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The Big Bang 2009

Thousands of young people attended The Big Bang, the inaugural UK celebration of engineering and science at the Queen Elizabeth II Conference Centre in London from 4 to 6 March 2009, officially opened by HRH The Duke of York.

Featuring seven floors of science and engineering, The Big Bang 2009 attracted over 6,500 people to the first national young scientists' and engineers' fair, almost 5,000 of whom were young people aged 11 to 19. The event was such a success that organisers are now targeting a figure of 10,000 young people for the next event in 2010.

The Royal Academy of Engineering was one of the key supporters of The Big Bang and helped to plan and choose the event's 200 exhibitions, along with live shows, presentations, and workshops. Featured shows included the acclaimed 'Visualise' from Cardiff-based outfit Science Made Simple; the Science Museum's 'Punk Science' team; the Institution of Civil Engineers' Young Brunel Lecture; and a look at the legacy of Charles Darwin in 'Darwin's Worms'.

Also announced was the winner of the Young Engineer for Britain Competition, awarded to the inventor of the best innovation or solution to an everyday task. The winner of the 2009 competition was Philippa Clarke from Wyke Sixth Form College in Hull, who invented a tutoring device for people learning to play the trumpet.

A particular highlight of the Big Bang was the final of the National Science Competition, which included the presentation of the UK Young Scientist of the Year and UK Young Technologist of the Year awards, won respectively by Peter Hatfield of Simon Langton Grammar School for Boys and Chris Jefferies from Pershore High School. The competition is aimed at young people aged 13 to 19 and covers all areas of science, engineering, technology, and mathematics.

Dozens of other awards were presented over two awards evenings, the first of which was hosted by TV presenter Kate Humble and Titan, an eight-foot tall robot. Shortly before the awards were announced, Prime Minister Gordon Brown sent his congratulations via a special video message in which he praised the event as a "unique opportunity to celebrate the achievements of Britain's young scientists and engineers, and to recognise the skills and dedication of the teachers behind their success."

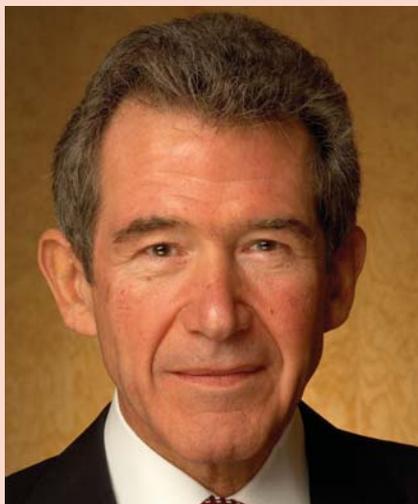
Engineering was very much to the fore throughout the event, with the Engineering and Technology Board providing overall project management and the Academy and other engineering institutions supporting various activities.

Plans are already underway for The Big Bang 2010, which will take place in Manchester. For more information, visit www.thebigbangfair.co.uk

*A young visitor
tries out one of the
exhibits at The
Big Bang
2009*



The President's Column



Lord Browne

The social, economic and employment landscape of Britain is changing. According to studies, by 2011, white, able-bodied males under 45 – who traditionally dominated the national workforce – will form less than 20% of the UK total.

Women will soon make up over half of the total workforce (from the current level of 45%) and people with ethnic minority backgrounds will have an increasingly important role to play in the future economy: although accounting for just 8% of the total UK population, 80% of the ethnic minority population is aged between 16 and 35.

The need for diversity in engineering is not just driven by changes in British society but also by the fact that business and industry are now global. We compete for global talent, for people with new ideas and with the ability to challenge from diverse viewpoints.

In an open and meritocratic job market we recruit the most talented people in the world, regardless of their background. If we, in the UK, can get a disproportionate share of the most talented people, then we have a chance of creating a competitive edge.

This is the strategic logic behind the commitment to diversity and the inclusion of all individuals.

If companies and institutions become truly meritocratic, they open doors that were previously closed, they build ladders for professional development and set examples for future generations. Not only is this good practice, it has economic advantages and builds a constructive and healthier society.

In engineering, despite important work by organisations like the UK Resource Centre for Women in Science, Engineering, and Technology (UKRC) and the Women into Science, Engineering and Construction (WISE) campaign, only 15% of engineering undergraduates and 6% of engineering professionals are women. Clearly there is a need to attract and retain more women in engineering.

To address this need, the Academy has been examining its own practices and ways of working. We have created a Proactive Membership Committee, chaired by Dr Ian Nussey, to ensure more effective identification of a diverse set of candidates for consideration for Fellowship of the Academy.

We have established a Diversity Working Group and, as a mark of her dedication to creating the group, appointed to its chair internet pioneer Dame Wendy Hall FREng, Professor of Computer Science at the University of Southampton.

The Academy's successful London Engineering Project (LEP), aims to attract more women, minorities, and late entrants into the engineering profession. Run with the support of the UKRC and others, the LEP is soon to be rolled out nationally as part of a government initiative.

The LEP has worked in schools and colleges to stimulate interest in engineering as a career, focusing particularly on attracting more women, black and minority ethnic students and more students from families with low income backgrounds and no previous involvement in higher education.

The pilot project has been hugely successful and well received in schools, with 54% female participation and over 70% among people from black and minority ethnic backgrounds.

We are committed to doing all we can to

improve participation in our profession across under-represented sections of the population. There is, however, much more to do to ensure that engineering attracts the brightest and the best young minds.



Meetings and Visitors

The President has recently met:

Professor William M Banks FRSE FIMechE FIMMM FRSA
President, Institution of Mechanical Engineers

Charles Blundell MA
Company Secretary, Rolls-Royce plc

John Brady
Member of Northern Ireland Trade Investment Board

Lord Alec Broers FREng Hon FMedSci FRS
Past President, The Royal Academy of Engineering

Rt Hon Gordon Brown MP
Prime Minister

Dr David Clark OBE
Executive Secretary, ERA Foundation

Sir Anthony Cleaver FBCS
Chairman, ETB

Rt Hon John Denham MP
Secretary of State for the Department of Innovation, Universities and Skills (DIUS)

Lord Paul Drayson of Kensington
Minister of State for Science and Innovation

Rt Hon Lord Mandelson
Secretary of State BERR

Ray O'Rourke
Chairman and Chief Executive, Laing O'Rourke

Lord Wolfson of Marylebone HonFREng HonFRS and Lady Wolfson
Chairman of the Trustees of the Wolfson Foundation

Videos of Academy talks online

The Academy has expanded coverage of its events by introducing a dedicated website for watching video footage and listening to audio clips of high-profile lectures and talks.

There has been growing demand for the Academy to film its lectures and publish them on the web. Over the past year, most of our prestigious events have been filmed and the IT team has built a website to show these online.

People who miss a lecture or would like to watch an event again can now see recordings on the internet at www.raeng.tv. Videos are streamed, so there will be no need for long downloads, and transcripts of lectures will also be available alongside audio recordings of selected events.

In the media archives, visitors can find talks that include the International Lectures by Nobel Prize winner Dr R K Pachauri and from the founder of the largest annual prize in the world, Dr Mo Ibrahim. There are also the most recent New Year Lectures by the Bishop of Southwark and Peter Head FREng.

Archived events also include the 2007 Hinton Lecture by David Waboso FREng; last year's inaugural Euro-CASE Conference of Europe's engineering academies; and the 2008 Academy Awards Dinner, compered by Alistair Stewart OBE.

The next event to be filmed and placed online will be the Lloyd's Register Educational Trust lecture on 21 April 2009 by Sue Ion OBE FREng, titled *Electrifying the Future: Nuclear Energy's Key Role in a Carbon Constrained World*.



RAEngTV – the portal for Academy videos

Energy and Global Security in the 21st century

It is possible to reduce CO₂ emissions while keeping hold of our existing oil, gas and biofuels infrastructure, according to Dr A D Romig Jr, Executive Vice President and Deputy Laboratories Director at Sandia National Laboratories in the USA.

At a lecture held at the Academy on 2 December 2008, Dr Romig – who is a member of the US National Academy of Engineering – outlined how it could be possible to “close the energy cycle” with regard to fossil fuels by developing technologies that can recapture waste CO₂ and reprocess it to produce usable fuel.

Dr Romig's lecture, *Energy and Global Security in the 21st Century*, focused on globalisation and the interdependence and geopolitics between nations that have changed the world's energy markets. He explained that the world's economy and global energy security are now interconnected, representing a “system of systems”, and said that this must be accepted if further discussions around energy security are to take place.

The lecture attracted a full house and was chaired by Professor Dame Julia Higgins FREng FRS, Vice President of the Academy.

For further information about the event, including a full transcript of Dr Romig's lecture, please visit www.raeng.org.uk/events/pastevents



Dr A D Romig Jr gives his lecture on energy security

Vodafone Lecture

The Royal Academy of Engineering, with the support of telecommunications group Vodafone, held the ninth lecture in the Mobile Telecommunications and Networks series on 4 February 2009.

Guest speaker was Professor Dr-Ing Peter Vary from the Institute of Communication Systems and Data Processing in Germany. Professor Vary was part of the team that designed the Global System for Mobile Communication (GSM) in 1988, which is now the most popular standard for mobile phones in the world.

Professor Vary discussed the idea of migration from plain old telephone system to crisp, transparent and tetherless audio communication networks.

He argued that while such a transition is both desirable and technologically feasible, significant investment will be required during a lengthy change-over period, and he put forward ideas for extending conventional services to make the migration cost-effective.

The lecture was chaired by Professor Mike Walker FREng, Research and Development Director at Vodafone Group.

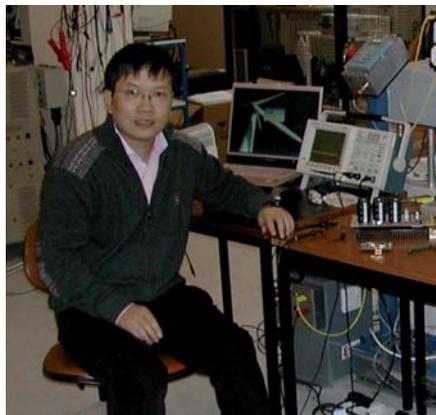
For further information and transcripts of past lectures in the series, please visit www.raeng.org.uk/events



Professor Dr-Ing Vary talks to attendees at the lecture

Research News

Global Research Award: secondment to MIT



Dr Ran recently spent three months at MIT

The Royal Academy of Engineering's Global Research Award scheme enabled Dr Li Ran, a Reader in Power Electronics at Durham University's School of Engineering, to go on a four-month secondment to the Massachusetts Institute of Technology (MIT).

The Global Research Award scheme has been running for several years now and provides a unique opportunity for UK-based engineers to travel to centres of excellence outside the UK and obtain skills from internationally recognised researchers. A significant feature of the award is the development of international research networks,

encouraging continued knowledge transfer between the UK and host institutions.

Dr Ran's research at MIT focused on energy storage techniques for applications associated with wind power. He investigated the electromechanical interactions in wind power systems and proposed a controller design strategy to prevent the damaging effects of resonance and to reduce energy wastage.

Dr Ran's MIT collaborator was Professor Jim Kirtley, a Fellow of the American National Academy of Engineering, who has significant experience in designing flywheel and superconducting magnetic energy storage systems. The collaboration has resulted in two research papers which will be published in the near future.

The award scheme is flexible in that it allows the secondment to be taken in modules over several years, as Dr Ran did, and is unique in that it allows funding for family members, particularly when the secondment is for a long period of time. There are no closing dates for applications and enquiries are always welcome.

For more information on the Global Research Award scheme, visit

www.raeng.org.uk/research/researcher/global

Distinguished Visiting Fellowship Scheme

The Academy's Distinguished Visiting Fellowship Scheme is a gateway to links and collaboration between UK and overseas centres of engineering excellence. The visits enable international relationships and networking to be developed, strengthened, and promoted at a senior level within academia.

Professor Zhenhui Tan from Beijing Jiaotong University (BJTU) in China visited the University of Kent in November 2008 as a Distinguished Fellow. BJTU and the University of Kent have shared research interests in mobile communications and the expertise of Professor Tan complements that of the host, Professor Jiangzhou Wang.

During his 10-year tenure as the Vice-Chancellor of BJTU, Professor Zhenhui Tan headed a programme of growth and innovation, leading to a tripling of

student numbers to 30,000 and to the introduction of social science and business modules to existing core engineering programmes.

Professor Tan's visit resulted in a number of talks and agreements, including: several seminars on Broadband Mobile Communications Technologies in China and on Challenges and Reforms in China's Engineering Education at the universities of Kent, Southampton, and Imperial College London; discussions on future cooperation between the University of Kent and BJTU; and a joint research proposal on adaptive resource allocation for high-speed wireless multimedia transmission.

In all, a total of 26 Fellowships were awarded in the last financial year. The deadline for the next round of applications is 30 June 2009.

New Year Honours

Several Academy Fellows received honours at the start of 2009. Here is the list in full:

Dame Commander of the Order of the British Empire (DBE)

Professor Wendy Hall, CBE. Professor of Computer Science, University of Southampton. For services to Science and Technology.

Commander of the Order of the British Empire (CBE)

Terence Keith Morgan. Chief Executive, Tube Lines. For services to Public Transport.

Professor Peter Neil Temple Wells. Research Professor and Senior Scientific Director, Institute of Medical Engineering and Medical Physics, University of Cardiff. For services to Healthcare Science.

Officer of the Order of the British Empire (OBE)

Michael John Glover. Arup Fellow, Technical Director and Deputy Project Director, Channel Tunnel Rail Link. For services to Engineering.

Professor Richard Andrew Williams. Pro-Vice Chancellor, University of Leeds. For services to Science and to Engineering.

Member of the Order of the British Empire (MBE)

Barry Albert Haseltine. For services to the Construction Industry.

Terence Michael Lazenby. Chairman, Engineering Construction Industry Training Board. For services to Skills and Training.

Contact

If you would like to find out more about any of the articles in the Academy newsletter, please contact:

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Development News

Academy fundraising continues apace

The Development team is delighted to report new funding for the education strand of its campaign, *Making Things Better* – notably a £1,000,000 gift from BAE Systems pledged over three years that includes support for The Big Bang fair. This gift leads the way for other major corporate gifts, with a second £1,000,000 commitment already made.

In March, Lord Sainsbury's Gatsby Foundation, long-term supporters of the Academy's education and engagement work, made a significant new gift of £250,000. First-time funds to encourage children to study and consider an engineering career have come from The Bernard Sunley Charitable Trust and The Eranda Foundation.

As a result of Dr Aderin-Pocock's presentation to children at The American School, we also received a welcome donation from the Blavatnik Charitable Foundation (see Education News). The Anglo-American Foundation has given £75,000 to support the

Academy's first capacity-building project in sub-Saharan Africa.

Slower progress is being made on securing pledges towards making Carlton House Terrace a forum for engineering. However several parties intend to help materially when the time is right; efforts are continuing.

The Academy has welcomed four new campaign board members: Mr Ian Barlow (Senior Advisor, KPMG), Ms Vivienne Cox (CEO, BP Alternative Energy), Mr Simon Robertson (Chairman, Rolls-Royce) and Mr Syamal Gupta FREng (Tata International).

Sir John Parker FREng, campaign chair, would like to thank all those Fellows who have already made a gift to the campaign and those who are intending to do so. If you are considering a legacy gift, please contact Bernadette Benati on 020 7766 0616.



New funding for Making Things Better

Help is at hand for nominating Fellowship candidates

The Academy Council has said it would like to see more of the existing Fellowship proposing candidates for election. It is also concerned about progress towards meeting one of the key recommendations of the membership study conducted by Sir Peter Gershon, namely that 50% to 60% of those being elected should be working in industry at the time of election, with a significant proportion of these aged under 50 and/or working in smaller companies.

There appear to be two particular reasons why neither of these aspirations is currently being met. One is that many Fellows say they need help deciding what makes a good proposal. The second is the difficulty in finding assessors for candidates working in currently unrepresented companies and sectors.

The Proactive Membership Committee (PMC) has been established to help you. So if you have someone in mind and would like to talk about how to put them forward for election to the Fellowship, please contact either: Ian Nussey, PMC Chair, (ian_nussey@uk.ibm.com) on 01789 773356, or Fellowship Manager, Chris Coulter, (chris.coulter@raeng.org.uk) on 020 7766 0687.

News of Fellows

Professor Nicholas Ambraseys was named a Legend of Earthquake Engineering at the 14th World Conference on Earthquake Engineering in Beijing.

Lord Broers received an honorary doctorate from Sheffield Hallam University.

Professor Dame Ann Dowling CBE received an honorary degree Sc.D from Trinity College Dublin.

Professor Brian Eyre was elected as Foreign Associate of the US National Academy of Engineering.

John Hudson was appointed Managing Director of BAE Systems Submarine Solutions in Barrow-in-Furness.

Dr Michael Lynch OBE was named Entrepreneur of the Year 2009 by Management Today magazine.

Sir Duncan Michael became an Honorary Fellow of the Royal Institute of British Architects (RIBA).

Professor Nigel Titchener-Hooker became Head of Biochemical Engineering at University College London.

Sir Robert Walmsley was appointed to the board of Ultra Electronics as a non-executive director.

Professor Ian White gave Cambridge University's Annual Prestige Lecture.

Honorary Fellows

Dr Vanessa Lawrence was named South East Director of the Year by the Institute of Directors (IoD). She was also appointed to the Council of Cambridge University.

International Fellows

Frederick P. Brooks Jr was honoured by the dedication of the Frederick P. Brooks Jr Computer Sciences Building at the University of North Carolina.

Professor Jorg Imberger gave the Duglad Clerk Lecture at the Institution of Civil Engineers.

Policy and Public Affairs News

Ethics of autonomous systems workshop

Many areas of technology are likely to be transformed by the introduction of autonomous or intelligent systems over the coming decades. Autonomous systems are an evolution from automated systems, in which a system is able to learn and to make decisions about how it should operate in a given situation.

A number of application areas are on the horizon, among them: defence (both unmanned aircrafts and battlefield robots); health and social care (patient monitoring and artificial companions); transport (GPS-controlled vehicles); and industrial control systems.

The Academy held a workshop on 6 February – *Ethics of Autonomous Systems* – to investigate when these technologies are likely to come to the attention of the public and begin to affect their lives and to identify some of the ethical, legal, and social issues that will arise from their implementation. Two main application areas were discussed at the workshop – autonomous vehicles on the highway network, and automated apartments for older people and those with illness or disabilities.

These two areas differ quite significantly. Road vehicles have become increasingly automated over the decades and, with the introduction of GPS, drivers are ceding ever more control of their vehicles to technology. However, there is still a significant step between those technologies which help drivers to make decisions and autonomous vehicles that take control away from the driver.

There are a number of legal and administrative hurdles to be overcome before autonomous vehicles could be used on the roads, and drivers' perceptions of and desire for such vehicles would be a significant factor in their uptake.

Automated apartments and remote patient monitoring systems are much closer to implementation. Such technologies are intended to allow older or ill people to remain in their homes on their own whilst ensuring that if they become ill or have an accident, action can be taken. However, there has been little investigation of the ethical and social ramifications of such technologies – do they infringe on privacy, and could they lead to social isolation?

A short report of the workshop will be produced, identifying the complex social, ethical and legal issues in this area. Public debate is needed before these technologies come in to use, and opportunities for engaging potential users will be a particular concern of the report, which build on information acquired from the *Visions for the Future* conference (see page 7).



Autonomous systems are becoming reality

Nuclear skills

The Government has committed to a new generation of nuclear power stations but does the UK have the requisite engineering skills to build these stations? And what will be the impact of diverting nuclear engineers from other parts of the sector, such as decommissioning and the military?

Two meetings were held at the Academy to address these questions. The first, in December 2008, was a meeting of stakeholders in the areas of civil nuclear power, decommissioning, nuclear submarines (both procurers and suppliers), academia, and skills agencies. This meeting concluded that there was a general need for engineers in the UK and there is likely to be competition for skills between nuclear new-build and other major projects the UK is undertaking, such as building infrastructure for the Olympics and Crossrail. It also highlighted the need for agreement on how to prepare students for a career in nuclear engineering – whether by undergraduate degrees, postgraduate qualifications, or vocational training.

The second meeting held in January 2009 focused on actions needed to ensure and that the UK is prepared for the demand on engineering skills. Cogent, the sector skills council for the nuclear industry, will be preparing a report over the coming year on skills needed by the nuclear sector. Attendees agreed that key stakeholders must be prepared for the conclusions of the report, and must be ready with strategies relevant to their own needs.

An over-arching view of nuclear engineering and its connection with other areas is needed. The Office of Nuclear Development has a key role in this, and the Academy also has a role to play in providing a forum for diverse areas of the sector to meet and discuss the issues affecting them.

Policy responses

The Academy's policy team have responded to the following recent inquiries and consultations: *Putting Science and Engineering at the Heart of Government Policy* for the Select Committee on Innovation, Universities, Science, and Skills; *Securing Food Supplies up to 2050 for the Environment*, Food and Rural Affairs Committee; *Framework for the Development of Renewable Energy in Scotland* for the Scottish Government; *Role of Carbon Markets in Preventing Dangerous Climate Change* for the Environmental Audit Committee; the *Digital Britain* interim report for the Department of Business, Enterprise, and Regulatory Reform and the Department for Culture, Media, and Sport; *Nanotechnology and Food* for the House of Lord's Science and Technology Committee.

All recent responses can be found at:
www.raeng.org.uk/policy/responses/default.htm

Engineering: Turning Ideas into Reality

A House of Commons committee has acknowledged the Academy's leadership role in the engineering profession.

The Innovation, Universities, Science and Skills Committee published its report, *Engineering: Turning Ideas into Reality*, on the importance of engineering in creating a resilient economy. The committee recommended that the Academy "take forward and formalise its leadership role, so that the engineering community can communicate – and co-ordinate – more effectively."

The report calls on Government to make better use of engineering advice to inform policy across departments. To ensure that engineering advice is available to Government, the Committee recommends a reorganisation of advisory structures, including the creation of a Government Chief Engineer as well as Departmental Chief Engineering Advisors in departments with a strong reliance on engineering policy. The report can be downloaded at:

www.raeng.org.uk/IUSS

External Affairs Committee

The Academy's newly formed External Affairs Committee held its inaugural meeting in March 2009 to develop an integrated communications, public affairs and public engagement strategy for the Academy.

The committee, which has taken on the work of the previous Communications and Public Engagement Committee, will drive forward an ambitious, high-impact agenda to raise the profile of the Academy's policy work through its standing committees for education, international affairs, and engineering policy.

Chaired by Dr Scott Steedman FEng, the committee comprises eight

Fellows of the Academy along with representatives from other organisations that can provide an extra dimension to the work (the CBI, Equality and Human Rights Commission and The Carbon Trust). The committee is developing a wider group of spokespeople from the Fellowship and across the engineering profession who will be offered media training and other support. A media advisory panel made up of journalists and PR specialists will provide ongoing advice and support.

During the first meeting, the committee discussed the strategy and work programme and considered how to define and measure outcomes.

The next issue of the Fellows' newsletter will feature a spotlight on the Academy's public affairs programme.

Robotics conference

In February 2009 the Academy published the findings of the *Visions for the Future* conference, which was organised jointly with the Walking with Robots network.

The conference provided the participants, who were aged 16 and over, with the opportunity to explore, debate, and discuss advanced robotics research and its potential impact on society.

The conference report gathered together the views and attitudes of the attendees on their hopes and expectations for how robots would be used, in addition to debating negative consequences for humankind and society.

It was noted that robotics has many benefits to offer future society but that policymakers, scientists and engineers need to think carefully about the motivations behind the research and their potential (and perhaps unintended) consequences.

Particular advantages of robotics were considered to be: the ability to increase the safety, speed, and accuracy of certain tasks and to undertake more mundane chores. The strongest concerns raised were those relating to 'human replacement' including a loss of jobs, and a reduction in human-to-human contact (for example if robots were to care of the elderly).

For more information, visit www.walkingwithrobots.org.uk

Heat workshop

Domestic buildings are significant end-users of the UK's total energy supply and are therefore a critical factor in moves to reduce the nation's carbon emissions by 80% by 2050.

On 22 January 2009, the Academy was host to a workshop on Heat, organised jointly with the Energy Research Partnership and the Energy Technologies Institute (ETI). The meeting brought together UK experts to discuss the policy issues presented by plans to reduce carbon emissions generated by heating and the technologies available to ameliorate CO₂ produced by domestic energy use.

Speakers included Bryan Silletti, of the ETI Strategic Advisory Group; Geoff Hammond from the University of Bath; Hergen Haye, from the Department of Energy and Climate Change; Dennis Loveday from Loughborough University; and Garry Staunton of the Carbon Trust.

Talks focused on the current state-of-play of the UK's heating infrastructure, and the technologies currently available to improve efficiency and lessen wastage. An important point raised during the workshop was the fact that over 70% of the UK's 2050 housing stock already exists, which necessitates solutions that can be used in existing properties.

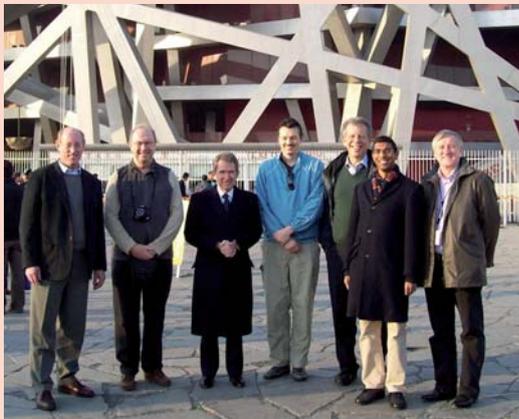
According to an informal survey of attendees, there was agreement that domestic buildings should be a priority for both research and demonstrator programmes to work towards minimising heat loss and promoting efficient use of heat, through methods including better insulation, using surplus heat from industry, and renewable heating like solar thermal and waste-to-energy.



Sensible use of heating could reduce emissions

International News

Mission to China



Fellows outside the 'Bird's Nest' stadium in Beijing

Following the signing of a memorandum of understanding between the Chinese Academy of Engineering (CAE) and the Academy in June 2008, a group of Fellows were invited by the CAE to China to help develop mutual understanding and industrial, academic, and governmental links between the UK and China in the areas of energy and climate change.

In December, Academy President Lord Browne FEng FRS and the Academy's Honorary International Secretary, Peter Saraga OBE FEng, led a delegation of Fellows to Beijing and Shanghai. The mission successfully strengthened ties between the two academies and reinforced the President's strong relationship with his counterpart, Professor Xu Kuangdi. The highlight of the visit was the participation by Fellows of both academies at a joint symposium on energy and climate change held at Peking University. This event provided a showcase for the latest technological advances and policy frameworks in this area and a platform for experts to exchange ideas on future policy development.

Also presented were some startling statistics highlighting the scale of the issues discussed, including the fact that if all the air conditioning units in China conformed to EU standards, the power saved by 2020 would be equivalent to that generated by the Three Gorges Dam. There was general agreement on the need to build further international collaborations to tackle the issue of climate change. A particular highlight of the Symposium was the large number of engineering students who attended the event and the high level of environmental awareness on display.

Topics covered in the symposium included clean coal, carbon capture and storage, renewable energy, energy efficiency and nuclear power. The UK speakers were Professor Nigel Brandon FEng (Imperial College); Sir Patrick Haren FEng (Chief Executive, Viridian Group); John Loughhead FEng (Executive Director, UKERC); and Professor Brian Collins (Chief Scientific Advisor to the Government Departments for Business Enterprise and Regulatory Reform and the Department for Transport).

The remainder of the visit included receptions at the residence of the Deputy Head of Missions in Beijing and the British Consulate in Shanghai to discuss British Government priorities in China. There were also meetings at some of the China's largest industrial companies to learn about novel methods being used to promote energy efficient technologies and the effects on business of tax incentives for the purchase of energy efficient equipment.

A meeting at Shanghai Municipal Government highlighted the high number of engineers in leading positions both in Government and management positions in industry.

A tour of the laboratories at Shanghai Jiao Tong University revealed the quality of research taking place in Chinese institutions. There was particular interest in the hybrid cars currently being developed in response to the rapid rise of automobiles in China.

Plans for a return Symposium are underway and it is expected to be held at the Academy in late 2009 or early 2010.

Research exchanges with China and India

The Research Exchanges with China and India scheme promotes academic collaboration between high quality engineering researchers in the UK and China/India and supports the expansion of international networks of excellence.

The scheme funds two types of awards: 'short' and 'major'.

Short awards support visits of up to one month and are primarily for exploratory or networking visits. Major awards support visits of 3 to 12 months and form part of longer-term efforts to build UK-China/India partnerships.

The latest round of awards was made in February this year. There were 21 awards made in total. The scheme funded five exchanges with India and 16 exchanges with China.

Several collaborations funded under the scheme will address critical CO₂ emission challenges, including energy, heating and fuel efficiency.

Professor Kang Li at Imperial College is planning to host Professor Xiaoyao Tan at Shandong University of Technology for a 12-month collaboration on increasing fuel efficiency.

The aim of Professor Li's proposed project is to develop multifunctional ceramic hollow fibre membranes for partial oxidation of methane into syngas (synthetic gas) production, in order to reduce carbon dioxide emissions from energy production processes.

Dr Runming Yao at the University of Reading and Professor Jie Zheng at Chongqing University will take part in visits for a joint exchange to investigate the impact of indoor thermal environments on human behaviour and the development of intelligent environment control systems.

The research aims to create a better understanding of the interrelationship between building performance and the behaviour of occupants

The deadline for the next round of applications will be October 2009.

The full list of awards is available at www.raeng.org.uk/international

Science and Innovation Network

In November 2008, the Academy submitted a response to the Department for Innovation, Universities and Skills' (DIUS) consultation on the innovation capacity of the UK's global Science and Innovation Network (SIN). The Academy's response called for a sharper overseas focus on innovation support, particularly for small and medium-sized companies (SMEs).

The Academy highlighted the need for SIN to introduce UK stakeholders to research and/or technology-based businesses, innovation agencies and potential investors in key overseas markets. This would help the most innovative companies in the UK, most of which are SMEs, to develop international partnerships and grow their international markets.

There was also a need to raise greater awareness of the network and to provide appropriate communication and stakeholder engagement activities.

Council News

The Council held its first meeting of 2009 on 20 January. The Council approved a new, more transparent process for electing the next President: nominations will be sought from the Fellowship and a shortlist drawn up by the Nominations Committee, from which a recommended candidate will be put forward for election at the AGM.

Chief Executive Philip Greenish reported on current activities, including: efforts to limit the cost of events; expanding the exposure and impact of the Academy's policy work; progress with the Science and Engineering Fair; and the development of an information strategy for the Academy.

The Council approved a strategic delivery plan. This sets out the metrics and milestones to be achieved in the key areas of creating and recognising excellence in engineering, addressing the issues of the day, and promoting engineering.

The Council also considered plans for

developing the Academy's headquarters and instructed the Carlton House Terrace Project Committee to investigate whether work can be carried out in a phased manner. If this were possible, it would enable a substantial part of the development plan to be signed off in advance of all the funds being raised for the entire masterplan.

A number of recommendations from the Awards Committee were discussed and the Council approved the 2009 awards of the President's Medal, the Sir Frank Whittle Medal, and the ERA Foundation Entrepreneurs' Prize 2009.

The Chairs of the standing committees on Engineering Policy, Education and Training, International, and External Affairs reported on the current major issues for their departments. Reports included news of a Parliamentary enquiry into how Government formulates science and engineering policy. Also, the Academy's mission to China helped to build relationships and plans are underway for a follow-up meeting.

Newton International Fellowships

The Newton International Fellowships, administered by The Royal Academy of Engineering, the Royal Society and the British Academy, aim to bring research stars of the future from around the world to work with top UK groups to build new global research collaborations. Further follow-on funding is available to enable the Fellows to maintain their links with the UK.

One of the first batch of 13 engineers to be awarded a Newton International Fellowship is Dr Deborah Villarroel-Lamb, who is a civil engineer and lecturer at the University of the West Indies in Trinidad.

She will spend the next two years with Richard Simons, Professor of Fluid Mechanics and Coastal Engineering at University College London, examining new ways to model and predict coastal erosion, particularly for her home region in the Caribbean.

During her PhD research, Dr Villarroel-Lamb developed a coastal erosion model to predict the short-term response of

beaches in both stormy waves and calmer seas, imitating natural conditions. In its fullest context, the aim of the model is to simulate the long-term behaviour of beaches and provide an effective tool for coastal zone management. Unlike other similar models, it can demonstrate the effect of storm or hurricane conditions and the effects of sea level rise.

"Much of the research we are doing in the Coastal Group at UCL relates closely to Dr Villarroel-Lamb's interests and her new ideas will stimulate our work," says Professor Simons. "We are developing and applying novel computer models of coastal processes, which complements our established track record in detailed laboratory investigation of various flow phenomena."

"Trinidad and Tobago's economy is driven mainly by industrial exports of oil and natural gas," says Dr Villarroel-Lamb. "But there is now a real drive to promote tourism and we need to manage our coastal resources properly. Ready access to a state-of-the-art package applicable to the region will provide a rigorous technical basis for decision-making. This is even more important for other Caribbean

islands that already rely heavily on their beaches for tourism."

The second round of applications for the Newton International Fellowships closed in January 2009 and over 750 applications were received, covering the full range of disciplines under the remit of the British Academy, The Royal Academy of Engineering and the Royal Society. The results will be announced in the summer.



Newton Fellow Dr Villarroel-Lamb

Education Programmes

BAE Systems Engagement Project

BAE Systems has generously provided the Academy with funding for a three-year commitment to support the development and promotion of engineering among young people and their teachers in UK secondary schools.

Through our many years of work with the Best Programme, more recently through leading the London Engineering Project and supporting the introduction of the Diploma in Engineering, and overall through acting as lead organisation in the Government's STEM Programme, the Academy has been able to identify four key requirements to support engineering in UK secondary education. These are: supporting teachers, linking the curriculum to the real world of work, providing engineering activities for pupils in and around school, and providing inspirational engineering role models.

The BAE Systems Engagement Project will focus on these requirements. It will support teachers in delivering STEM – in an engineering context – and ensure that relevant continued professional development provides them with good subject knowledge of engineering.

It will also support the formation of after-school science and engineering clubs in both primary and secondary schools to enable students to experience engineering for themselves. In addition, the project will develop and provide teaching resources that clearly demonstrate the links between STEM learned at school and real-world engineering.

Finally, the project will support engineers from all walks of life in becoming effective science and engineering ambassadors thereby providing role models who are able to attract pupils from diverse backgrounds into engineering to widen participation in the subject at all levels.

Academy training for undergraduates

The Academy runs a suite of personal and professional development courses for engineering undergraduates. The number and range of courses has increased significantly recently thanks to grant-in-aid funding from DIUS. The latest course saw 30 engineering undergraduates, selected on merit from

universities up and down the UK, come together at 3 Carlton House Terrace to receive hands-on training in the vital skill of negotiation. This practical course was co-delivered by the Academy, the Engineering Construction Industry Training Board (Chairman – Terry Lazenby FREng) and Foster-Wheeler.

STEM education programme rolls out

The London Engineering Project (LEP) is anticipated to be rolled out on a national scale in August 2009. The University of Birmingham has been appointed by HEFCE as the host of the National Higher Education STEM Programme, and the LEP is currently disseminating its best practice along with its counterpart projects in physics, mathematics, and chemistry.

Both the Welsh Engineering Project (WEP) and Barrow Engineering Project (BEP) are undergoing important evaluations of their first years. The BEP has already secured funding from West Lakes Renaissance to continue for a second year. West Lakes Renaissance is a dynamic urban regeneration company currently leading the economic revival of Furness and West Cumbria regions.



The LEP is inspiring UK STEM education

Rose Review of the Primary Curriculum

The interim review of the primary school curriculum by Sir Jim Rose, former Director of Inspection at education watchdog Ofsted, was published in December, with the final review released at the end of March 2009.

The review was carried out to advise Government Ministers on how the primary school curriculum needs to change in order to do three things: ease the transition from nursery schooling into primary schools; sharpen the focus on mathematics and English; and give teachers more flexibility to design and deliver a localised curriculum.

With new programmes of study being signed off by the Secretary of State in September 2009 - and due to be introduced into primary schools in September 2011 - the Academy is working with QCA (the agency responsible for schools curricula in England) and others to define manageable ways for teachers to cope with the transition to the new curriculum, particularly in the areas of science and technology.

The Academy extends its thanks to the Blavatnik Family Foundation for its generous support of this work, which will help to fund continuing professional development for teachers and the formation of after-school engineering clubs.

Best review

The external review of the Academy's flagship education scheme, the Best Programme, has now concluded. As a result, the Best Programme now has a clear view of where it fits into the education landscape.

The review panel, led by Professor Jonathan Osborne of King's College London, has made a number of useful recommendations that are being taken forward under the chairmanship of Professor Neil Alford FREng. The principal thrust is to continue the quality of provision and to target schools and students where the greatest impact can be made.

Catapulting to success



Trebuchet Challenge students present their competition entry

Over 100 LEP students took part in a week of workshops at the Tower of London during Enterprise Week in November.

Coordinated by Lead LEP Fieldworker Ahmed Kotb, they took place in the vaults of the Royal Armouries and included a trebuchet design competition.

A trebuchet is a siege engine that was employed in the Middle Ages either to smash masonry walls or to throw projectiles over them. Trebuchets first appeared in China around the

4th century BC and in Europe in the 6th century BC. Far more accurate than other medieval catapults, they could fling 140 kg projectiles at high speeds into enemy fortifications.

So successful were they as a weapon, they did not become obsolete until the 16th century; well after the introduction of gunpowder.

Judging criteria for the competition focused on the technical accuracy of the trebuchet designs and the students' ideas on how they would market and distribute their product worldwide.

Among the schools taking part were The Charter School, Central Foundation Girls' School, Lilian Baylis Technology School, Bacon's College and Harris Academy Bermondsey.

All the participants were treated to a tour of the Tower of London where they saw the Crown Jewels and entered the White Castle.

Roger Hiskey, Coordinator at Harris Academy, says the event has attracted considerable interest from his school: "Word has spread through Harris Academy Bermondsey about what an interesting and exciting day this is. The girls work in small teams, helping each other overcome the various engineering challenges in constructing a trebuchet."

"The competition to see which team's trebuchet can send a projectile the furthest is an exciting climax to the day which, from an educational point of view, is ever so worthwhile."

Engineering Islam

Around 100 students from five London Engineering Project (LEP) schools took part in a celebration of culture and engineering at the Academy.

They took part in some of the activities from *1001 Inventions*, a UK-based project from the Foundation for Science, Technology and Civilization (FSTC) which aims to increase awareness and appreciation of 1,000 years of Muslim contribution to science, technology and modern civilisation.

The pupils, from Harris Academy Bermondsey, St Saviour's & St Olave's School, Bow School for Boys, Little Ilford School and Mulberry Girls' School, came together for the end of Ramadan to recognise and celebrate the achievements of the Islamic world.

Led by LEP fieldworkers, activities included making a pin-hole camera and a functioning glider.

The students were given talks by science and engineering ambassadors and members of the FSTC.

Club Asia Radio covered the event live from the Academy.

Student Development Fellowships

A joint scheme run by The Royal Academy of Engineering and the ERA Foundation has given an Oxford DPhil (Doctor of Philosophy) student the chance to conduct important research into hybrid and electric vehicles.

Founded in 2005, the Research Student Development Fellowships have been awarded annually to a select group of students to aid research and academic development.

Tim Woolmer, a recipient of one of these awards, has for the past three years seen the benefits of the Fellowship in his DPhil research into electric and hybrid vehicles.

Tim's research sought to address the twin problems of an electric engine: weight and cost, and directly led to the invention of the Yokeless And Segemented Armature (YASA) motor. The unconventional use of materials coupled with the motor's novel design enabled the YASA motor to achieve a specific torque to mass ratio two to three times higher than the best alternative products.

The Research Student Development Fellowship has enhanced Tim's research capabilities, and provided him with a

number of useful networking opportunities within the automotive industry and in academia. The Fellowship has also enabled Tim to present academic papers in Sweden, Turkey, and the UK. In 2007 he was invited to give seminars on the YASA motor at MIT in the United States and at the Japanese automotive show, JSAE, in Yokohama.

Currently Tim is undertaking further research at Oxford University into optimising the YASA motor for high-volume production. He expects to form a spin-out company in the coming months to commercialise the motor, which will be formed with the help of Oxford University's technology transfer company, ISIS Innovation.



Tim Woolmer and the Morgan LIFECar team

Obituaries

The Academy has been looking for a way to enable tributes to be paid to Academy Fellows who have passed away. We have now set up a section on the Academy website titled *Appreciation of Past Fellows*.

Names of the Fellows listed below have been placed on a page where people can add their tributes.

If you would like to pay tribute to these Fellows or to others in the future please go to www.raeng.org.uk/pastfellows

Dr Anthony Downing FEng died on 1 January 2009. Prior to his retirement he was a Partner at Binnie and Partners Consulting Engineers.

Mr Robert Dunn FEng died on 23 November 2008. Prior to his retirement he was Director-General of Mining, National Coal Board.

Professor Robert Gibson FEng died on 23 December 2008. At the time of death he was Emeritus Professor of Engineering Science, King's College London.

Professor John Harris MBE FEng FRS died on 3 February 2009. At the time of

his death he was Vice-Chair of British Pugwash Group.

The Hon Peter Kershaw FEng died on 10 March 2009. Prior to his retirement he was Director and Chief Engineer at Sir Robert McAlpine and Sons Ltd.

Mr T V Lawson FEng died on 9 March 2009. At the time of his death he was a consultant in wind engineering.

Sir Alan Muir Wood FEng FRS died on 1 February. At the time of his death he was a consultant for Halcrow Group.

Professor John Mullin FEng died on 12 March 2009. He was Emeritus Professor of Chemical Engineering, University College London.

Dr James Porteous DL FEng died on 18 March 2009. At the time of his death he was Director of Nuclear Liabilities Fund Ltd.

Dr Roy Rowe CBE FEng died on 18 December 2008. Before his retirement he was Director-General of the Cement and Concrete Association.

Dr Charles Sandbank FEng died on 15 December 2008. At the time of his death he was Broadcasting Technology Adviser, Department of Trade and Industry.

Professor Frank Wallace FEng died on 27 January 2009. He was Senior Partner, F J Wallace and Associates Ltd.

Mr D B Welbourn FEng died on 4 March 2009. He was a consultant for Delcam International plc.

Professor Olgierd Zienkiewicz CBE FEng FRS died on 2 January 2009. He was Professor Emeritus, University of Wales, Swansea.

Honorary Fellows

Sir Ernest Harrison OBE HonFEng died on 16 February 2009. He was Life President of Vodafone Group plc.

Lord Ron Dearing of Kingston upon Hull Kt CB HonFEng died on 19 February 2009. At the time of his death was Chairman of the Government Higher Education Policy Committee.

International Fellows

Mr Victor Milligan FEng died on 4 March 2009. Before his retirement he was a founding partner of Golder Associates Consulting Engineers.

Staff News

Claire Little has joined the Academy as Development Administrator. Previously, she worked in Membership and International Development for RICS.

Emma Walsh has joined the Academy as Corporate Partnerships Manager. She previously worked for a sustainability consultancy.

Cuong Dang has changed roles to become International Officer. He was previously Team Administrator to Policy

and Public Affairs/International.

Alice Curnow has joined the Academy as Team Administrator Policy and Public Affairs/Strategy and Planning. She was previously a PR and Digital Radio Representative in Italy.

Ian Bowbrick, Head of Professional Formation at the Academy, has been elected to the Fellowship of the Institute of Materials, Minerals, and Mining.

Kenneth Ng has joined the Academy as Team Administrator, Professional Formation. He was previously an

administrator with Zelin and Zelin Solicitors.

Shane McHugh and **Shafiq Ahmed** have taken on the joint role of Acting International Manager.

Hayaatun Sillem, International Manager, has taken six months maternity leave. She gave birth to a baby boy on Sunday 15 March 2009.

Two people have left the Academy: **Antoinette Carey** joined Goldsmiths College and **Carolee Summers-Sparks** left to join CASE Europe.

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