

# THE ADVANCED PHOTON SOURCE

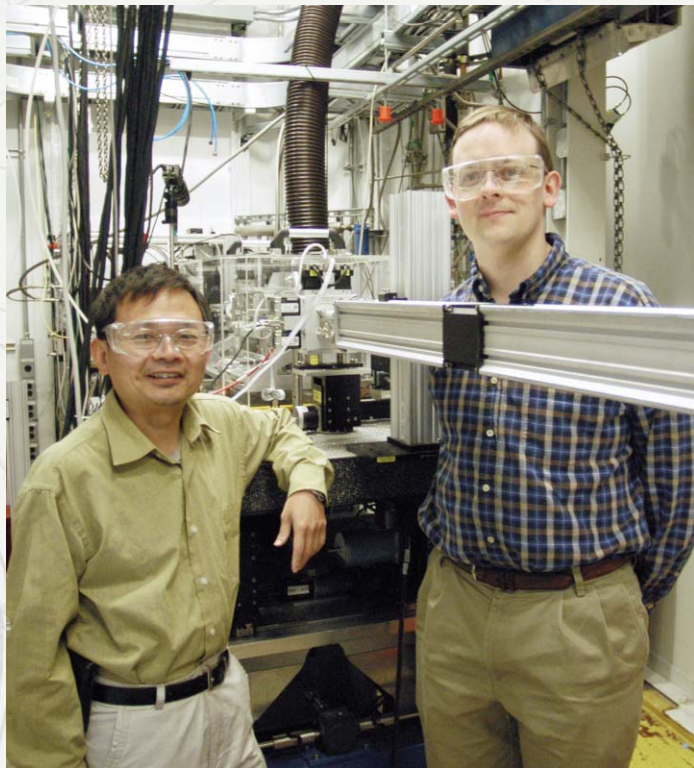
## A DEDICATED FUEL-SPRAY BEAMLINE AT THE APS

High-pressure, high-speed fuel sprays are a critical technology for engine fuel-injection systems where the structure and dynamics of the fuel sprays are the key to increasing fuel efficiency and reducing pollutants. But because liquid sprays are difficult to image with conventional (optical) techniques, particularly in the region close to the nozzle, quantitative information the structure of these sprays has been elusive. Research on this critical subject has been ongoing at the U.S. Department of Energy (DOE) Office of Science's Advanced Photon Source (APS) at Argonne National Laboratory for several years. The primary technique for these investigations has been ultrafast x-radiography carried out mainly at X-ray Science Division (XSD) Sector 1 at the APS and at the Cornell High Energy Synchrotron Source, with microsecond x-ray tomography also being employed. Results from these initial experiments, which have seen wide circulation in several peer-reviewed journals articles, have yielded information on quantitative fuel mass distribution and high-speed spray and combustion models.

Now, a dedicated fuel-spray beamline is in operation on the XSD 7-BM bending magnet beamline at the APS. This new resource is made possible through a partnership between the DOE Office of Vehicle Technologies/Office of Energy Efficiency and Renewable Energy (VT/EERE) and the DOE Basic Energy Sciences (BES) Program.

The facility provides fast x-ray imaging techniques for experiments in a new, centralized resource for cutting-edge research on transportation engine technologies, high-throughput measurement of fuel sprays and combustion via the synchrotron x-ray techniques, microsecond x-radiography, and microsecond x-tomography for a large user community.

The VT office made a significant investment in the 7-BM beamline, that supports ultrafast ( $\mu\text{s}$ ) x-radiography, ultrafast ( $\mu\text{s}$ ) x-tomography, high beam intensity, wide-bandpass mono ( $10^{13}$ - $10^{14}$  ph/s, tunable from 6 to 12 keV), and flexible beam size. Instrumentation includes a sagittal focusing double-multilayer monochromator, a harmonics rejection mirror for use with ultrafast area detectors, a secondary Kirkpatrick-Baez focusing mirror



*Jin Wang (left) and Alan Kastengren in the 7-BM research station.*

for use with point detectors, modular sample stations, pressurized chambers, unpressurized chambers, and rapid compression machines. Major emphasis is placed on safe operation with the sample under high-pressure, high-temperature conditions.

Beamline 7-BM is expected to be one of the APS flagship beamlines for industrial applications on energy-related projects and a symbol of collaborations between BES and EERE.

The beamline is in full operation and is now accepting general users through the APS General User Program (see below). For more information regarding this beamline, contact Jin Wang ([wangj@aps.anl.gov](mailto:wangj@aps.anl.gov)) or Alan Kastengren ([akastengren@anl.gov](mailto:akastengren@anl.gov)).

### CALL FOR APS GENERAL-USER PROPOSALS

The Advanced Photon Source is open to experimenters who can benefit from the facility's high-brightness hard x-ray beams.

**General-user proposals for beam time during Run 2013-2 are due by Friday, March 8, 2013.**

Information on access to beam time at the APS is at [http://www.aps.anl.gov/Users/apply\\_for\\_beamtime.html](http://www.aps.anl.gov/Users/apply_for_beamtime.html) or contact Dr. Dennis Mills, [DMM@aps.anl.gov](mailto:DMM@aps.anl.gov), 630/252-5680.

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