IN BRIEF

AMY GOES FOR GOLD

A five-year technology partnership between BAE Systems and UK Sport, designed to boost Britain's quest for medals at major championships, has borne fruit with Amy Williams's gold medal in the 2010 Winter Olympics – the first British winter gold for 30 years. The Bath-based Skeleton Bob athlete was victorious on a sled designed and made by an expert engineering team spearheaded by BAE Systems' Advanced Technology Centre staff.

Although described by some media as a 'tea-tray', the 33kg sled is a complex engineering system with a range of complementary requirements – all of which were initially captured by engineers via interviews with athletes and coaches.

Several major changes over previous sled designs were introduced and honed during 200 hours of aerodynamic testing in the University of Southampton's RJ Mitchell wind tunnel, supported by computational fluid dynamics techniques led by Sheffield Hallam University.

Traditionally athletes of each team shared the same sled; this time, the size, shape and position of the sled's torso plate was customised for each individual athlete. Computer-based finite element analysis examined the sled's flexibility and stiffness in given attitudes, which ultimately resulted in a more rigid, stronger but more responsive sled.

Amy Williams and high-speed sled 'Arthur' compete in the Women's Skeleton at the Vancouver 2010 Olympic Winter Games in Whistler, Canada © Gouhier-Hahn-Nebinger/ABACA/Press Association Images

The resulting vehicle, named 'Arthur', remained under a cloak of secrecy during development, but emerged triumphant when put to the ultimate test on the track – at speeds up to 90 mph – firstly in 2009 at the world championships in Lake Placid, when both Amy and team-mate Adam Pengilly picked up silver medals, then with Amy's Olympic gold.

Another success factor was the learning points registered as BAE Systems and academic staff worked side-by-side during the project's latter stages. Other organisations playing a role in Arthur's development were RJF Design, Total Sim and University College, London.

The partnership is now focusing on London's 2012 Olympics, earmarking sports like cycling, sailing, swimming and rowing where effective equipment can supplement athletes' fitness and prowess and remove fractions of a second for the competitors.

MILLENNIUM TECHNOLOGY PRIZE

Two Fellows of The Royal Academy of Engineering have been shortlisted for the 2010 Millennium Technology Prize, the 'Nobel Prize' for technological innovation. The world's largest technology prize is awarded every two years to an individual deemed to have made a significant positive impact on quality of life or sustainable development.

Professor Sir Richard Friend and Professor Stephen Furber were named along with Professor Michael Gratzel as the laureates for the 2010 prize by Technology Academy Finland.

Professor Sir Richard Friend FREng FRS is Cavendish Professor of Physics at the University of Cambridge. His research into plastic semiconductors – at a time when many in the field were working with silicon – revolutionised optoelectronics.

Professor Friend and his team created the world's first plastic transistor and the first organic light emitting diode. These are now used in the latest generation of touch-screen mobile phones and could soon be used in 100-inch flat screen televisions that are so thin they can be rolled up when not in use.

Professor Stephen Furber FREng FRS is currently Professor of Computer Engineering at the University of Manchester. In the 1980s, he designed the Advanced RISC Machine (ARM) microprocessor while working for Acorn Computers – a single chip that uses one tenth of the electricity of other 32-bit processors. The innovation has opened up a new world of advanced handheld devices and is now found in 98% of the world's mobile phones.

Technological innovators: Professor Steve Furber FREng FRS (left) and Professor Sir Richard Friend FREng FRS pictured at an Academy event to celebrate their nominations for the 2010 Millennium Technology Prize.

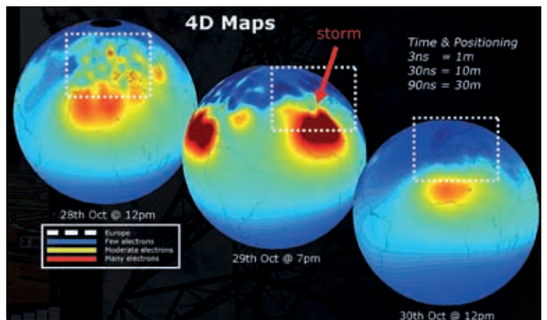
Professor Michael Gratzel developed dye-sensitised solar cells while at the Laboratory of Photonics and Interfaces in Switzerland. The low-cost solar cells could introduce new applications such as electricity-generating windows and affordable mobile solar panels.

Technology Academy Finland will announce the winner on 9 June 2010. The winning laureate will be presented with a trophy by the President of Finland along with a cash prize drawn from a total pot of €1.1 million.

SET FOR SUCCESS

Various strands of research including trapping light to speed up computers and the internet and stimulating blood vessel growth using gold nanoparticles were showcased at a national event in March 2010.

SET for Britain is an annual event to encourage, support and promote Britain's early-career research engineers and scientists. It was revived in 2008 by the Parliamentary and Scientific Committee, The Royal Academy of Engineering, the Royal Society of Chemistry, the Institute of Physics, and the Institute of Biology,



An image from Julian Rose's winning poster: 4D Inospheric maps during the October 2003 storm © Julian Rose and Professor Cathryn Mitchell

SET for Britain invites research students, postgraduates, postdoctorates, MSc students, and part-time and mature students to submit posters of their research to be judged by a panel of experts. Winners in each category receive £3,000 and a medal and runners-up receive £1,000.

The engineering category was won by Julian Rose, from the University of Bath. He presented research on ionospheric tomography, which could prevent delays in GPS signalling caused by storms in the uppermost part of the Earth's atmosphere. Julian was also named the overall winner of the event and received the Westminster Medal, presented in honour of the late Dr Eric Wharton, the event's former organiser.

The runner-up prize in engineering went to Dr Kosmas Tskamakidis from the University of Surrey for his research into stopping light using artificially engineered 'metamaterials'. This research could lead to the development of new hybrid optoelectronic devices for telecommunication networks.

In other categories, presentations covered topics including the development of commercial materials for tougher biodegradable bottles, detection of blockages in natural gas pipelines, autonomous planetary exploration, and organic memory devices.

GLOBAL WATER SECURITY

The world may need to produce almost a third more fresh water in the near future to avoid a crisis in global water supplies, according to a report produced by engineering alliance *Engineering the future*, which represents the UK's 450,000 professional engineers.

Global Water Security warns that water shortages in some developing countries are being exacerbated by developed nations' reliance on imported food and other supplies. Water resources will become even more stressed as the global population continues to grow, urbanisation increases, diets change, and global temperatures rise.

The report calls on the UK to take a lead in tackling the global water crisis by managing the hidden 'virtual' water used in its imports of food and services from water-scarce countries that, at some stage, use their own limited water supplies to produce them. Such activity accounts for around two-thirds of the UK's 'water footprint'.

The study was led by the Chartered Institution of Water and Environmental Management, the Institution of Civil Engineers (ICE), and The Royal Academy of Engineering, in response to a request mapped out by Professor John Beddington, the UK Government Chief Scientific Adviser. He had warned that by 2030 the world may need to produce 50% more food and energy, along with 30% more water, while at the same time mitigating and adapting to climate change. Unaddressed, these pressures could have grave consequences for the future.

Launching the report at the ICE, Academy President Lord Browne FREng FRS highlighted the contribution that engineers have already made to meeting the challenge of global water security and said, "Our report points to a much broader role in the future, with engineers engaging with the public and policy makers to a much greater degree, becoming advocates for the sustainable use of water resources and supporting informed water choices."

Read the full report at:
www.raeng.org.uk/gws

SCIENCE FOR ALL

The current state of the UK public's engagement with science and engineering has been examined in a new report from an expert group brought together by the Department of Business, Innovation and Skills.

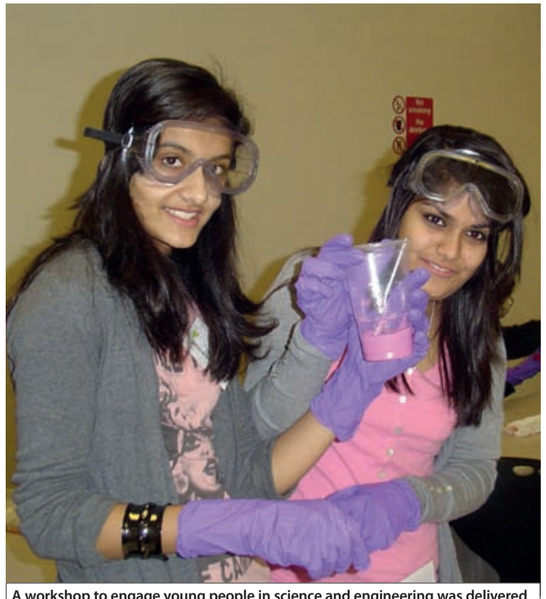
Published in February 2010, *Science for All* offers a view of public engagement as it stands in the UK and makes recommendations for developing the field, providing a vision for a 'healthy science and society relationship'.

The report is based on the results of seven pieces of research commissioned by the members of the *Science for All* expert group. The Royal Academy of Engineering led on research to develop a set of public engagement competencies for scientists and engineers and explored how these might be embedded into existing frameworks, such as Chartered Engineer.

The report identifies the need to build on approaches developed in recent years to engage the public with science and engineering. As such, *Science for All* lays out a roadmap for all science-related organisations, the UK Government and other groups to take action. The report containing some 60 individual actions and recommendations, the roadmap is a comprehensive plan for all groups involved.

The action plan laid out by *Science for All* is regarded is a 'work in progress' by its authors, who invite all those with shared interests to help develop its actions.

To read the report in full, visit **www.bis.gov.uk/science-for-all-report-launched**



A workshop to engage young people in science and engineering was delivered by the Royal Institution and sponsored by The Royal Academy of Engineering.

THE SEED CATHEDRAL

For Expo 2010 in China, the architect of the UK Pavilion worked with Expo's theme *Better City, Better Life*, to create a 'Seed Cathedral'. Thomas Heatherwick, in association with the contractors MACE, the structural engineers, Adams Kara Taylor, and environmental engineers, Atelier 10, built a 20 metre high double skin timber cube box bristling with acrylic spikes.

The structure has 60,000 clear fibre optic rods, each 7.5 m long, which are sleeved with aluminium to withstand typhoon conditions in Shanghai. The 'hairs' wave in the evening breeze across the site and shimmer in the low light. LED lights are placed inside the spikes so that at night light travels down them while during the day, sunlight is drawn down the tubes to illuminate the seeds held at the end of each spike.

The seeds for the UK Pavilion have been sourced from China's Kunming Institute of Botany, a partner in Kew Royal Botanic Gardens' Millennium Seed Bank Project – whose mission is to collect the seeds of 25% of the world's plant species by 2020. Weatherhead was inspired by the relationship between nature and cities and sourced 75% of the materials for the Pavilion from a 300 km radius of Shanghai.

Officially opened in May 2010 it is anticipated that 70 million people will visit the Expo site during the summer. After the Expo, the Seed Cathedral's 60,000 optic hairs, each one containing seeds, will be distributed across China and the UK to hundreds of schools as a legacy of the UK Pavilion.

IN BRIEF EXTRA

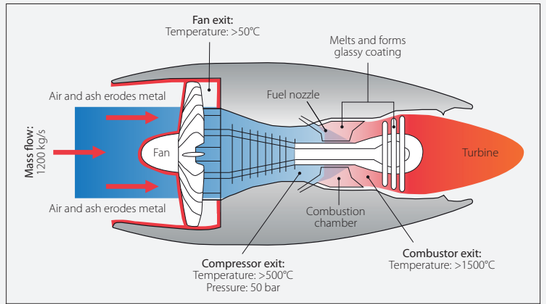
VOLCANIC ASH AND THE GAS TURBINE ENGINE

Following the suspension of flights triggered by volcanic emissions, Ingenia asked an engine manufacturer how ash affects the working of a gas turbine engine.

A jet engine works by drawing air into the core of the engine, where it is compressed, heated and expanded through a turbine. The mixture of air and burnt fuel are expelled from a rear nozzle to provide thrust.

The main effects of volcanic ash ingestion into jet engines include component erosion and solids build up. Volcanic ash particles in the air can erode the fan and compressor blades, changing their shape and reducing engine performance. More importantly, the ash constituents can melt and subsequently solidify as a glassy coating on the relatively cool metal surfaces of the combustor and turbine components. The build up of this solid reduces the flow area through the turbines until the area is so small that the engine's operation becomes unstable and the combustor flame may be extinguished. These solids can also block the cooling air holes and passages, exposing components to the extreme temperatures within the gas flow and accelerating material degradation that may lead to premature component failure.

The effects of volcanic ash on an engine depend on the density of ash in the air, the detailed chemical composition of the ash, the grain size of the ash particles and temperature and pressure within the engine. Estimates of gas turbine aircraft encounters with volcanic ash clouds have been as high as 200. However, only on 10 occasions has power been lost on some or all engines. In all of these cases, the engines recovered and the flights were completed safely.



Environment within a gas turbine engine.