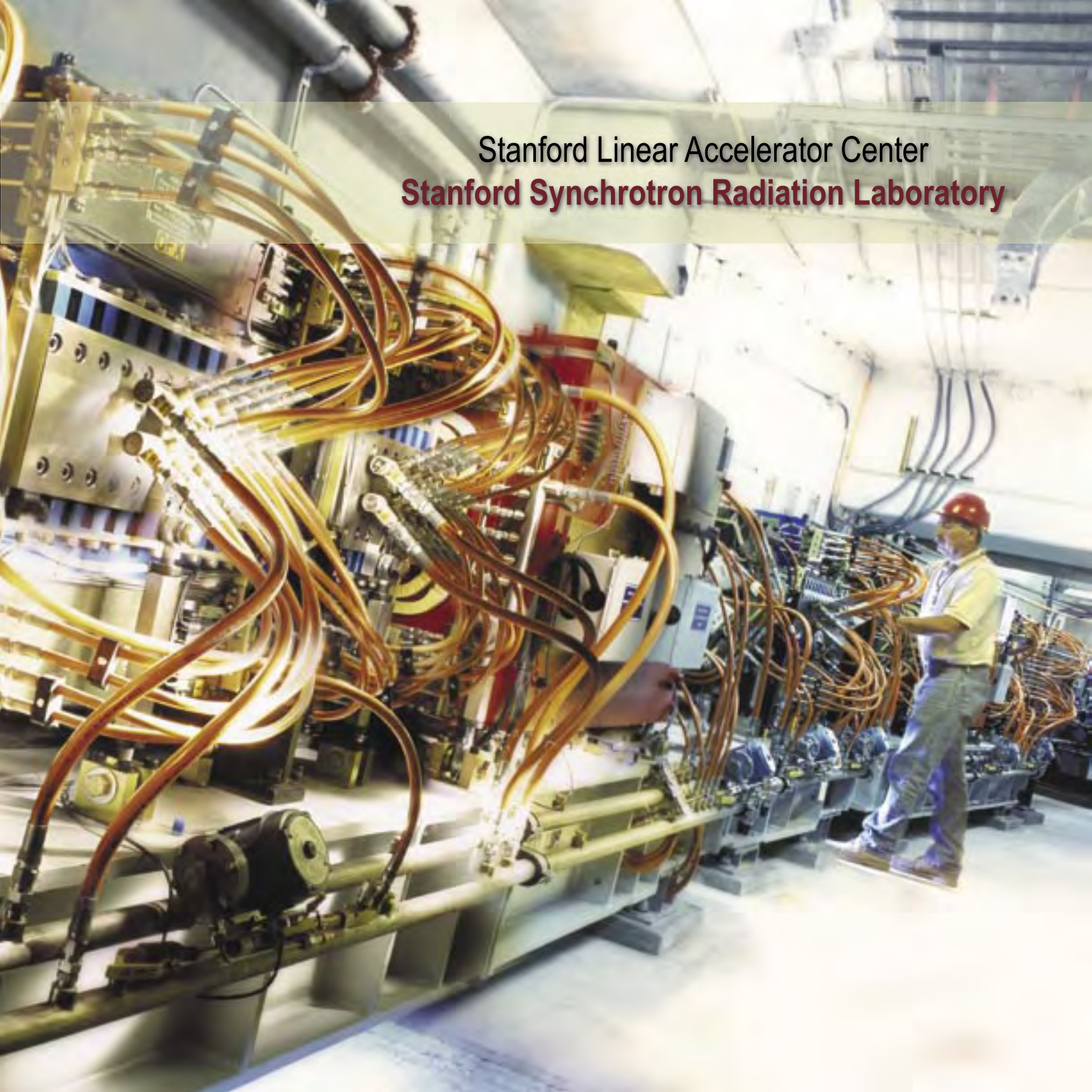


Stanford Linear Accelerator Center  
**Stanford Synchrotron Radiation Laboratory**







## THE LABORATORY

The **Stanford Synchrotron Radiation Laboratory (SSRL)** at the Stanford Linear Accelerator Center (SLAC) has provided synchrotron radiation to the scientific community for more than 30 years and is one of four lightsources funded by the U.S. Department of Energy (DOE) for scientific research. SSRL is one of the pioneering synchrotron facilities in the world, known for outstanding user support and important contributions to science and instrumentation.

Lightsource science benefits every sector of the American economy, encompassing nanotechnology, energy production, environmental remediation, and human health. Facilities like SSRL also provide unique educational experiences and serve as a vital training ground for students in the sciences.

### Public Outreach

Results from experiments conducted at SSRL are shared publicly in numerous ways, including presentations at scientific conferences, publications in peer reviewed journals, and recognition through international awards. Recent user research highlights include:

- Understanding transcription—How DNA is converted into RNA. Roger Kornberg, professor of Structural Biology at the Stanford University School of Medicine, received the 2006 Nobel Prize in Chemistry for this work, a significant part of which was conducted at SSRL's macromolecular crystallography beam lines.
- Learning how nature splits water—High-resolution structure of the active site of biological photosynthetic catalyst holds promise for the production of clean energy (*Science*, 2006).
- Chemists discover how nature makes medicine—MIT and Harvard scientist determined the atomic structure of an enzyme which catalyzes the chlorination of threonine during biosynthesis of a natural-product antibiotic. This is an example of how an enzyme can coax a reaction to generate medically valuable halogenated natural therapeutics such as anti-tumor agents and fungicides (*Nature*, 2006).
- Development of plastic semiconductors—Stanford and Merck researchers demonstrate that electrical performance of plastic semiconductors can be controlled and improved with surface treatments (*Nature Materials*, 2006).
- Steps toward hydrogen vehicles—Researchers have shown that carbon nanotubes, 50,000 times more narrow than a human hair, are a promising material for storing hydrogen safely, efficiently and compactly (*Phys. Rev. Lett.*, 2005).

## THE FACILITIES

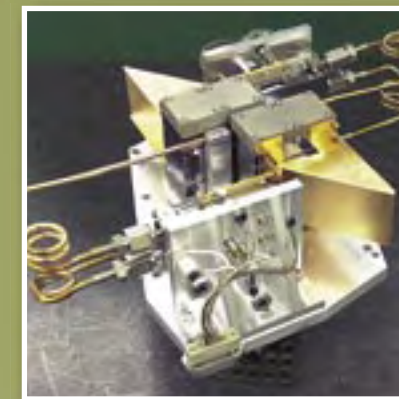
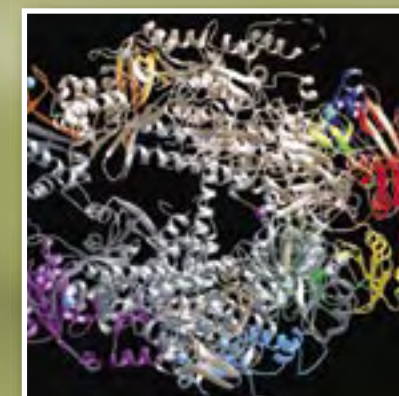
### Third Generation Light Source – SPEAR3

The Stanford Positron Electron Asymmetric Ring (SPEAR) at SSRL is a high-brightness “third-generation” storage ring, producing x-rays at an intermediate energy of 3 GeV, at 100 mA (500-mA capable).

### Experimental Facilities

Currently there are 11 beam ports on SPEAR3: 7 insertion-devices and 4 bending-magnet beam lines serve 27 experimental stations. Twenty of these stations can operate simultaneously. Several new beam lines are also under construction, with additional expansion opportunities at numerous locations around the SPEAR3 ring:

- Advanced macromolecular crystallography beam line, optimized for challenging studies (weakly diffracting crystals, ultra high resolution and large unit cells) and microcrystal experiments, based on an in-vacuum undulator source
- Soft x-ray microscopy, scattering, and advanced spectroscopy beam line, based on variable polarization undulator source
- High-throughput macromolecular crystallography station
- Hard x-ray transmission x-ray microscopy station on a wiggler source





### Future Opportunities: Ultrafast and Ultrasmall

As research techniques advance, so will the need for micro- or nano-sized x-ray beams with high-intensity, well-defined polarization and time structure. SPEAR3 offers high-brightness x-ray radiation emitted as ultrashort (about 30 ps) pulses, paving the way for the development of new instruments such as x-ray microscopes and new applications such as nanoscience. Such studies promise numerous unique insights in areas such as:

- Artificially nanostructured materials
- Biological crystals that only exist on the microscale
- Materials under extreme conditions, such as high pressure or high fields
- Materials that exhibit nanoscale dynamics (i.e., respond to excitations or naturally fluctuate on the second to picosecond time scale)



### Supporting the User Community

The experimental facilities at SSRL are scheduled and managed centrally to ensure all visiting scientists have a productive experience. SSRL provides access to beam lines, instrumentation, ancillary equipment and dedicated staff scientists and technicians in numerous areas, such as:

- Correlated and Magnetic Materials—high  $T_c$  materials and oxides with nanoscale ordering phenomena, magnetic materials and magnetic nanostructures
- Molecular Environmental Science—chemical bonding, oxidation states, micro- and nano- structures and compositions
- Structural Biology/Chemistry—local atomic coordination and bonding, macromolecular crystal structure, conformational structure of biological assemblies, nanoscale structure
- Surface and Interface Science—surface reactions, catalysis, liquid-solid interfaces



For more information on how to apply for beam time, visit us online at <http://www-ssrl.slac.stanford.edu/> and proceed to User Resources



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