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current events

This section carries events of interest to the synchrotron radiation community. Works intended for this section should be sent direct to the Current-Events Editor (s.s.hasnain@liverpool.ac.uk).

Construction of NSLS-II is more than 70% complete

Brookhaven National Laboratory recently celebrated two major construction milestones: completion of the massive ring building and commissioning of the light source's linear accelerator, declaring that the construction of the USD 912 million National Synchrotron Light Source II (NSLS-II) is more than 70% complete. This is currently the largest synchrotron radiation construction project in the world.

'This is an exciting time for the project', said Steve Dierker, NSLS-II Project Director and Associate Laboratory Director for Photon Sciences. 'With the ring building complete, we are moving quickly to install the accelerator and start bringing in components for the experimental stations.' Torcon, Inc., the general contractor for the ring building, began work in April 2009 under a USD 170 million contract, the single largest contract in the NSLS-II construction project. Torcon spent about 90% of its contract to hire subcontractors and suppliers on Long Island and in the region, bringing direct economic benefit to Long Island and New York State. Construction of the ring building was carried out in five sections, the first completed in March 2011 and the final section in February 2012, when Brookhaven Laboratory took official occupancy of the building. The laboratory has started installing equipment and components for the facility's accelerator and experimental stations. Installation of the linac was completed in February and commissioning started at the end of March. We look forward to reporting installation and commissioning of the rest of the accelerators in the NSLS-II accelerator complex as well as the commissioning of experimental beamlines and first scientific results.

A recent aerial view of NSLS-II.

Steve Kevan named ALS Deputy Division Director for Science

Steve Kevan will be joining the Advanced Light Source (ALS) management team as Deputy Division Director for Science from July 2012. Kevan, currently Professor of Physics at the University of Oregon, is a longtime active ALS user and has been a member of the ALS Scientific Advisory Council for several years as well as a member, and Chair, of the ALS Users' Executive Committee.

Dr Kevan gained his PhD in Physical Chemistry from the University of California, Berkeley, in 1980, where he worked with former Lawrence Berkeley National Laboratory Director David Shirley. After completing his PhD, Kevan worked at AT&T Bell Laboratories where he developed new instrumentation for performing high-resolution angle-resolved photoemission at the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory. He moved to the University of Oregon in 1986 and subsequently moved his research program from the NSLS to the ALS. He led the construction of beamline 12.0.2.2, which was an early step toward a dedicated and flexible coherent soft X-ray scattering and imaging beamline that is culminating with the construction of the COSMIC facility.

First high-resolution protein structure analysis demonstrates potential of free-electron lasers for obtaining atomic details from protein crystals

An international team led by the US Department of Energy's SLAC National Accelerator Laboratory has recently reported the first high-resolution (1.9 Å) structure determination of a protein using the Linac Coherent Light Source (LCLS) X-ray laser revealing all of the atomic details (*Science*, doi:10.1126/science.1217737). The team's work with lysozyme represents the first ever high-resolution experiments using serial femtosecond crystallography – the split-second imaging of tiny crystals using ultrashort ultrabright X-ray laser pulses from LCLS. The study was performed on the recently installed Coherent X-ray Imaging (CXI) instrument with 1.32 Å X-rays and used microcrystals measuring typically only 1 µm × 1 µm × 3 µm (https://slacportal.slac.stanford.edu/sites/lcls_public/instruments/cxi/Pages/default.aspx). Millions of small lysozyme crystals flowed through the laser beam in a liquid jet. From approximately 3.5 million X-ray flashes, the scientists registered about 100000 hits, enabling the lysozyme structure to be determined with a resolution of 1.9 Å.

Sébastien Boutet, a staff scientist at LCLS who led the research, said 'We were able to actually visualize the structure of the molecule at a resolution so high we start to infer the position of individual atoms'. He added "Not only that, but the structure we observed matches the known structure of lysozyme and shows no significant sign of radiation damage, despite the fact that the pulses completely destroy the sample. This is the first high-resolution demonstration of the 'diffraction-before-destruction' technique on biological samples, where we are able to measure a sample before the powerful pulses of the LCLS damage it". Co-author Ilme Schlichting from the Max Planck Institute for Medical Research in Heidelberg, Germany, said 'The good agreement benchmarks the method, making it a valuable tool for systems that yield only tiny crystals'.

The experiment was the first study performed on the new CXI instrument, designed, built and commissioned by SLAC and now available to the scientific community. Also key to the study was a novel custom-made detector, the Cornell–SLAC Pixel Array Detector (CSPAD), developed in collaboration between Cornell University and SLAC for use at the CXI instrument. Members of the international team included researchers from Max Planck Institutes, DESY, Arizona State University, Cornell University, SUNY Oswego, The Johns Hopkins University Applied Physics Laboratory, the Nikhef National Institute for Subatomic Physics, the European Synchrotron Radiation Facility, the University of Gothenburg, the University of Hamburg, the University of Lübeck and Uppsala University.

Tunnel construction for the European X-ray Free-Electron Laser completed

The European X-ray Free-Electron Laser (European XFEL) reached an important milestone: the construction of the network of tunnels, which total nearly 5.8 km in length and extend 3.4 km from Hamburg-Bahrenfeld to Schenefeld in Schleswig-Holstein, is now finished. The 11 sectors of the underground facility were completed according to plan. With an investment of more than EUR 1 billion, including EUR 240 million for the construction of the tunnels and other underground buildings, the new international research facility is one of the largest scientific projects on German territory. The European XFEL is expected to come into operation in 2015.

Professor Massimo Altarelli, Managing Director of European XFEL GmbH, said ‘The construction of the tunnels is one of the most difficult building phases. We are glad that this task could be completed according to plan and that we could keep costs within the tight budget targets we set at the time the contract was awarded.’ Professor Helmut Dosch, Chairman of the Board of Directors of Deutsches Elektronen-Synchrotron (DESY), said ‘With the timely tunnel boring completion, we reached an important milestone for this unique research facility. A lot of earth and concrete work will now be followed by the installation of technical infrastructure and, finally, the accelerator components. These additional construction phases of the facility are now, so to speak, DESY’s core business.’

The accelerator tunnel is the longest tunnel of the accelerator facility. It runs in a straight line for 2.1 km through Hamburg’s underground. The tunnel system eventually branches out into five so-called ‘photon tunnels’, which lead into the future experiment hall. Between the accelerator tunnel and the photon tunnels are the so-called ‘undulator tunnels’, which contain special magnet structures or undulators. First, the tunnels will be equipped with the necessary infrastructure and safety devices. Then, the main components of the facility will be installed: the superconducting electron linear accelerator, whose development, installation and operation will be conducted by DESY, and the photon tunnels, undulator lines and experiment hall, whose equipment and instrument installation will be led by the European XFEL. Experiments are expected to start in 2015.

Group photograph marking the occasion of the arrival of the tunnel boring machine in the final reception shaft.