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News from the
Science and Technology
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Outreach
Special

Exploring & Understanding Science

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Science & Technology
Facilities Council

Prime Minister visits the Daresbury Science & Innovation Campus

David Cameron announces Enterprise Zones and a £10million investment

The Prime Minister, David Cameron visited Daresbury in August and revealed plans for 11 new enterprise zones across the UK including STFC sites, Daresbury Science and Innovation Campus (DSIC) and Harwell Oxford. During his visit, the Prime Minister also confirmed a £10 million investment into the Daresbury Campus. Describing DSIC as an inspirational example of what great collaboration between public and private sector can achieve, the aim of the newly announced Enterprise Zones is to stimulate and create jobs, growth and investment in the UK.

STFC's Rutherford Appleton Laboratory at Harwell Oxford was part of the successful Science Vale UK Enterprise Zone bid alongside the Diamond Light Source and Milton Park, Oxfordshire. The Science Vale zone is expected to bring in around 4800 new jobs to the area and generate up to £10.5 million of additional business rates every year.

Similarly, STFC's Daresbury Laboratory, part of DSIC, along with property investment company Langtree and Halton Borough Council is estimated to benefit from at least 30 new businesses by 2015 and attract a considerable number of high quality inward investment projects.

Impressed by what he saw on his visit, the Prime Minister confirmed his £10 million investment into Daresbury Laboratory,

with £7.5 million of the investment to be used to upgrade the Campus computing infrastructure to be able to host the next generation of high performance computing systems. The remaining £2.5 million is to be invested into a specialist environment that will enable the testing of the next generation accelerator technologies. Working with STFC, and the academic community, industry R&D teams will use these facilities to develop ultra efficient, miniaturised accelerators. The investment will position the UK at the cutting edge of computer development and accelerator technology.

Speaking at the time of the announcement, STFC's then Chief Executive, Professor Keith Mason said: "This is great news for Daresbury Laboratory, the Daresbury Science and Innovation Campus and Harwell Oxford. The announcement of the Enterprise Zones in Oxfordshire and Daresbury recognises both Campuses for their science, research and business capabilities and will generate huge economic benefits for the UK. Furthermore, the new funding into Daresbury Laboratory will enable us to work even more closely with industry".



New CEO at STFC

Professor John Womersley became the new Chief Executive Officer of the Science and Technology Facilities Council on 1 November 2011, for a four year term.

Professor Womersley, who previously held the position of STFC Director of Science Programmes, replaces Professor Keith Mason, who is joining the UK Space Agency on secondment until 31 March 2012.

Professor Womersley is a graduate of both Oxford and Cambridge Universities (D.Phil, Experimental Particle Physics) and has played a leading role in particle physics in Europe and the United States. Prior to returning to the UK in 2005 to take up the position of Director of Particle Physics Department at RAL, John worked at Florida State University, Fermilab and as a Scientific Advisor to the US Department of Energy.

Professor John Womersley said:

"I am delighted to be appointed as the next STFC Chief Executive and to have the opportunity to lead the organisation over the coming years. The STFC supports an inspiring portfolio of fundamental and applied research, enlarging and enriching our understanding of the world around us while helping the United Kingdom to prosper in the global knowledge economy and addressing the major challenges facing the world through science and innovation. The STFC's world-leading facilities and outstanding staff together provide the best possible platform for academia, research institutes and business to work more effectively and collaboratively."



STFC components help achieve ALMA 'first science'

ALMA, the Atacama Large Millimeter/submillimeter Array, the most complex ground based telescope in existence, has officially opened to astronomers and has produced its first images. Requiring high-tech components from all over the world, including cryogenic components from the Rutherford Appleton Laboratory, ALMA will lead the way in fascinating astronomical discoveries.

Located in the Atacama Desert of Northern Chile at an altitude of over 5000m, ALMA observes 'light' emitted in the millimetre and submillimeter wavelength range, which is roughly one thousand times longer than visible-light wavelengths. This allows astronomers to see in much greater clarity, details such as the dense clouds of cosmic dust and gas from which stars and planets form, as well as very distant objects from the early Universe. Once ALMA is complete in 2013, it will enable transformational research into the physics of the cold Universe, probe the first stars and galaxies, and directly image the formation of planets.

The state-of-the-art project and equipment is the result of an international collaboration including the USA and Canada (led by the National Radio Astronomical Observatory), ten European countries (led by the European Southern Observatory)



and Japan and Taiwan (led by the National Astronomical Observatory of Japan). In return for the UK's investment in the project, UK scientists have access to ALMA through STFC's subscription to the European Southern Observatory and the project has seen the UK's technical capabilities and expertise strengthen both within academia and industry.

The UK is participating in a number of areas in this challenging and complex project. STFC's Cryogenics and Magnetics Group is supplying the cryostats at RAL- each cryostat houses ten receivers mounted on quick-release cartridges cooled down to 4K (-269.17°C). ALMA represents the largest assembly of superconducting electronics ever built, and will allow astronomers to observe cold regions of the Universe with unprecedented clarity.

X-rays reveal the brain shape of an early human ancestor

An experiment at the ESRF (European Synchrotron Radiation Facility) has given us an exciting new insight into human brain evolution. Described as a 'powerful beacon on the hazy landscape of brain evolution', the findings have revealed the highest resolution, and most accurate X-ray scan of an early human ancestor.

ESRF in Grenoble, France—available to UK scientists due to its funding by STFC—played an important role in this research. This project was only the second time that the skull of a hominid (a primate of the family Hominidae) has been examined using powerful synchrotron radiation.

The skull of the *Australopithecus sediba* dates back to 1.9 million years ago and was found in 2009 by Palaeontologist, Lee Berger. Wanting to examine his find further, he teamed up with the ESRF to use the latest X-ray technology to unearth more information about the *Australopithecus sediba*. Working with over 80 scientists from institutes in Germany, USA, Australia, South Africa, Switzerland and the UK, the project was a big international collaboration.

The exceptionally well-preserved cranium was scanned at a resolution of around 45 microns, approximately half the size of a human hair. Using the highest resolution available, incredible details of the anatomy of the brain case were revealed. The use of the synchrotron X-rays was crucial for this discovery, as the micro-tomography technique used allowed the scientists to visualise the inside of a fossil block without damaging or breaking open the sample. Only the powerful X-rays at the ESRF could pierce deep into the fossil to reveal the cranium's interior shape and allowed for the mapping of the contours of the internal surface to produce an image of the original brain location in the skull.

More information about the research is published in *Science*, part of a series of five papers based on new evidence about the anatomy of the species *Australopithecus sediba*.



A 3-D rendering of the skull of *Australopithecus sediba*. Credit ESRF/I. Montero.



Australopithecus sediba during the experiment at the ESRF beamline ID19. The red dot from a laser illustrates where the X-ray beam would meet the fossil. Credit ESRF/I. Montero.

Outreach and Public Engagement Special

This edition of Fascination carries with it a special theme covering some of our recent highlights amongst our communications, outreach and public engagement activities. Although the communications stories in the edition only cover a small selection of our successes over the past few months, the articles will provide you with an insight into what we aim to achieve into next summer and beyond.

With the clocks now having gone back and the night sky visible for longer, the exciting STFC supported project, Dark Sky Discovery had its official UK launch in late October. As you will read, this project is a fantastic opportunity for stargazers,

both experienced and those starting fresh, to see some of the wonders of our Universe from excellent hand-picked regional locations.

Also covered is a selection of excellent rolling activities. Most notably some of the work done by the winners of our public engagement funding awards who take science to the masses across the UK, together with our well established work experience programmes at RAL, our fantastic Talking Science lecture series across our UK sites, and our outreach events in Daresbury, to name only a few.

On your phone and at your festival: STFC funded science outreach!

STFC actively encourages and supports our scientific communities to provide outreach and public engagement activities. Through the success of our Science in Society Large and Small Awards scheme we are able to encourage innovative and inspiring outreach projects that take place across the UK. This month the LHSee android smartphone app was launched following an STFC small award to its creator Dr Alan Barr and his team at the University of Oxford. The app is now available as a free download and allows users to view live data from collisions at the Large Hadron Collider in Geneva as well as learn more about how parts of the ATLAS detector work. Proud of his apps development, Dr Alan Barr of the University of Oxford says: "I love the detail in the live displays - it's amazing to see that you can pick out the different individual proton collisions." Indeed, owing to the international nature of the CERN project, the app is also available in French, German, Italian, Spanish and Swedish!

Following a grant to the University of Cambridge, Guerilla Science 2011 has taken science to the masses at events not known for their science focus. By delivering an exciting blend of discussion, debate, live experiments and talks to festival goers at both the Camp Bestival and The Secret Garden Party music festivals in this summer, they've been able reach those who do not usually engage with science. As a result, this group of talented science communicators are helping to change how science is viewed and celebrate the experience of live science.

Curious Directive also received a small award, with their project Exoplanets, which took science into UK festivals. Combining a mixture of accurate astronomy with performance art, the group led by STFC Science in Society Fellow, Dr Martin Hendry used young and emerging artists to explain the latest research on the extra-solar planets that orbit the stars in our Galaxy. Performing their piece at Latitude and Camp Bestival festivals, they left fans thinking about stars both on and off the stage.

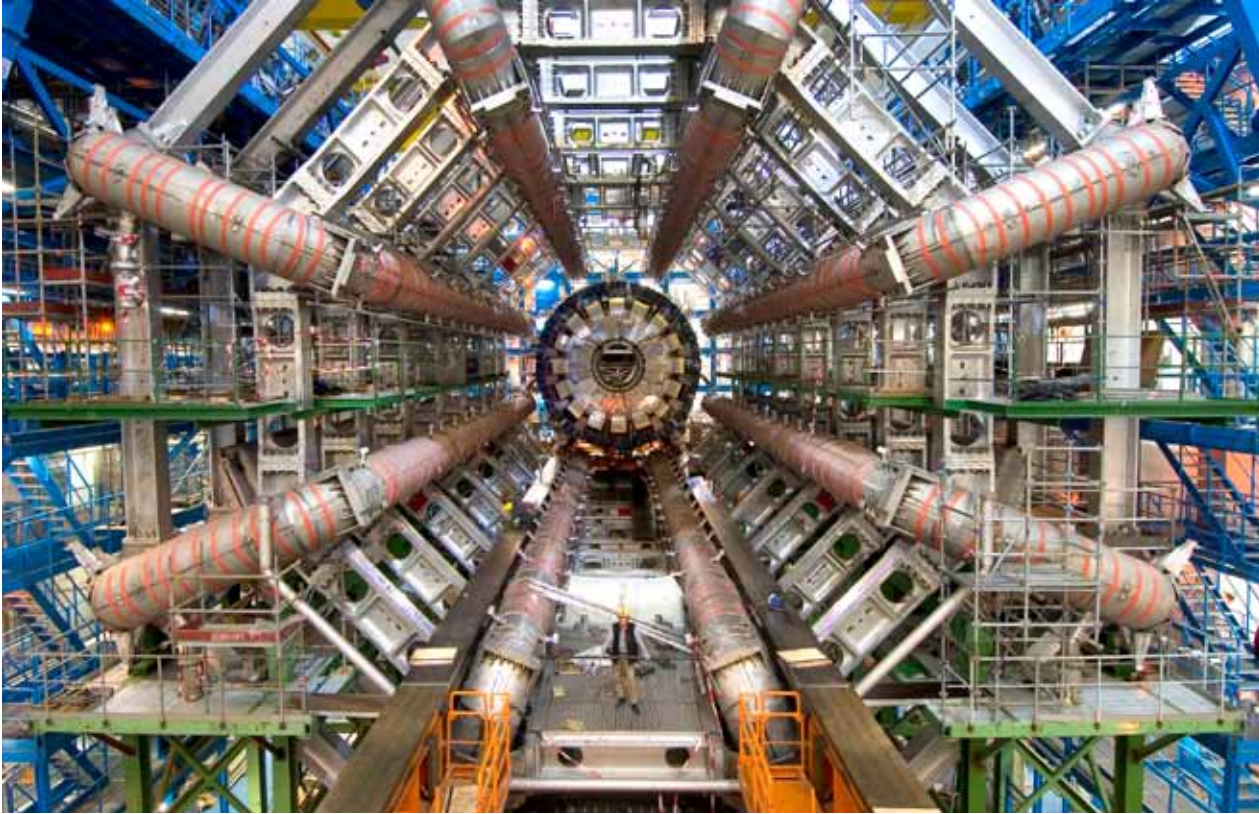
Following on from these and years of other highly successful activities, STFC will fund a number of new Science in Society awards in the coming year. With Large Awards (up to £100,000) and Small Awards (£500-£10,000) set to be given out, 2012 is sure to bring with it some exciting outreach projects.

If you have a great idea , please visit:

<http://www.stfc.ac.uk/Public+and+Schools/1379.aspx>



Be a Cyber Citizen with CERN's LHC@Home 2.0



Getting involved in the world's most ambitious science project has never been easier! CERN's Citizen's Cyberscience Centre launched a software called LHC@home which allows internet users from around the world to take part in exploring just what happened after the big bang, whilst also providing a virtual supercomputer to assist researchers in developing countries.

The latest version, called LHC@home 2.0, simulates collisions between two beams of protons travelling at almost the speed of light in the Large Hadron Collider (LHC). Scientists working at CERN compare these simulations, based on their own theoretical models, with real data from the four LHC experiments.

The software can be accessed on any ordinary laptop or PC and allows many volunteers around the world to be a part of CERN's outreach project, bringing together a volunteer cloud that can work as a virtual supercomputer. In addition to this and through the Citizen Cyberscience Centre and its volunteers around the world, the virtual supercomputer will provide grid computing tools and techniques to scientists in developing countries. This will provide them with access to the latest computing technology and the ability to solve problems that they are facing, such as providing clean water and helping to get urgent provisions to natural disaster survivors through crisis mapping. Indeed, whether you're interested in finding the

Higgs Boson, playing a part in humanitarian aid or advancing knowledge in developing countries, this is truly a great project to get involved with.

The outreach project, supported by the Shuttleworth Foundation, has captured the attention and support of world leading computer manufacturers such as IBM and HP, who have both offered their expertise to the Citizen Cyberscience Centre in developing projects such as UNOSAT - a programme providing solutions to development organisations within and outside the UN. UNOSAT can produce maps for humanitarian projects such as damage assessment and deforestation; with volunteers playing an increasingly central role in dealing with crisis responses by actively analysing imagery of the effected landscape and comparing results.

The Citizen Cyberscience Centre is a partnership between CERN, the United Nations Institute for Training and Research (UNITAR) and the University of Geneva. The project is just the latest in an increasingly long line of "citizen science" projects in which the power of the public's home computers is put to use in solving scientific problems.

For further information :

<http://lhathome.web.cern.ch/LHCathome/>
And

<http://www.citizencyberscience.net/index.htm>



Educational Open Days at Daresbury Laboratory

Open days provide a great opportunity to reach out to an audience that is not directly linked with science and to share excitement with people about the facilities at the Laboratory, the research that is currently taking place and to spark an interest in science.

On 17 and 18 August 2011 Daresbury Laboratory opened its doors to local Brownie, Guide, Scout and Cub packs and the general public for some fun educational science days at the site. During the two day pilot event, the Laboratory saw over 150 visitors enjoy the wonders of science. The hope is now that these events will be developed and extended in the future.

A large volume of feedback was gathered and has provided valuable information of what the public and Scouting packs like to see, what they want to know and when they would like the events to take place.

There are many different activities that can be offered at open days. Open days are designed to educate and allow the audience to have fun whilst learning.

Events on the days in August ranged from a solar system walk; 'Rock, not the Blackpool stuff', an educational talk about the rocks found on Earth; a rockets station, allowing you to build your own paper rocket and fire it into the air; the WOW bus, designed to look as if you're aboard a real rocket heading for outer space, and allowing children to make their very own space vehicle; and to top off the fun science busking was located all around site.

Star Lab was one of the most popular activities during the open days and takes the audience on a virtual tour of the solar system, giving them a closer look at the constellations of the night sky - and all from within a large inflatable dome.

These days proved a hit with the public and children of the Scouts and Brownie packs. The Laboratory plans to hold a lot more of these events for the public and intends to adapt the format according to the feedback gathered from the trial days.

For Future events visit: <http://www.stfc.ac.uk/Public+and+Schools/1281.aspx>



Dark Sky Discovery launches UK wide!

On a crisp autumnal evening you step outside your house wrapped in your winter woollies, and gaze up into the dark night sky at the hundreds of stars twinkling above you. On the same night, your next door neighbour is walking their dog in the local park and gazes up at the thousands of stars above them. But why could your neighbour see more than you?

On 24 October 2011, Dark Sky Discovery, in cooperation with STFC and thanks to funding from Natural England's Access to Nature programme, launched a two year project across England which will work with nine regions covering the country. The project aims to inspire schools and members of the community across the UK to identify 27 local Dark Sky Discovery Sites from which to observe the night's sky. Dave Chalton, Dark Sky project officer at the Royal Observatory Edinburgh, said "There are many places across Britain which are excellent for viewing the galaxy around us. I'm sure that we'll get some fantastic views of the stars, planets and the Moon from these sites."

The project is based on the highly successful Dark Sky Scotland partnership led by STFC's the Royal Observatory Edinburgh Visitor Centre which, since 2007, has been encouraging people from all walks of life to rediscover the night sky hotspots close to their door steps.

Within England the nine regions and their partners are:

- North East, Durham University
- North West, Daresbury Laboratory (STFC)
- Yorkshire and Humberside, Space Connections
- West Midlands, Cannon Hill Park
- East Midlands
- East of England, University of Hertfordshire
- South West, Exmoor National Park Authority
- South of England, Rutherford Appleton Laboratory (STFC)
- London

Indeed, the project could not run as successfully without the help from all the Dark Sky Discovery partners which include; the Association for Science and Discovery Centres, British Astronomical Association, Institute of Physics and Campaign for Dark Skies – just to name a few.

Dark Sky Discovery is looking for everyone to get involved in choosing their local Dark Sky Discovery Site. From these sites all members of the community will be able to see the wonders of the night sky. Ideally, these should be away from the worst of the local light pollution, tall buildings and trees, have relatively flat ground and be either in walking distance or have good public transport access. These are normally found at national parks, playing fields, local parks, woodlands and car parks.

Dark Sky Discovery events are free, fun and run by a specially trained team of professionals, amateur astronomers, teachers and students, with each event the result of a collaborative effort between local environmental and community organisations. Dan Hillier, Dark Sky Scotland project leader from the Royal Observatory Edinburgh commented "These family events will give everyone, from children to grandparents, the chance to get out there to spot the constellations, marvel at the Milky Way or count the craters on the Moon. We will also be showing how UK scientists and engineers are at the forefront of exploring the wonders of the Universe such as the search for Dark Matter and life on other planets."

As visibility of constellations change according to the season, attending star-gazing events throughout the year, using constellation maps and talking to the Dark Sky Discovery events team you will have the opportunity to witness these changes yourself and experience the seasons of the sky.

The UK is very fortunate to have some of the largest areas of dark sky in Western Europe, with the best examples found in rural areas that are free of light pollution, tall buildings and are safe and accessible for everyone. Whilst if you live in the middle of a city you are likely to only be able to see hundreds of stars when there is in-fact over one hundred billion stars in our own galaxy, the Milky Way. However, there are some excellent sites for city dwellers to gaze at the moon, stars and planets with nothing but your eyes, which are local to you.

The International Dark Sky Association, which recognises sites with exceptional nightscapes by giving out International Dark Sky Communities (IDSC), International Dark Sky Park (IDSP) or an International Dark Sky Reserve (IDR) awards.

The UK boasts two locations of these categories with Galloway Park in Scotland announced an IDSP in 2009, and Exmoor National Park in the South West of England awarded an IDR status in October 2011. The award means that both sites will now have lighting controls in place to prevent light pollution and ensure that the dark sky quality will be protected from deteriorating for many generations to come.

With Galloway Park IDSP welcoming roughly 3,000 people in August 2010, many that attended were amazed at the shooting stars, planets, comets and meteors that it is possible to see on clear nights. Experiences like these are helping people put our planet into perspective and it offers a window into our understanding of the Universe.

<http://www.darkskydiscovery.org.uk/>

Some of the top star-gazing tips from Dark Sky Discovery:

1. Wrap up very warm as it is often cold when the sky is clear.
2. Find a place that is away from the glare of direct lights, open to the public, safe, with good sight lines and away from tall buildings or trees.
3. Wait until an hour and a half after sunset for the sky to become properly dark, and preferably when the moon is not in the sky.
4. Give yourself plenty of time to adjust to the light levels as it can take your eyes up to 10 minutes to adjust fully to the dark. It is also best to avoid looking into harsh lights and only use a red torch.
5. It is best to use the naked eye to first orientate yourself around the sky and the constellations above you. Then binoculars or a telescope can help with more specific views such as examining the craters on the Moon.



Schools in for STFC Teacher in Residence

Finding new, innovative and effective ways to bring STFC science into the classroom is vital to inspire the next generation of UK scientists. One of the ways that the STFC is playing its part in this important area is through the Teacher in Residence scheme, operated by our Science in Society team at RAL.

Now in its second year, the scheme appoints a teacher who offers advice on the STFC's communications and engagement with schools, teachers and pupils, and encourages the STFC's scientists and engineers into outreach projects. The scheme also provides each Teacher in Residence with a fantastic opportunity to develop their understanding of cutting edge science before their full-time return to the classroom.

Recently appointed, this year's Teacher in Residence, Andrew Wilkins from New College in Swindon has already begun to look into ways that he can help. Andrew said,

"I'm already really impressed by the quality of what the

STFC has available for teachers and schools to deliver in the classroom. There are lots of pressures on teachers, so making sure that they know how easy it can be to access these resources is absolutely vital. STFC science reaches across the school curriculum, so making sure it fits what the teachers' needs is a challenge that I'm really excited by."

Last year's pilot Teacher in Residence, Dr Verel Shull, was also suitably inspired and worked on several projects throughout his fellowship, including the development of an exhibit to explain diffraction to STFC visitors, and mapping the career paths of STFC scientists – learning to the surprise of some pupils, that some highly successful careers were totally unplanned!

Andrew will be with the STFC until July 2012 and will be reporting back to Fascination with his experiences of the scheme towards the end of his residency.

Work experienced!

At the Rutherford Appleton Laboratory, STFC have played host to over 100 work experience students this year with pupils aged 14-19 arriving from across southern England to take part. As well as the many Oxfordshire students who apply, we also give places to those from further afield, such as Rustin Nourshargh, from the Royal Latin School in Buckinghamshire. Rustin spent four weeks working in ISIS with the IT support team, where he developed a new interface for some of the thousands of scientists and researchers who use the ISIS neutron and muon facility every year to carry out their research.

Rustin said, "Thank you very much for the work placement and for all your help with the CREST award. My project has successfully achieved both gold and platinum awards and has passed the Nuffield criteria. I have really enjoyed the whole experience. Hannah was an excellent supervisor and I would like to come back one day!"

Other work experience students took advantage of the STFC's wider remit and took part in the Futures Programme's annual work experience project, taking a forward look at global challenges, such as energy, environment, healthcare and security. For this year's project, Energy for the Future (E4F), ten students from across the southeast came to RAL for two weeks and looked into the evidence for climate change, and the technology capabilities that may enable non-fossil fuel alternative energy sources in the future.

Working independently, albeit with support of science and technical staff to guide their work, the group practised their essential teamwork skills during the project. They also received valuable training on futures analysis, which required them to seek and analyse information on a variety of exciting topics and gave some excellent presentations to staff to conclude their work.

STFC's Geoff McBride, who facilitated the team said, "I was really impressed by the work that the team put in. We wanted

to challenge them so we deliberately didn't give them an easy task, so I was really pleased by how quickly they picked up skills."

Joe Foster, from Quinton House School in Northamptonshire, was Deputy Executive Officer on the E4F project. Since completing his work experience, he has gone into Year 12 studying maths, further maths, chemistry and physics and hopes to do some more science-based work experience this summer.

Joe said, "I really enjoyed myself. It has given me a great insight into scientific careers and allowed me to speak to experts."

STFC work experience placements are open to all 14-19 year old students across the UK, with placements ranging from one week to one month. Applications for places in the summer of 2012 are now open and will close on 25 December 2011.

For more information, or to apply please visit <http://www.stfc.ac.uk/Public+and+Schools/2594.aspx>



RAL Space robots roving summer!

The Robotics Team at RAL Space consists of in-house expertise in electro-mechanical systems, sensors and autonomous systems. This expertise coupled with a keen interest in robotics and how such devices may be used, has resulted in some unusual public outreach activities.

The group have developed a highly agile robot platform, RAL Rover, which can carry a variety of sensors, such as stereo cameras, to provide the sensory inputs for the autonomous software. The Rover is able to lock its wheels and raise or lower its legs independently, allowing it to 'walk' or climb over hazards. In addition to the RAL Rover, the group have developed a smaller version of the RAL Rover called Kryten, two smaller robotic vehicles Bob and Madge and two six-legged robots called Firefly and Bumble Bee, purely for outreach purposes with the main focus being inspiring and educating. Working with the public and in particular children is a great way to test the capabilities of the robots and to see exactly what works and what doesn't! The team attend outreach events outside of RAL and also at the new Robots Trials area on site, which has been developed as an area where the team can test the capabilities of rovers on a Mars-like landscape.

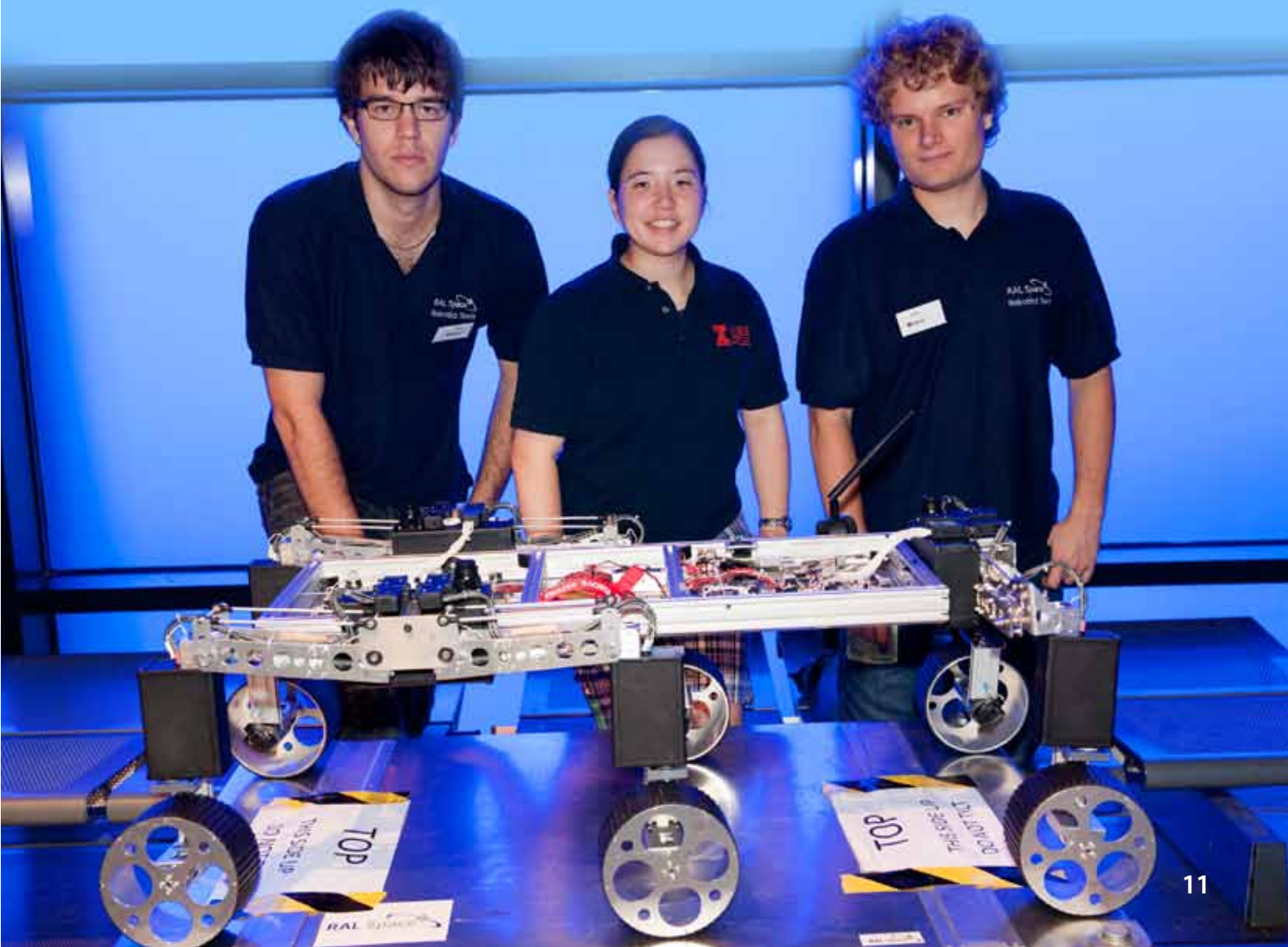
It has been an extremely busy summer for the team who ran

three workshops at the first UK Space Conference at Warwick University in July as part of the Young People's Outreach programme for students in Key Stage 3. This was followed by three days at the Science Museum, London, as part of the 'Spend your Summer in Space' in the Antenna Gallery. This was an enormous success with an incredible 2,600 members of the public getting involved in the event.

Taking part in a host of exciting activities such as Robot Twister and Martian Shepherd, the public were able to try their hands at manoeuvring the rovers, giving them simple commands to navigate a course and retrieve and return samples to base control - whilst being given expert guidance and supervision from the RAL Space Team.

Intense activity over a short period, coupled with some lively and sometimes over-enthusiastic operators, bent more on speed and collision, tested the robot's robustness. Fortunately, their durable design and engineering proved they were more than a match for these tasks with all five robots running smoothly throughout both events.

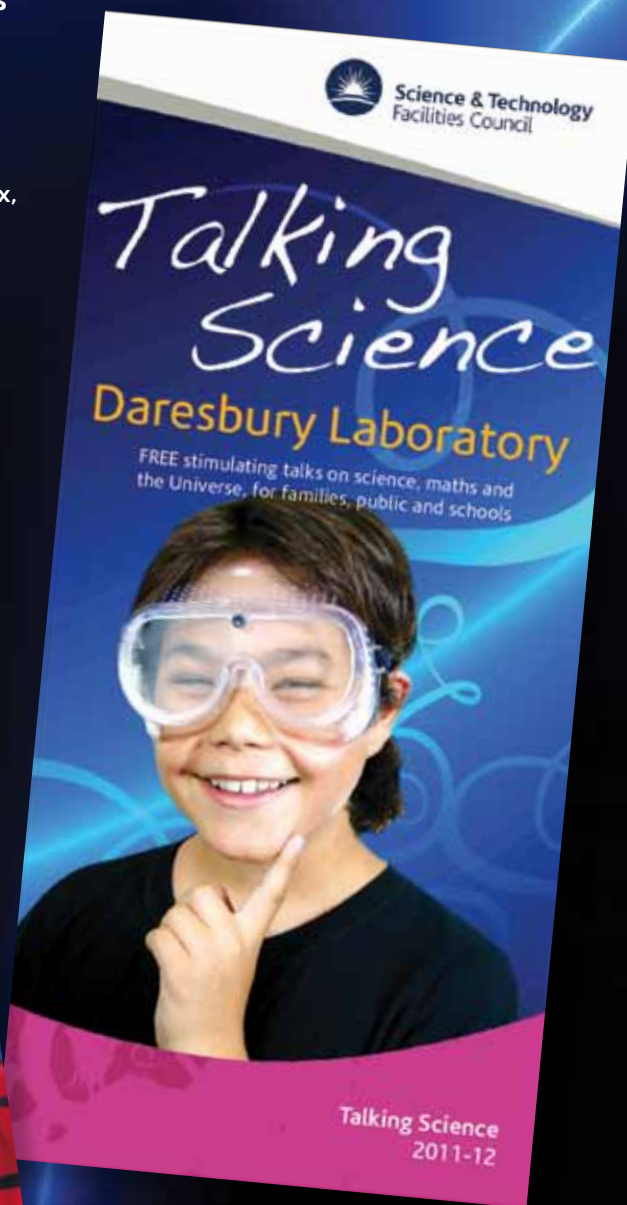
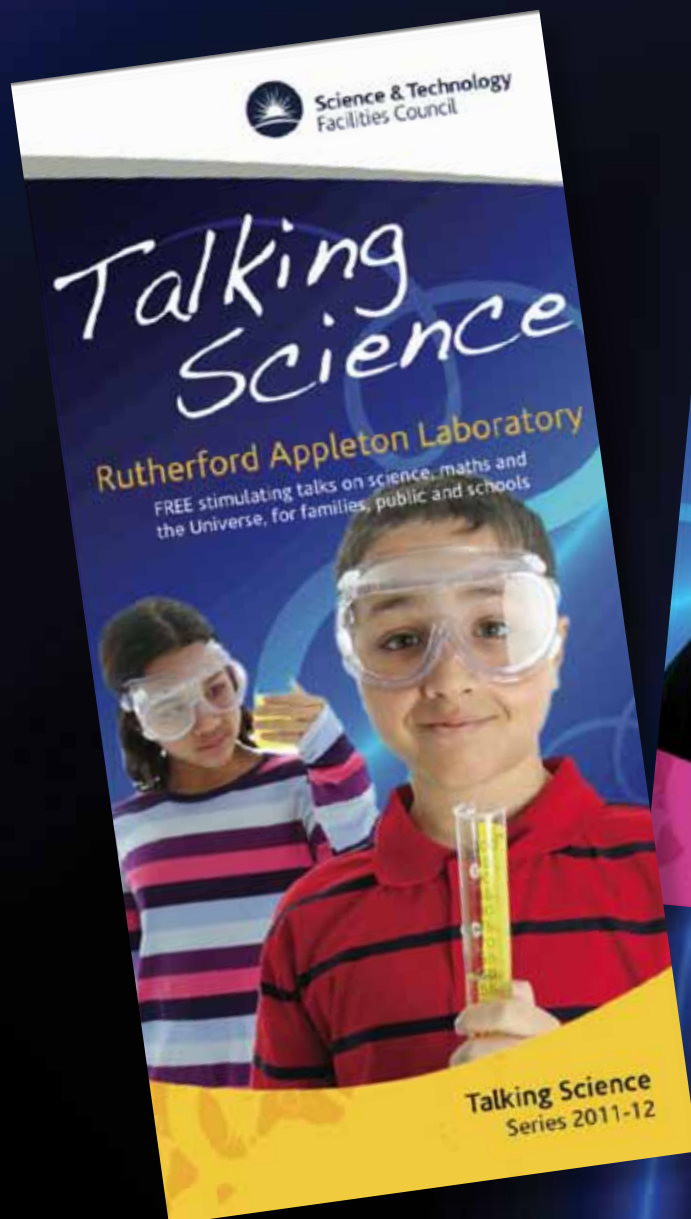
The group will also be at the upcoming Big Bang Fair in Birmingham during March 2012. To learn more about the event, please visit <http://www.thebigbangfair.co.uk/home.cfm>



The new season of *Talking Science*

The new season of exciting Talking Science lectures at our Daresbury, Harwell, Edinburgh and Swindon sites have been announced and are available for booking.

To book, or for more information, please visit <http://www.stfc.ac.uk/Public+and+Schools/1286.aspx>, or if viewing online, click on one of the Talking Science pictures.



Many thanks to all our contributors and additional authors:
Sarah Smart, Jack Fletcher, Chrissie Jones, Zoe Hill and Charlotte Houghton

Contacts

Science and Technology Facilities Council,
Polaris House, North Star Avenue, Swindon,
SN2 1SZ

Tel: +44 (0)1793 442000
Fax: +44 (0)1793 442002
Email: fascination@stfc.ac.uk web: www.stfc.ac.uk
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