

THE ADVANCED PHOTON SOURCE UPGRADE PROJECT

Building the Ultimate 3-D Microscope



The Advanced Photon Source (APS), which began operations in 1996, provides hard x-rays to more than 5,500 researchers each year from industry, universities, and research institutions, both federal and private.

The APS is a major driver of our nation's global scientific and technological competitiveness. Two Nobel Prizes have been awarded for research at the APS.

The APS Upgrade is a highly cost-effective revitalization of this facility, improving capabilities by orders of magnitude, maintaining our competitive advantage over other nations, and keeping the U.S. at the forefront of hard x-ray science for decades to come.

The Advanced Photon Source at Argonne National Laboratory is one of the most productive scientific facilities in the U.S.

With a new microscope the size of Wrigley Field, American scientists will be able to access an invisible world – the infinitesimal world where the most stubbornly difficult problems begin.

This new microscope will make it possible to see changes at the molecular level that occur:

- before a steel girder starts to crack,
- before a healthy brain succumbs to Alzheimer's,
- before an electric car's battery begins to fail.

By peering into this world, we will enable scientific discoveries to benefit human life and advance American businesses.

The U.S. Department of Energy Office of Science's Advanced Photon Source Upgrade (APS-U) at Argonne National Laboratory will be the ultimate 3-D microscope, producing the world's brightest hard x-rays and transforming our ability to understand and manipulate matter at the nanoscale. With this

powerful, versatile tool, researchers will be able to observe individual atoms moving and interacting – in real time – deep inside real samples, biological organisms and complex engineered systems.

THE CHALLENGE: MAINTAINING U.S. LEADERSHIP FOR A NEW CENTURY

Today, next-generation x-ray microscopes are being constructed in China, France, Japan, Germany, Britain, Sweden and Brazil.

The United States will cede leadership within the next 10 years without the APS Upgrade, sacrificing a critical component necessary for American innovation.

Such a shift would be a major blow for American science and industry, particularly as this fantastic technology was essentially invented in the U.S.

A HISTORY OF TRANSFORMATIONAL DISCOVERY "MADE IN THE U.S.A."

A quarter-century ago, the United States invested \$500 million in building the Advanced Photon Source (APS), which has offered the world's best source of penetrating x-rays. This groundbreaking machine expanded researchers' concept of what was possible, by creating x-rays that are one billion times more powerful than the routine x-rays delivered at doctors' offices.

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