Journal of
Synchrotron
Radiation

ISSN 0909-0495

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@liv.ac.uk).

Another Nobel Prize linked to synchrotron radiation work

The 2008 Nobel Prize in Chemistry went to Osamu Shimomura, Martin Chalfie and Roger Tsien 'for the discovery and development of the green fluorescent protein, GFP'. This year's Nobel Prize in Chemistry rewards the initial discovery of GFP and a series of important developments which have led to its use as a tagging tool in bioscience. By using DNA technology, researchers can now connect GFP to other interesting, but otherwise invisible, proteins. This glowing marker allows the movements, positions and interactions of the tagged proteins to be monitored.

Osamu Shimomura was the first to isolate GFP from the jellyfish *Aequorea victoria*, found off the west coast of North America, and discovered the protein's green glow [Shimomura *et al.* (1962). *J. Cell. Comp. Physiol.* **59**, 223–240]. Martin Chalfie demonstrated the value of GFP as a luminous genetic tag. In one of his first experiments he coloured six individual cells in the transparent roundworm *Caenorhabditis elegans* with the aid of GFP. He had obtained the GFP gene (*gfp*) clone from Prasher [Prasher *et al.* (1992). *Gene*, **111**, 229–233] and expressed it in *E. coli.* The GFP protein displayed a bright green fluorescence in this heterologous organism, suggesting that it could indeed serve as a versatile genetic marker in virtually all organisms. Chalfie transformed *C. elegans* with *gfp* under the control of a promoter regulating the expression of β-tubulin, abundant in six touch receptor neurons in *C. elegans.* The organism subsequently expressed GFP from distinct positions in its body and at distinct times in its development [Chalfie *et al.* (1994). *Science*, **263**, 802–805].

Roger Tsien contributed to the general understanding of how GFP glows by determining the formation of the GFP chromophore, a chemical group that absorbs and emits light. Tsien is best known for extending the colour palette of GFP beyond green, allowing researchers to follow several different biological processes at the same time. According to background on the Nobel Prize website, 'An important step forward, allowing for rational design of mutants, was the solution of the crystal structure of GFP . . . '. Tsien collaborated with Jim Remington and his team who solved the structure of GFP at 1.9 Å using data in part collected at NSLS beamline X4A. Tsien and Remington were able to use the structural information and design specific mutants (Thr203, to Tyr or His) which resulted in significantly red-shifted excitation and emission maxima and thus converting GFP into YFP (yellow fluorescence protein) [Ormo *et al.* (1996). *Science*, **273**, 1392–1395]. Acknowledging the contribution of NSLS Brookhaven, University of Oregon scientist Remington said 'The data collected at beamline X4A were essential to solve the structure of GFP. We were unable to solve the structure using native and heavy-atom-derivative data sets collected at home'. Remington added 'In those days the technology to flash freeze crystals had not been fully worked out and so diffraction data had to be collected at temperatures above freezing. Crystal lifetime was very short. At X4A, a crystal cooling system enabled data collection at close to zero degrees Celsius, extending the crystal lifetime, while the intense beam permitted data to be collected at significantly higher resolution. In addition, the tunable nature of the source allowed us to collect data at the selenomethionine absorption edge, which dramatically improved the signal for phasing purposes. The improved phasing, combined with higher resolution data, resulted in an interpretable electron density map. The first look at the GFP chromophore in that electron density map was one of the most exciting moments of my entire career.'

Roger Tsien, who shared the 2008 Nobel Prize in Chemistry.

STFC Daresbury Laboratory's ALICE accelerates to 4 million volt milestone

A major milestone has been achieved in the completion of the UK's next-generation particle accelerator, ALICE, which is set to produce an intense beam of light that will revolutionise the way in which accelerator-based light source research facilities will be designed in the future.

To mark the occasion, ALICE was visited on 13 November 2008 by HRH Duke of Kent, a cousin of the Queen and HRH Duke of Edinburgh, as part of his visit to the Daresbury Science and Innovation Campus. On 23 October, ALICE, after more than four years of planning and construction, achieved its first high-energy beam. This brings ALICE a step closer to its completion and to achieving its goal of energy recovery, a critical requirement for the economic viability of such future light sources.

Neil Bliss (right), the project engineer of ALICE, explaining the concept of ALICE and EMMA to HRH Duke of Kent.

Colin Whitehouse, Head of Daresbury and Deputy Chief Executive of STFC (right), explaining the current status and future plans of the Daresbury Science and Innovation campus to HRH Duke of Kent. In the background is Professor Keith Mason, Chief Executive of STFC.

The first high-energy beam was achieved using ALICE's photo-injector, which fired a beam of electrons into a superconducting linear accelerator, creating a particle beam with a total energy of almost 4.5 million electron volts. The photo-injector is a high-brightness electron gun capable of generating extremely short pulses of electrons, less than a hundred picoseconds in duration. These pulses are fired into the first linear accelerator (known as the booster) at a rate of 81 million shots per second. The booster is maintained at a temperature of 2 K, at which temperature it becomes superconducting and capable of sustaining very high electric and magnetic fields. This accelerated beam will eventually be used to generate pulses of infrared, ultra-violet and X-ray light, creating the ultimate stroboscopic light source capable of making real-time movies of chemical reactions at the atomic level.

Susan Smith, Head of the Accelerator Physics Group at Daresbury Laboratory, said "This is a significant milestone towards ALICE's main target of demonstrating energy recovery. Energy recovery means that the energy used to create the beam is recovered and re-used after each circuit of the accelerator, so the best beams of light scientists will ever have used can also be produced most cost-effectively. Achieving the first high-energy beam is a significant step forward for the scientists and engineers at STFC Daresbury Laboratory who can now move on to commissioning the full accelerator system and demonstrating energy recovery."

Synchrotron scientist takes Chair of the DESY Directorate

Professor Helmut Dosch will become the new Chair of the Directorate of DESY, where synchrotron radiation work started in 1964 as a minor parasitic use of the 6 GeV electron synchrotron designed and built for high-energy physics research. This appointment symbolizes the success of DESY as a major photon science institute where many of the former high-energy physics accelerators have been transformed into major dedicated synchrotron radiation sources. With the successful completion of FLASH, a free-electron laser source in the VUV and soft X-ray region, and the launch of the European X-ray Free Electron Laser project (E-XFEL), DESY has become the host of some of the most advanced light sources in the world.

Solid-state physicist Dosch, presently the Vice-Chair of the ESRF Council, is a full-time director of the Max Planck Institute for Metals Research in Stuttgart and professor at the University of Stuttgart. On 1 March 2009 he will replace Professor Albrecht Wagner as Chair of the DESY Directorate, who has served as DESY Director since 1999. Commenting on the appointment, Wagner said 'I am very pleased to be able to welcome Helmut Dosch, an outstanding scientist and experienced leader, as my successor. With him at the helm, DESY will be well prepared for future challenges.' Dosch said 'DESY is a brand name standing for top research worldwide. With the new accelerator facilities which are currently built in Hamburg, DESY will shed light on so far unexplored dimensions in nanospace and will continue to play a leading role in the international top league of large-scale research.'

India agrees to set up a dedicated beamline at the Photon Factory in Japan

On 22 October 2008 the High Energy Accelerator Research Organization (KEK), Japan, and the Department of Science and Technology (DST), India, signed a Memorandum of Understanding (MoU) on Scientific and Technological Cooperation between the two parties in order to further strengthen the cooperation between the two countries. Setting up an Indian beamline at the Photon Factory in KEK is included in this MoU.

Beamline 18B is to be used by Indian researchers. The DST will set up X-ray diffractometers and two-dimensional detectors for structure analysis of nanomaterials, solid and liquid surfaces, thin films *etc.* Other users can use the equipment and the beamline for up to 50% of the available user beam time after the commissioning is over. Research probes, such as studying the X-ray reflectivity and diffuse scattering from solid and liquid interfaces, on-line growth and structural characterization of thin films and nanostructures using ultra-high-vacuum systems are included.

This idea was proposed in March 2007 at the India–Japan Science Council meeting held by the Japan Society for the Promotion of Science (JSPS). After the discussions between KEK and DST, a Letter of Intent (LoI) was signed in July 2007. This LoI was welcomed by the Prime Ministers of both countries in the joint statement made in August 2007, when former Japanese Prime Minister Abe visited India. After detailed technical discussions and formal procedures, KEK and DST signed the MoU during the visit of the Indian Prime Minister Dr Singh.

Osamu Shimomura, Director of the Institute of Materials Structure Science in KEK (left), and H. K. Singh, Ambassador of India to Japan (right), exchanging the MoU at the signing ceremony.

ESRF gets approval for upgrade programme

On 25 November 2008, at its 50th council meeting, the ESRF Council approved a 10% budget increase for 2009, to start a 177 million Euro upgrade programme over the next seven years (2009–2015). The main element of this programme is the development of new world-class experimental stations (beamlines), which will gradually enter into service in 2011 [for previous coverage, see *J. Synchrotron Rad.* (2008). **15**, 195–197]. The ESRF was inaugurated in 1994 and was one of the first large-circumference storage rings with insertion devices as the main source of X-ray radiation. It contributes to a significant fraction of science emanating from the use of synchrotron radiation sources. Commenting on the decision, Chairman of the ESRF Council, Professor Robert Feidenhans, said 'I am convinced that the upgrade programme will ensure the competitiveness of the ESRF for the benefit of Europe and European science'.

STFC Daresbury Laboratory senior staff Pat Ridley (far left) and Paul Quinn (far right), together with Chris Llewellyn-Smith and Herwig Schopper, standing next to the first shipment of beamlines which arrived at SESAME from Daresbury prior to the inauguration ceremony.

Director-General of UNESCO inaugurates the building of SESAME

Mr Koïchiro Matsuura, Director-General of UNESCO, visited the Hashemite Kingdom of Jordan to inaugurate the International Centre for Synchrotron Light for Experimental Science and Applications in the Middle East (SESAME). Prior to this ceremony, the Director-General was received in audience, on 3 November, by HM King Abdullah II of Jordan. During their meeting, held in the presence of HRH Prince Ghazi bin Muhammad bin Talal, Mr Tayser Al-Nahar Al Noaimi, Minister of Education, and Mr Khaled Toukan, Director of the SESAME Centre, the fruitful cooperation between Jordan and the organization was discussed.

The 'soft inauguration' ceremony of SESAME was performed by Mr Matsuura and HRH Prince Ghazi bin Muhammad bin Talal. The ceremony was placed under the auspices of HM King Abdullah II and took place in the presence of ministers and representatives from SESAME member and observer countries, as well as numerous ambassadors and members of the international scientific community. This inauguration marks the handing over of the building to SESAME and the installation of its secretariat. Mr Matsuura emphasized the fact that SESAME would provide the region with a world-class laboratory for basic research ranging from physics to the biological and medical sciences and archaeology; it is a major opportunity to boost science and technology in the Middle East, helping to promote economic growth and transform the region into a leader of innovation. Mr Matsuura also underlined the key opportunity offered by SESAME to promoting peace through science: 'Such a collaboration will not only help foster greater solidarity and mutual understanding; the bringing together of diverse cultures will also create an enriching environment, conducive to open debate, fresh thinking and inventiveness', said the Director-General.

In this context, Mr Matsuura paid tribute to the many countries, such as Germany, France, Switzerland, the USA and the UK, that are providing SESAME with the equipment and beamlines necessary for it to function. 'I applaud this demonstration of international solidarity. It is a perfect example of how the north can help develop scientific capacity in the south', he underlined. In his address, Professor Herwig Schopper, who is handing over the presidency of the SESAME Council to Professor Sir Chris Llewellyn-Smith, warmly thanked the Director-General of UNESCO for his unwavering support since 1999 and personal efforts to bring this unique and innovative project to fruition. 'Without his support', he said, 'we would not have been able to set up such a cutting-edge research laboratory in the Middle East'.

Amor Nadji, Machine Director of SESAME, explaining the layout of the SESAME booster synchrotron and the microtron injector which has been recently commissioned.

Khaled Toukan signing a MoU at the 13th Council Meeting of SESAME for receiving a gift of several beamlines from Daresbury Laboratory. Dincer Ulku (Vice President of the Council), on the right-hand side, looks on, with Herwig Schopper and Chris Llewellyn-Smith, the past and current presidents of the Council, standing behind.