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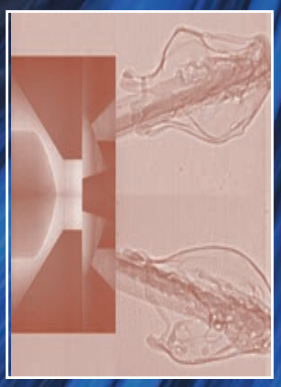
OUR ENERGY FUTURE

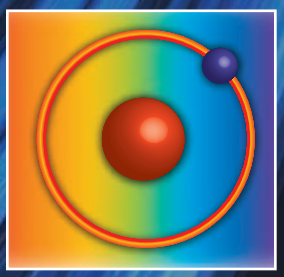
AND THE ADVANCED PHOTON SOURCE

Lighting the way to a brighter energy future is a major focus of photon science at the U.S. Department of Energy's Advanced Photon Source at Argonne National Laboratory

Fuel injector efficiency and clean engine combustion require the best mixture of fuel and air. To improve injector design, it is critical to understand how fuel is atomized as it is injected. Standard imaging techniques have failed due to the high density of the fuel jet near the injector opening. Scientists using the Advanced Photon Source have developed an x-ray imaging technique that peers through high-speed, dense liquids and can be used to examine the internal structure of liquids at the moment they leave an injector nozzle (image at right). Contact: fezzaa@aps.anl.gov



Looking for ways to conserve energy is leading Argonne scientists to explore unexpected but important avenues. Utilizing three Department of Energy facilities at Argonne, including the Advanced Photon Source, the scientists studied the oxide scale that protects alloys from corrosion. Their research indicates that a change in the composition of the scale on alloy surfaces could save over $1 billion per year in lost energy for the U.S. hydrogen industry alone. Contact: natesan@anl.gov



Over millions of years, plants evolved the ultimate renewable energy resource: photosynthesis. Plants absorb light from the sun, produce a flow of electrons, and then use the electrons to power the chemical combination of carbon dioxide from the air with water to make their food. Oxygen is the main by-product of this process. Researchers using an x-ray beamline at the Advanced Photon Source are looking for ways to take a leaf out of nature's book, tap into that electron flow step, and convert solar energy directly into electricity. Contact: m-wasielewski@ northwestern.edu

Photo courtesy ESA, NASA, SOHO/EIT)

The Advanced Photon Source (APS) at the U.S. Department of Energy's Argonne National Laboratory provides this hemisphere's brightest x-ray beams for research. Scientists and engineers using the APS help assure a bright future for our nation by carrying out research that promises to have far-reaching impact on our technological and economic competitiveness, our health, and our fundamental knowledge of the materials that make up our world.

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Background photo: https://wiki.bc.net

The fuel-spray experiments were carried out by researchers from Argonne National Laboratory, the Mayo Clinic, and the Visteon Corporation using the X-ray Operations and Research 32-ID x-ray beamline at the Advanced Photon Source.

See: Yujie Wang, Xin Liu, Kyoung-Su Im, Wah-Keat Lee, Jin Wang, Kamel Fezzaa*, David L.S. Hung, and James R. Winkelman, "Ultrafast X-ray study of dense-liquid-jet flow dynamics using structure-tracking velocimetry," Nat. Phys. **4,** 305 (April 2008).

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The alloy research was carried out by scientists from Argonne National Laboratory using the X-ray Operations and Research beamline 2-ID at the Advanced Photon Source.

See: Z. Zeng, K. Natesan*, Z. Cai, and S.B. Darling, "The role of metal nanoparticles and nanonetworks in alloy degradation," Nat. Mater. **7**, 641 (2008).

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The solar energy research was carried out by scientists from Northwestern University, Argonne National Laboratory, and Kyoto University using the X-ray Operations and Research/BESSRC beamline 12-ID at the Advanced Photon Source.

See: Richard F. Kelley, Suk Joong Lee, Thea M. Wilson, Yasuyuki Nakamura, David M. Tiede, Atsuhiro Osuka, Joseph T. Hupp, and Michael R. Wasielewski*, "Intramolecular Energy Transfer within Butadiyne-Linked Chlorophyll and Porphyrin Dimer-Faced, Self-Assembled Prisms," J. Am. Chem. Soc. **130**, 4277 (2008).

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