



## Engineering the Big Bang

The LHC's 27km of cutting edge technology required the cooperation and coordination of thousands of scientists and engineers from around the globe. The official switch on was the culmination of 11 years of hard work and dedication for many members of staff in STFC's Technology Department.

The technical achievements of the LHC are staggering; the data produced in the CMS detector is the equivalent of 2,000 CDs produced every second. The contribution made by the Technology Department has been particularly significant. For example, it designed and developed the End Cap Toroid (ECT) Magnets for ATLAS: huge 130 tonne superconducting magnets designed for particle tracking. The

*Continued back page*

*Merry Christmas and a  
happy new year to all our readers*



# Movers and shakers



1 **Laurent Chapon** (ISIS) has been appointed Visiting Professor at the CRISMAT laboratory (Crystallography and Materials Science) in Caen, France.



2 **David Neeley** (CLF) has been appointed as one of the recipients of the Professor Mitsuyuki Abe chair by Proton Medical Research Center. These positions are visiting appointments made by PMRC that honour the pioneer of hadron therapy in Japan.



3 **Sean Langridge** (ISIS) has been appointed Visiting Professor of Physics at Durham University.



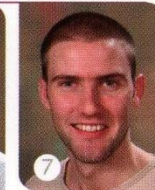
4 **Tristan Davenne** (Technology) has been appointed Industrial Liaison Officer by the IMechE. Tristan is putting together a register of STFC IMechE members. If you would like to be included, please send him your membership status. If you have any questions about IMechE please give him a call.



5 **Rob Ivison** (ATC) was awarded the Premier Prix by the Societe Francaise d'Astronomie et d'Astrophysique and the Royal Astronomical Society at a joint meeting in Paris on 3 July. The medal was presented by Dr Alain Omont, Research Director at CNRS. Dr Omont cited Rob's



successful collaborations with French astronomers, particularly following his discovery of submm galaxies using SCUBA in 1997, and later during his survey of their molecular gas properties, in a project he co-led with Professor Reinhardt Genzel and which used the IRAM Plateau de Bure Interferometer.



6 **Bob Stevens** (Technology) and his team in MNTC have won a Medical Futures Innovation Award for their novel use of nanotechnology processes and coatings to improve the performance of surgical implants. The team uses electrospinning synthesis, electrospray coatings and etching processes to pattern nanoscale features on the surfaces of implants which help them bond to natural tissues.

Over the summer, 7 **Matt Rooney** (Technology) was awarded a BA Media Fellowship. The scheme enables young scientists and engineers to learn about the media first hand and increase the positive coverage of science stories. Matt worked for the Times Higher Education and covered the BA Festival of Science in Liverpool.

Congratulations to **Guillermo Minguez**, a CMSD funded student who has been awarded a Gold Medal at the European Young Chemist Awards 2008 for his PhD work entitled "Porous Material Behaviour in a Non-Porous Material: Gas Uptake of Small Molecules Involving Multiple Structural Changes".

## CLF staff are celebrating the completion of the upgrade of Vulcan's Target Area West.

The changes will enhance the short pulse capabilities that the target area can offer and open up further opportunities for fast ignition inertial fusion experiments. Target Area West was officially reopened on 5 September by Professor Ciaran Lewis, Chairman of the Vulcan's Facility Access Panel.



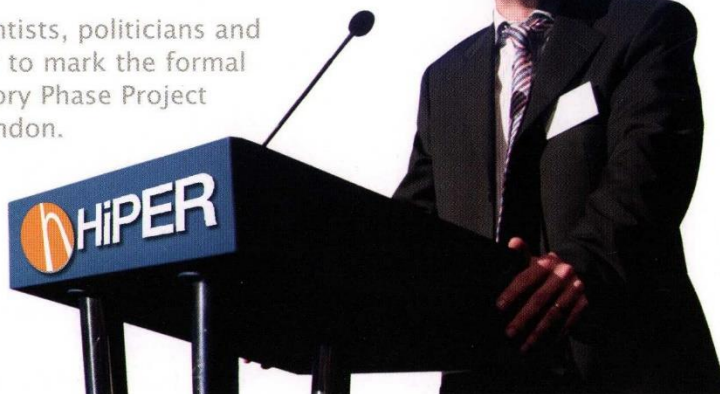


# HiPER Launch

On 6 October 2008 250 scientists, politicians and journalists gathered together to mark the formal launch of the HiPER Preparatory Phase Project at the Science Museum in London.

HiPER (High Power laser Energy Research) is a proposed facility dedicated to demonstrating the feasibility of laser driven fusion as a future energy source. STFC is leading the consortium that is composed of national funding agencies and research institutes across Europe. There are also strong international links to programs in USA, Japan, Republic of Korea, Russia, China and Canada.

The Preparatory Phase will run for three years and is designed to assess the options for future construction of the facility in terms of technology choices



(e.g. repetition rate) and the associated impact, feasibility and cost.

This prestigious launch event was hosted by Professors Mike Dunne and John Wood in the IMAX theatre at the Science Museum in London and was attended by representatives from the 26 partner institutions

as well as politicians and journalists. One highlight of the event was the first showing of the HiPER film which describes the process of laser driven fusion and highlights the benefits of this approach. The film, along with photographs of the event can be viewed at [www.hiper-laser.org](http://www.hiper-laser.org).

## Watching liquids separate at white heat

Even during its final days the Synchrotron Radiation Source (SRS) at Daresbury continued to produce ground breaking papers.

Scientists from Aberystwyth, Paris, Oréans and Chicago have just reported in Science Magazine the discovery of white hot liquids separating into two different states - one lighter and more perfect than the other. Using a special laser heated furnace they melted aluminium and yttrium oxides at temperatures approaching the surface of the sun, forming drops that were floated on a stream of gas. When intense X-rays from the SRS at Daresbury were fired at these

shimmering spheres, the scattered radiation revealed the liquids separating and then reformed as the temperature dropped below the melting point. The X-rays enabled the team to measure the different states of the same liquid at the atomic level and the different capacities of each to hold heat. This is the first time the phenomenon has been seen in any liquid at any temperature. Professor Neville Greaves from Aberystwyth University, who led the team said, "What we have

discovered at these colossal temperatures will have profound implications for understanding liquids in general, both at the high temperatures and pressures in the earth's metallic core, for example, or at room temperature in biological liquids. Most of our body mass is water and it is likely that the dissolved enzymes and proteins adopt different water states depending on their operation."





# Gateway Technology Centres

Five new Technology Gateway Centres will form a key part of STFC's strategy for developing the Daresbury and Harwell Science and Innovation Campuses. Capital funding for the first three - described here - has been approved by the Department for Innovation, Universities and Skills.

## The Hartree Centre

£50M has been provided from the Large Facilities Capital Fund to build and equip the Hartree Centre as a new kind of computational sciences institute for the UK. It will seek to bring together academic, government and industry communities and focus on multi-disciplinary, multi-scale, efficient and effective simulation. The goal is to provide a step-change in modelling capabilities for strategic themes including energy, life sciences, the environment, and materials.

If you would like to find out more about the Hartree Centre, Adrian Wander and Richard Blake will be hosting special OPB events at DL and RAL in January. More information will be available soon.



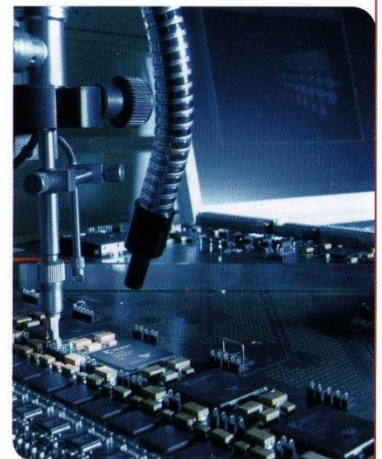
## Imaging Solutions Centre

The Imaging Solutions Centre (ISC) will also be based at RAL. It will provide one-stop solutions through new skills and imaging technology. The ambition is to provide new imaging capabilities, and enhanced access to the existing specialist large-scale facilities, which will both improve the productivity of specialist users, and assist non-specialist users in tackling new applications. The ISC will include expertise from the STFC, UK universities and industry.

The ISC will thus bring together:

- Leading large-scale radiation sources (ISIS, Diamond Light Source, CLF etc.)
- Leading laboratory-scale imaging techniques (e.g. electron microscopy)
- Advanced visualization & data interpretation software
- Imaging R&D
- Leading detector technology – in partnership with the Detector Systems Centre
- Computational modeling – in close collaboration with the Hartree Centre
- Imaging users & imaging providers to define a development path

The ISC will focus initially in one area: the real-space imaging of materials and components using photons (from X-ray to IR), neutrons and electrons. This encompasses both the structure of materials (including biological materials) and material properties (e.g. stress) that vary as a function of position within a sample or component.



Such techniques may be used to image a wide range of materials and components, over a range of length scales – from nanometres to millimetres. The potential subjects to be studied will include living cells, sub-cellular structures, advanced engineering materials, nano-materials, engineering components, fuel cells and semiconductors. The new ISC would therefore make a step change in the use of STFC's facilities by industry – while also enabling exciting new academic research to be pursued.



# take shape

## Detector Systems Centre

The Detector Systems Centre (DSC) will act as a focus of collaboration between STFC, universities and industry for the development of detector technologies for a wide range of scientific and commercial applications. The DSC will be based at RAL and DL, building on the existing strengths in detector systems development and microelectronics design on both sites. It will also be the hub of a network that will include the UKATC, university groups and commercial organisations.

At the heart of the DSC's activities will be addressing scientific requirements collaboratively across STFC and with university groups, but strong partnerships with industry will facilitate the exploitation of emerging technologies into new application areas and introduce commercial practices and technologies into the development chain.

The DSC represents an opportunity to deliver a UK lead in several detector systems technologies through collaborations between STFC, academia and industry with accompanying benefits to the UK science programme and increased economic impact.

The Centre will also collaborate with leading universities to provide a strategic training programme to develop detector engineers and physicists. This will give students access to key STFC technology and placements at large scale facilities in the UK and abroad.

## Daresbury bids a fond farewell

There have been several events to mark the closure of the SRS at Daresbury. The formal switch off was on 4 August. (Reported in the summer edition of FACTS).

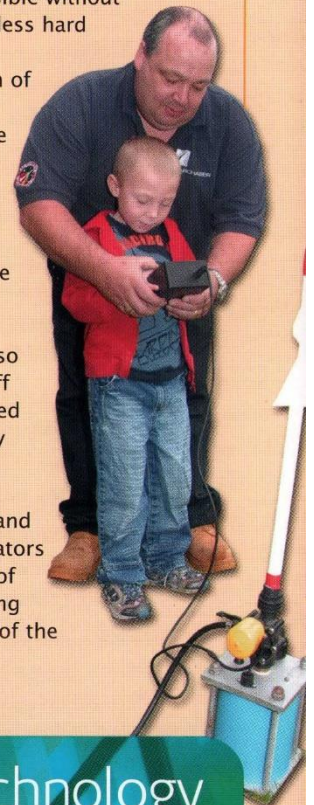
Other events have included a friends and family day attended by over 1500 people. Many of the visitors stayed a lot longer than planned.

During the day, the Laboratory hosted events as far reaching as Starchaser the largest rocket launched from UK soil to making your own molecular structure. Around the SRS visitors could complete a self guided tour which entered many of the areas normally closed to the public. A program of lectures ranged from Prof. Neil Marks (ASTEC) to Galileo.

The displays varied from the history of computers, including fantastic hands-on demonstrations of computer games to seven birds of prey. Following injury, the birds had been rescued by the Corio Raptor Care and Rehabilitation Charity, and cannot be released back into the wild. Both Keele University and the Manchester Science and Industry Museum

were on site to help and excite the enthusiastic audience.

The event would not have been possible without the relentless hard work and dedication of the staff behind the scenes who had spent months putting the program together. Thanks also to the staff who worked on the day acting as guides, stewards and demonstrators for many of the budding scientists of the future.



## Micro and Nanotechnology Centre (MNTC)

There is a new era at RAL with the relaunch of the CMF as the newly-formed Micro and Nanotechnology Centre (MNTC). Under the leadership of Justin Greenhalgh, the new Centre will utilise the skills and experience of more than 30 scientists and process engineers. The Centre specialises in chip and device R&D for micro and nanotechnology devices and process development. The Centre has strong links with other STFC departments and several spinout companies are exploiting MNTC ideas. For more information, please contact Justin Greenhalgh - [Justin.greenhalgh@stfc.ac.uk](mailto:Justin.greenhalgh@stfc.ac.uk).



# Scientific Computing Technology Group

The Scientific Computing Technology (SCT) group has been created out of a recent re-organisation of the e-Science Centre. SCT, lead by Peter Oliver, provides the compute, application and job submission infrastructures that meet the facilities needs, both now and in the future.



This exciting opportunity builds on existing strengths in the fields of high performance computing, grid deployment and e-Science innovation. The SCT team already runs services such as SCARF, the >1200 processor grid-enabled compute cluster open to STFC and Diamond, and national and international grid projects such as the National Grid Service (NGS) and EGEE.

## ATC Open Day

Each year, the Royal Observatory Edinburgh opens its doors to the public, as part of a city-wide 'Doors Open Day'. This year a record number of just over 2500 people attended over the course of the two days.

Almost all areas of the site were open, and around 40 members of technical and non-technical staff were involved in the Open Days - from preparing posters and rearranging equipment, to being the face of the UK ATC. The theme for the weekend was 400 years of the telescope.

The MIRI team (Mid InfraRed Instrument) were on-hand to tell the public about the James Webb Space Telescope, and about the UK ATC's involvement in this project. In the clean room, the MIRI spectrometer pre-optics were on display.

The Spectral and Photometric Imaging Receiver (SPIRE) instrument is one of three instruments which will be used with the Herschel telescope. By measuring the far infra-red and sub-millimetre emission radiated by gas and dust heated by young stars SPIRE will help us understand the physics of how stars form and will enable us to detect galaxies forming in the very early Universe. Staff had the SPIRE beam steering mirror set up and running, making an interesting laser pattern for the public to see, whilst the Systems Engineering group had models

of the micro autonomous positioning system which will be used with the Extremely Large Telescopes (ELTs).

The KMOS team had three KMOS picking arms on display. KMOS, the K-band Multi-Object Spectrometer, is a second-generation instrument for one of the ESO Very Large Telescopes.

Elsewhere on site, the public had the opportunity to see short talks and comet making demonstrations, see a planetarium show or have a look at some of the historical books in the Crawford Collection.

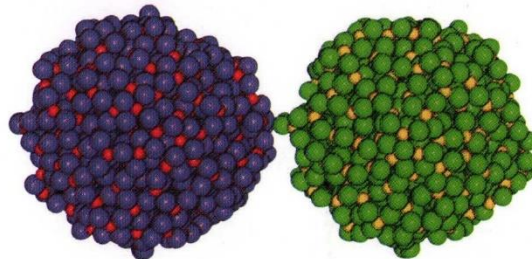


# Knowledge Centre for Materials Chemistry

A new consortium including STFC is about to develop a Knowledge Centre for Materials Chemistry (KCMC). Using the combined resources, facilities and expertise of STFC, the Universities of Bolton, Liverpool and Manchester, the KCMC aims to solve problems and/or create business opportunities for industry across the North West.

Funding for KCMC will come from the Northwest Regional Development Agency once the details of the consortium have been finalised. STFC's contribution to the KCMC will be through the Computational Science and Engineering Department at DL, which will

offer modelling and simulation input to the Centre's clients. CSED participation is estimated to be valued at £500,000 over the first three years of the project. It is likely that experimental input from DL will also be needed from time to time, as will input from other STFC sites.



→ Titanium Dioxide particle dynamics

## Another important milestone for ISIS

On 18 September, ISIS started regular running of both its neutron targets at full power. One in five pulses from the ISIS accelerator is sent to the new target station; the remaining four are delivered to Target Station One. For Target Station Two, it was also the first time that solid methane moderators (used to slow neutrons down to speeds useable in experiments) have been operated with such a high beam power anywhere in the world.

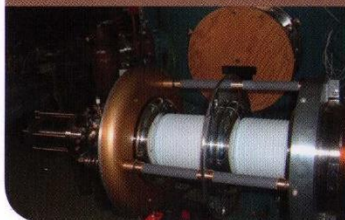


## ALICE achieves beam

The ALICE technical team has just celebrated achieving first high energy beam from the photo injector gun using an ex 'Star Wars' ceramic assembly.

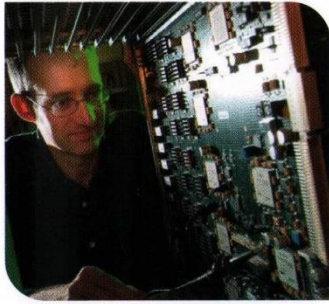
The ALICE injector was originally commissioned in 2006 with a single large ceramic but the design of the ceramic to flange braze proved unreliable. After suffering three serious failures of this system, substantial delays loomed. Daresbury engineers embarked on a development programme involving an international collaboration to

find a reliable braze for this innovative and superior ceramic. To prevent a long delay a working solution was required. By borrowing two smaller ceramics from a now defunct Stanford University FEL Star Wars programme, a stop gap solution has been found. Achieving beam this month was a large step forward for the scientists and engineers at Daresbury Laboratory who can now move on to commissioning the full accelerator system to demonstrate energy recovery.



→ ALICE photo injector ceramic assembly, which achieved first beam in October 2008.





superconducting magnets on the ATLAS detector need to be kept at temperatures just above absolute zero. The Cryogenised group, led by Tom Bradshaw, designed a system that achieves this which circulates 1.2 kg of liquid helium per second.

The challenges faced by each team were unique; John Hill's engineering team designed and installed the CMS End Cap

Calorimeters: devices used to measure the energy of the colliding particles, each 2.5 metres in diameter. In contrast, Viraj Perera's trigger processor team delivered over 700 motherboards of 11 different designs (each no larger than an average PC's) so that real time data from each particle collision can be processed in the ATLAS experiment. Other projects included the ATLAS ECT detector, the ATLAS ECT magnet services and the CMS tracking electronics.

Justin Greenhalgh, project engineer on the CMS Electromagnetic Calorimeter End Caps said "It was fascinating to be involved with so many technical and organisational challenges. At times frustrating, at times exhilarating."

## HET bows out

It was the end of an era on 17 October. HET, one of the oldest instruments on ISIS, performed its last experiment. HET has enjoyed a distinguished career, contributing to breakthroughs in the field of high energy magnetic excitations. It has been superseded by a new instrument, Merlin which is already delivering impressive results.



If you would like an article included in FACTS please contact Stephanie Hills, RAL 5398 or Jane Binks DL 3235.

## SHE Codes

Since June, 3 new STFC SHE Codes have been launched:

Noise at Work;  
Portable Electrical Equipment; and  
Work on Buildings, Premises, Services and Infrastructure.

The main points from each code are given below:

### Noise at Work

- If you think that you work in a noisy area or undertake noisy work please request a noise survey through your line manager and / or the SHE Group (as a rough guide a noisy area might exist where two people need to raise their voices to conduct a normal conversation when about 2 meters apart).
- Where areas or activities are noisy a risk assessment based on the noise assessment will need to be made and where necessary actions will be taken to eliminate or reduce the noise.

### Portable Electrical Equipment

- Before you use portable electrical equipment please check that it has been tested and has the correct label attached.
- Also carry out a visual inspection for damage, loose or damaged cables etc - if it looks unsafe it probably is!
- Please do not use portable electrical equipment that does not have a test label or where the date of test has expired. Please report any faulty or out of test date equipment to your line manager and/or Estates and remove it from use so that it can't be used by others.

### Work on Buildings, premises, services and infrastructure

- Modifications to buildings or their services can only be managed by authorized 'Building Work coordinators', please contact Estates to find out who they are.
- For the change of use of buildings, laboratories, offices etc the 'Building Work coordinator' will ensure that the fire safety implications are considered and site Fire Risk Assessments are updated.
- Please report defects in buildings, premises, services and infrastructure to Estates and report related SHE incidents or near misses to SHE Group.