



## Global Grand Challenges Summit

The second in the series of Global Grand Challenges Summits, jointly organised by the national engineering academies of the UK, US and China, was hosted by the Chinese Academy of Engineering in Beijing on 15-16 September 2015. This event was a follow up to the successful summit held in London in March 2013, where Bill Gates and Craig Venter were the plenary speakers.

The Summit highlighted the need for interdisciplinary, international collaboration to address the world's most pressing challenges, particularly those arising from climate change, a growing and ageing population, and the energy and infrastructure needs posed by increasing urbanisation across the globe. It also called for increased investment to attract students to engineering careers, and a more challenge-based education framework for the next generation of engineers.

Dean Kamen, founder of the FIRST robotics league, a highly successful US schools robotics competition, used the summit to announce a global expansion of the programme, culminating in a FIRST Robotics Olympics, to take place alongside the third Global Grand Challenges Summit in Washington, DC in 2017.

A number of senior UK engineers spoke at the summit. Andrew Chan FREng, Chairman of Arup Group Trusts, spoke in the plenary session about the doubling of global infrastructure spend needed by 2050 and the principles which should inform future cities. Dervilla Mitchell CBE FREng, also of Arup, talked of the challenges posed by integrated urban transport systems. Keith Clarke CBE FREng, Vice President of the ICE, urged the developed world to combat climate change rather than focusing solely on resilience.

Professor Helen Atkinson CBE FREng, Chair of the Academy's Education Committee, presented a new approach to engineering education centred around the values and habits of mind set

out in the Academy's 2014 report, *Thinking Like an Engineer*. Professor Alastair Borthwick FREng of Edinburgh University gave an overview of the potential of marine renewable energy resources, while Professor Guang-Zhong Yang FREng, director of the Hamlyn Centre, examined the impact that wearables and implants would have on personalised healthcare. Academy Enterprise Fellow Dr Jack Cohen spoke about enhancing work environments through virtual reality, and Silver Medal winner Professor Máire O'Neill addressed cybersecurity challenges.

The UK delegation was led by Vice President Professor Richard Williams OBE FREng, while Academy President Professor Dame Ann Dowling DBE FREng FRS gave an address by video. A number of Engineering Leadership Awardees also attended and participated in an innovation pitching student competition prior to the event.

Other speakers included Jack Ma, founder of Alibaba. Charles Holliday, Chair of the US National Academy of Engineering and President of Royal Dutch Shell, encouraged engineers to be more forthright in explaining and publicising their innovations: "if it walks, brand it". The pop star and entrepreneur will.i.am spoke eloquently about his work promoting engineering as a career, and noted that engineering was vying for children's attention with two industries - sports and entertainment - which spent billions every year on publicity. He said that, if we as engineers were serious about competing, we would need to co-opt their strategies and massively increase our investment.

The event was livestreamed, and videos of all presentations will shortly be available on the Academy's video website, [www.raeng.tv](http://www.raeng.tv)

▲ Alibaba.com founder Jack Ma speaking at the Global Grand Challenges Summit in Beijing on 15 September

# President's column



## Meetings and visitors

### In her capacity as President, Dame Ann has met with:

Norman Apsley OBE FEng, CEO, Northern Ireland Science Park

Nicola Blackwood MP, Chair of the House of Commons Science and Technology Select Committee

Ian Blatchford, Director, and Jean Franczyk, Deputy Director, Science Museum

Erik Bonino, EVP, Downstream Technology and Chair, Shell UK

Sir Emyr Jones Parry GCMG PLSW, President of the Learned Society of Wales

Diego Gómez Pickering, Mexican Ambassador to the United Kingdom

Jon Prichard, Chief Executive, and Nigel Guild CB FEng, President, Engineering Council

Scott Steedman CBE FEng, Director of Standards, BSI Group

### She attended the following events and meetings:

Council for Science and Technology Dowling Review Workshop and Innovation Group

Dyson Design Prize

Engineering Research Forum

Presidential visit to Belfast which included a visit to Bombardier hosted by Michael J Ryan CBE FEng, Vice President and General Manager, and Gavin Campbell, Director Engineering and Technology Development; and a visit to Queen's University Belfast hosted by Professor John McCanny FEng FRS, Director of the Institute of Electronics, Communications and Information Technology (ECIT)

### She was interviewed by:

Tim Hulse, Editor of British Airways Business *Life* magazine

Business-university research collaboration is a crucial part of the innovation ecosystem, and I was delighted to assist the Department for Business, Innovation and Skills (BIS) when they asked me in December last year to review the ways in which government can help initiate and support such relationships to the broad benefit of the UK.

My report, which was published in July, was compiled after we had held a number of workshops and regional meetings and had received over 200 written submissions of evidence from academia, industry and research organisations. I was also helped by an effective Steering Group who brought expertise across a range of sectors and disciplines. The evidence we gathered demonstrated that, while some companies have been exceptionally active in building effective research collaborations with universities, it is extremely patchy. This means that the UK is not reaping the full potential of its opportunity to connect businesses – both domestic and international – with the excellent research being done in UK universities. The review found that the complexity of the existing government funding and support mechanisms creates frustration and confusion, and acts as a barrier for companies who want start to engage with universities. A major recommendation was that government needs to simplify their funding schemes and to provide effective brokerage to facilitate the identification of potential research partners.

We also need a change of culture in our universities. We heard that academics who pursue collaborations with industry often felt that they did so in spite of, rather than because of, their universities. The perception persists that collaborating with industry is damaging to an academic career path. In the UK, we can be somewhat dismissive towards research undertaken as a result of engagement with users. The review team could not have felt more strongly that we really do need to move on from this. Use-inspired research – research inspired by challenges faced by users, whether in industry or elsewhere – is just as intellectually challenging as research inspired by other academics, and can be truly excellent. Universities need to ensure that recruitment and promotion criteria for relevant disciplines reward rather than penalise academics who have achieved excellence in translational and collaborative activities, and that these messages are communicated effectively.

To date, the media coverage of the review has been positive, and it is clear the government understands the important

role business-university research collaborations have to play in the UK. My review was mentioned in both the Budget and the Chancellor's Productivity Plan. It was a pleasure to see continuing interest from over 100 attendees at an Academy workshop on 2 September, where we discussed the many issues raised. There is a huge amount of goodwill and drive to make collaborations happen. With appropriate support and an effective policy framework, this can be translated into substantial benefits for the UK through the development of innovative products and services and improved competitiveness and productivity. We await the government's response with interest.

Universities working together with businesses can give a real boost to the economy. In July I was pleased to visit Queen's University Belfast, the Northern Ireland Science Park and Bombardier Aerospace, Belfast, which provide excellent examples of effective collaborations and how leading edge technology delivers jobs and world-beating products and services.

The UK has world-class universities, an excellent and highly productive research base, an extraordinary history of invention and innovation and many world-leading science and engineering-based companies. However, international competition is stronger than ever and set to increase in years to come. Despite the maintenance of the science 'ring-fence', the science budget has been falling in real terms since the last Comprehensive Spending Review, with inevitable consequences for the health of the research base. Moreover, the UK suffers from a history of underinvestment in innovation, which persists today.

The current financial pressures facing the government cannot be ignored but investing in research and innovation can help to create high-value jobs and growth, strengthen productivity, improve the efficiency, effectiveness and resilience of public services and attract high-quality investment and talent. The importance of public investment in innovation is the subject of a new Academy publication, *Investing in innovation*.

Along with our sister academies, we shall be promoting the importance of public support for research and innovation at this autumn's political party conferences.

## Fellows' Day and AGM

On 21 September, the Academy held its first Fellows' Day alongside the AGM. Prince Philip House was filled with displays of Academy work, and Fellows and staff were on hand to explain how Fellows can get involved with their Academy.

Fellows had the opportunity to meet the President and Trustee Board. A tour of the building included the lower ground floor, which is to undergo extensive refurbishment.

In the formal AGM, the President, Dame Ann Dowling DBE FREng FRS, presented her review of the Academy's year. The Annual Review and Financial Report and Accounts for the year ending 31 March 2015 were received. The chair of the Finance Committee, Ian Ritchie CBE FREng FRSE, gave the financial report. Attendees celebrated the election of 47 new Fellows, and three International Fellows. The full list of new Fellows can be found at [www.raeng.org.uk/New-Fellows-2015](http://www.raeng.org.uk/New-Fellows-2015)

After the AGM, Professor Richard Williams OBE FREng presented the results from the Fellowship engagement survey. The decision to hold Fellows' Day had been one outcome of Fellows' feedback and other ways of engaging Fellows are being pursued.



The President presented the 2015 Sir Frank Whittle Medal to Professor Peter Clarricoats CBE FREng and the 2015 Sir George Macfarlane Medal to Dr Matthew Cole.

Malcolm Brinded CBE FREng gave a presentation on the Academy's Africa Prize for Engineering

The evening concluded with presentations on the future of engineering and the Academy from Professor Sir Peter Gregson DL FREng, David Eyton FREng, Allan Cook CBE FREng, Dame Sue Ion DBE FREng, Professor Mark Miodownik FREng and Dr Amanda Wright.



▲ **Above:** John Robinson CBE FREng and Professor David Bogle FREng at the exhibition  
▲ **Top:** Professor Mark Miodownik FREng speaking as part of the Fellows' Day programme of events

## Queen Elizabeth Prize

The QEPrize Global Engineering Ambassadors Network is an international group of young engineers from business and academic institutions. During the first two QEPrize cycles, early- and mid-career UK-based engineers acted as evangelists for engineering, engaging with teachers, parents, schoolchildren, politicians and journalists about their work and the importance of engineering as a profession.

The network aims to develop a global community where the ambassadors will be invited to participate in QEPrize activities, attend international conferences and provide a platform to promote their work. As engineering role models, they will connect with peers from different disciplines, in different areas of the world.

QEPrize Ambassadors are graduate students or early-to-mid-career engineers (either apprentices or

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engineering graduates), with less than 20 years of experience, and are passionate about engaging and inspiring others in engineering. To become an ambassador or for the QEPrize, or for more information, please contact the QEPrize team at [info@QEPrize.org](mailto:info@QEPrize.org)

## Enterprise Hub support

International oil and gas sector provider Schlumberger has become the latest partner of the Academy's Enterprise Hub. The Hub partnership programme, through which supporters commit multi-year funding, is helping build an engaged and connected entrepreneurial

community. Other Hub partners include The Entrepreneurs Fund, Atkins, the ERA Foundation, Johnson Matthey and Anglo American Platinum.

The Royal Commission for the Exhibition of 1851 has agreed to fund three new Enterprise Fellowship awards, to enable graduate-level engineers to create

start-up companies based around their technological ideas. The fellowships include business mentoring and salary support, and aim to build entrepreneurial capacity and create the next generation of UK technology innovation success stories.

## Launchpad Competition final



▲ David Gammon awards James Roberts his trophy after the winner announcement by Dame Ann Dowling DBE FREng FRS

On 29 September, the final of the Enterprise Hub's Launchpad Competition, aimed at budding young technology entrepreneurs in the UK between the ages of 16-25, was held at the Academy. The winner, James Roberts, received the JC Gammon Award – a £15,000 prize plus tailored support including mentoring from Academy Fellows. The Launchpad Competition is generously supported by Rockspring and the Gammon family.

The event commenced with a keynote address from Demis Hassabis, the co-founder of Deepmind, an artificial intelligence

company recently acquired by Google/Alphabet. The four shortlisted finalists each had two minutes to pitch their business, followed by a Q&A. The panel of judges was led by judges was led by Ian Shott CBE FREng, the Chair of the Academy's Enterprise Committee. The winner was selected using a combined audience and judges' vote.

The four finalists were:

- Amanda Campbell, founder of Comp-A-Tent, an environmental alternative to normal tents, that often end up in landfill. Comp-A-Tent is plant-based and compostable.
- George Edwards, founder of Gas-sense, a solution to monitor levels of bottled gas through a magnetic strip that connects wirelessly to a smartphone.
- Sorin Popa, founder of Stent Tek, an electronic guide system to enable stent graft surgery to be performed much less invasively and with a reduced failure rate, providing a better quality of life for patients.
- James Roberts, founder of mOm – The inflatable incubator, an electronically controlled, inexpensive incubator designed to decrease the premature death rate through the developing world.

All four finalists have been invited to become members of the Enterprise Hub where they will receive mentoring and support.

## Africa Prize for Engineering Innovation

The UK Foreign and Commonwealth Office's Africa Prosperity Fund has awarded a grant of £120,000 towards the Academy's Africa Prize for Engineering Innovation. The first winner of the prize, which supports the development of engineering

innovation and entrepreneurship in sub-Saharan Africa, was announced in June 2015. Tanzanian chemical engineer Dr Askwar Hilonga won the prize for his specialised water filtration system.

The grant will enable finalists for the 2015-16 prize to receive an enhanced mentoring and business training package.

## Mexican initiative



The Academy has signed a Memorandum of Understanding (MoU) with the Academy of Engineering of Mexico (AI). The ceremonies took place in two stages,

with the first part hosted on 28 July 2015 at the Mexican Ambassador's residence in London. Professor Dame Ann Dowling DBE FREng FRS signed on behalf of the

Academy, and Ambassador Diego Gómez Pickering signed as witness of honour.

On 31 July, AI President Dr Sergio Alcocer signed the MoU with HM Ambassador to Mexico, Duncan Taylor, as witness of honour. This MoU was signed in the 2015 Dual Year of the UK and Mexico; a yearlong celebration of cultural, educational and business exchange to the benefit of both nations.

With this agreement in place, the Academy looks forward to continuing existing work in Mexico through the Newton Fund, and collaborating with the AI to strengthen engineering links for the benefit of the UK and Mexico.

◀ Ambassador Diego Gómez Pickering and Dame Ann Dowling DBE FREng FRS at the signing of the MoU

## Parliamentary inquiries

Following the 2015 general election, there has been an overhaul of Parliamentary Select Committees. This has prompted a raft of new inquiries over the summer. The Academy, often in conjunction with other engineering institutions, has responded to a number of these.

The Energy and Climate Change Committee asked for short submissions to recommend areas it should focus on. The Academy highlighted the decarbonisation of the electricity grid, including smart meters, the implementation of new electricity market mechanisms and decarbonisation of the heat sector, including the future of the gas grid.

The House of Commons Science and Technology Committee is carrying out inquiries on big data and the science budget. In a joint submission with the IET on big data, the Academy set out the risks and opportunities inherent in the use of data for the economy as a whole and for specific sectors such as energy and manufacturing. On the science budget, the Academy focused on the need to invest in research and innovation in order to help to create high-value jobs and growth, strengthen productivity and improve the efficiency, effectiveness and resilience of public services.

The government's Productivity Plan is being scrutinised by the BIS Committee and, in response, the Academy, along with a number of other institutions,

has emphasised the need for continued support for science and innovation as well as urgent action to address the shortage of engineering skills.

Finally, the House of Lords has established the National Policy for the Built Environment Committee that will seek to establish what steps can be taken to ensure better planning and design and whether we have the right balance between national policy and local accountability for planning decisions. The Academy will respond to this inquiry, drawing on its recent report, *Built for living*, and work done on the future cities agenda.

## CST energy report

A new report for the Council for Science and Technology, to be published later this autumn, assesses what must be done now to deliver the UK's future energy system. By considering models of the most likely evolution of the system and how these compare with expectations of industry stakeholders, the working group have identified what they see as the main risks to delivering against the energy 'trilemma' - cost, security and decarbonisation.

The group concluded that delivery of the UK's future energy system is under serious threat. Substantial investment is needed, costs are likely to rise and decarbonisation must be realised across multiple interconnected sectors where the full technical solution is not obvious. The main conclusions are: to undertake local or regional whole-system, large-scale pilot projects to establish real-

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world examples of how the future system will work; drive forward new capacity in the three main low carbon electricity generating technologies - nuclear, carbon capture and storage and offshore wind; develop policies to accelerate demand reduction, especially in the domestic heat sector; and clarify and stabilise market mechanisms and incentives in order to give industry the confidence to invest. Time is seen as critical, given the long timescales needed to develop, plan and deploy infrastructure and technologies.

## Biofuels report

The Academy will be undertaking a study on the sustainability of liquid biofuels. Though currently a relatively small proportion of primary fuel supplies in the UK, legislation requiring wholesale cuts in greenhouse gas emissions means liquid biofuels are likely to become increasingly important.

Following interest from the Department of Energy and Climate Change and the Department for Transport, the aim of the study will be to better understand the real world emissions, both direct and indirect, of liquid biofuels and the issues involved in their production and supply. This will assist policymakers in making future decisions about biofuels. Contact [andrew.chilvers@raeng.org.uk](mailto:andrew.chilvers@raeng.org.uk) with any queries.

## Hinton Lecture 2015



On Tuesday 24 November, Professor Robert Mair CBE FREng FRS, Sir Kirby Laing Professor of Civil Engineering and Head of Civil Engineering at the University of Cambridge, will give this year's Hinton lecture, the Academy's flagship annual lecture.

Professor Mair will address the challenges of creating urban underground infrastructure, in particular the development of underground transport that is environmentally essential for many of our future cities. He will explore what can go wrong with such developments and raise important questions such as whether buildings above will be damaged by subsidence, how they can be

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protected and how existing underground infrastructure might be affected by new construction. Examples of projects from around the world, including the Crossrail project in London, will demonstrate the size, technical challenges and complexity of modern underground construction.

The lecture will take place at Prince Philip House. Those who cannot attend can view the lecture live on [www.raeng.tv](http://www.raeng.tv). To book your place, please visit [www.raeng.org.uk/events](http://www.raeng.org.uk/events)

## China air quality mission

In June, the Royal Academy of Engineering, supported by the Newton Fund, convened a second delegation of air quality experts to visit the Counsellors' Office of the State Council (COSC) in China, to discuss collaboration on air quality management. Led by Professor John Loughhead OBE FREng, Chief Scientific Advisor to the Department of Energy and Climate Change, the delegation included representatives of the Department for Environment, Food and Rural Affairs, the London Mayor's Office, and the Met Office, as well as air quality

consultants and specialists in the fields of public health and transport.

The delegation began the week by participating in a high-level symposium opened by HM Ambassador to China, Barbara Woodward CMG OBR. During the symposium, the UK delegation gave an overview of the modelling and source attribution of air quality, an outline of how London is dealing with this issue, followed by a presentation looking at the severe public health issue that poor air quality poses. Following the symposium, the delegation travelled to Shandong province

to hear about the challenges the cities of Jining and Tai'an are facing in trying to tackle smog, and the efforts already being made.

During the discussions in these cities, the UK delegation was able to further demonstrate the systems approach to tackling air quality in the UK, and discuss the benefits of tackling air quality and climate change jointly. Following the visit, the Royal Academy of Engineering is working with COSC to look at further collaboration on the issue of air quality management.

## Research Forum



The Academy's Research Forum was held on 18 September, attracting approximately 120 attendees and successfully showcasing the work of 24 top engineering researchers.

The Forum takes place annually to provide an opportunity for individuals undertaking cutting-edge engineering research, their industry sponsors, and a host of interested parties to meet and hear about the wide range of work that is currently underway. Researchers exhibit their work and the invited speakers are representative of the Academy's research schemes.

This year, there were a record 16 academic posters on display and demonstrations of new technology from three Academy-funded projects. Highlights included Dr Aleksandra Vuckovic, from the University of Glasgow, who demonstrated a new system for home-based neurorehabilitation, and Dr Danail Stoyanov from Imperial College, who showcased advances in robot-assisted surgery.

Speakers included Dr Freddie Withers, who discussed his work on the optoelectronics of heterostructures, and Professor Jon Carrotte of Loughborough University who, along with Kenneth Young of Rolls-Royce, discussed the value of partnerships between academia and industry.

The programme was rounded out by a panel discussion entitled *The Impact of World Leading Research and Innovation on Growth and Productivity*. The panel comprised Professor Sir Peter Gregson DL FREng (Vice Chancellor, Cranfield University),

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Professor Philip Nelson FREng (Chief Executive, EPSRC), Professor Mary Ryan FREng (Shell/RAEng Research Chair, Imperial College), and Paul Mason (Head of Development, Innovate UK). Led by the Forum's Chair, Professor Ric Parker CBE FREng, the panellists provided their own views on the topic and then answered questions from the attendees.

Overall, the feedback from the event was extremely positive, with many attendees enjoying the chance to network with others from across industry and academia.

◀ Q and A session with Professor Ric Parker CBE FREng, Professor Paola Lettieri, University College London, Dr Gary Burnett, University of Nottingham, and Dr Freddie Withers, University of Manchester

## Biomedical access review

On 14 September, the Academy held a workshop on behalf of the government's Accelerated Access Review, which aims to speed up access to innovative drugs, devices, diagnostics and digital health products for NHS patients. As part of its ongoing work on medical devices, software and systems, the Academy brought together a group of entrepreneurs to share their experiences in commercialising medical devices and software.

The discussion identified solutions from the engineering community to accelerate the development pathway, improve current funding models and engage patients in the innovation process. The review will conclude in December 2015, and will make recommendations to government. Contact [philippa.shelton@raeng.org.uk](mailto:philippa.shelton@raeng.org.uk) for more information.

## Medical engineering conference

On 7-8 September, Leeds University played host to the MEIbioeng15

conference. This is one of the UK's largest annual gatherings of biomedical engineers, bioengineers and medical engineers.

On the first day, the Academy hosted a session looking at the design, development and adoption of medical innovation. Chaired by Professor Serena Best FREng, who chairs the Academy's Medical Technologies Community of Practice, the audience heard a keynote address from 2015 MacRobert Award finalist Dr Eric Mayes, CEO of Endomag. Dr Mayes spoke of the challenges involved in developing a device from early clinical

prototypes to a commercialised product. Early-career researchers in the audience were given tips and advice for achieving business success. A panel discussion then brought together representatives from NICE, MHRA and Innovate UK. They debated how engineers can navigate the current regulatory system to ensure

safety while guaranteeing prompt access to innovative technologies for patients and medical professionals.

On the second day, Fellows and Academy staff joined a strategy workshop lead by Professor John Fisher CBE FREng. Attended by experts from industry,

healthcare services, regulators, funders, and academia, the afternoon was spent probing the challenges faced in translating applied research to deliver improved products and services and patient and economic benefits. For more information visit <http://meibioeng.org>

## People and talent

### Presentation of medals

Professor Peter Clarricoats CBE FREng FRS has been awarded the 2015 Sir Frank Whittle Medal, presented to an engineer whose sustained achievements have had a profound impact upon their engineering discipline. Over the last 50 years, Professor Clarricoats' successes have ranged from pioneering research with Nobel laureate Professor Sir Charles Kao FREng FRS on optical fibre technology, to influential work on the design and development of high-performance microwave antennas for space-borne satellite communications. His immense contributions have made him one of the best-known microwave engineers of his generation.

Dr Matthew Cole, Oppenheimer Research Fellow at the Centre for Advanced



Photonics and Electronics, University of Cambridge, has been awarded the Sir George Macfarlane Medal for his work in nanoscale materials science. The award is presented to an engineer who has demonstrated excellence in the early stage of their career. Dr Cole's achievements have particularly focused on carbon nanotubes and their use in field emission sources, which produce high-energy electrons under an electrical field. He is also recognised for his commitment to teaching and supervising in engineering education.



Both received their medals from Academy President Professor Dame Ann Dowling DBE FREng FRS at the AGM on 21 September.

▲ The President with 2015 Sir Frank Whittle Medal winner, Professor Peter Clarricoats CBE FREng FRS

◀ 2015 Sir George Macfarlane winner Dr Matt Cole with the President and Sir George's daughter and son, Dr Anne Howell and Professor John Macfarlane

### Enriching Engineering Education

Engineering has an important role to play in tackling challenges such as food security, healthcare, sustainable energy, water and infrastructure. Across sub-Saharan Africa, engineering skills shortages are prevalent, and students are enrolling in engineering courses hoping to fill this gap. Yet too often, outdated equipment and teaching methods mean that students graduate without the skills and practical experience needed.

Over the last two years, the Academy has worked with universities in Botswana, Kenya, Mozambique, Namibia, Tanzania,

Uganda and Zimbabwe to help bring engineering curricula in universities in line with current industrial practice, and to improve teaching practices in engineering. The programme centres on a combination of two-way secondments and collaborative workshops between industry and academic teaching staff.

The final workshop of this two-year pilot programme was held in Zimbabwe in July. Successes include the creation of a five-year research agenda for the University of Zimbabwe, created alongside the national research council and local industry. In addition, the University of Dar es Salaam, Tanzania, has themed all final-year student

projects to meet industry needs and updated teaching resources in key subject areas with industry input.

Visiting Professor Dr Keith Carter from Rolls-Royce and the University of Leicester joined the workshop and, Dr Godfrey Gandawa, the Deputy Minister for Higher and Tertiary Education, Science and Innovation, Zimbabwe, met Academy staff to discuss government involvement in the programme.

This programme is generously supported by the Anglo American Group Foundation. The Foundation has approved funding for an extension of the project and its continuation for the next three years.

### Skills for university

In September, the Academy delivered its fifth developing skills residential course for 16 young women who are beginning engineering courses at university. The course equips these young women

with core life skills before starting their degrees, and before embarking on a career where they will be in the minority.

Training sessions covered personal development planning, negotiation and presentation skills. The women also

heard from female role models from the engineering industry who gave advice and support for university as well as the world of work, including advice on applying for graduate programmes.

## Drones resource box

The education team's latest resource box, *Drones: friend or foe?*, explores how drones work. It explains how propellers create lift, how sensors are used to navigate the environment, and how the electromagnetic spectrum and binary code are used to communicate. It also asks pupils to discuss the ethical and legal impact and civil, humanitarian and commercial applications associated with the technology.

Two case studies are included in the resource to promote engineering careers.

Engineer Sabine Hauert explains how her work on swarm drones was used as inspiration for nanoparticles used to improve cancer treatment, while Chris Chase at ASV talks about his work designing and making marine drones.

The Academy will be distributing 500 copies of the resource, along with training and support materials, to STEM teachers in UK secondary schools during the 2015 autumn term. The resources will also be available to download from the website at: [www.raeng.org.uk/curriculum-resources](http://www.raeng.org.uk/curriculum-resources)



## Industrial Secondment Scheme

The Academy has announced the awards of 10 new Industrial Secondees, including two funded by the Welsh National Research Network.

The Industrial Secondment Scheme offers the opportunity for academics to undertake a collaborative research project in an industrial environment. The scheme aims to strengthen the strategic relationship between the university and the industry host, as well as enhancing the quality and industrial relevance of the teaching.

More details of this scheme are available on [www.raeng.org.uk/industrial-secondment-scheme](http://www.raeng.org.uk/industrial-secondment-scheme)

## Regional programmes

The Academy's regional programmes in Barrow and Stoke continue to go from strength to strength, with the Barrow Engineering Project about to start its eighth year of activity, and Stoke its third.

Both programmes work with primary, secondary and post-16 sectors and provide funding to enhance the STEM curriculum. They organise activities which

get all sectors working together, as well as with local industry. They also provide teacher training and support collaborative activity during Tomorrow's Engineers Week. Through these programmes, 9,224 STEM learning opportunities were provided for students in Barrow and 13,545 in Stoke.

The continuation of these programmes has been made possible thanks to recent funding received from the Sir John Fisher Foundation, the Drayson Foundation and the Comino Foundation.

## Sainsbury Management Fellowships

The Academy has announced seven Sainsbury Management Fellowship awards, funded by the Gatsby Charitable Foundation. These highly sought-after awards enable engineers with a high level of leadership potential to undertake full time MBA courses at major international business schools.

See the list of awardees at [www.raeng.org.uk/mba](http://www.raeng.org.uk/mba)

## MSc awardees

The Academy has announced the recipients of 12 new master's bursaries. These include four Petrofac Engineering Fellowships, six Panasonic Trust Fellowships, one Sir Angus Paton Bursary and one Hertha Marks Ayrton Fellowship.

The Petrofac Engineering Fellowships provide exceptional opportunities for graduate engineers wishing to pursue a technically specialist role in the oil and gas industry, while at the same time

addressing the need for more highly skilled engineers.

The Panasonic Trust Fellowships and associated awards aim to encourage and facilitate the professional development and technical upskilling of UK-based engineers by providing funding for the study of full-time master's degree courses in relevant subjects.

Find out more about these schemes at [www.raeng.org.uk/schemes-for-students](http://www.raeng.org.uk/schemes-for-students)

## Teacher coordinators celebration

The Academy's teacher coordinators provide free resources, training and curriculum enrichment opportunities for teachers of science, technology, engineering and mathematics (STEM) in schools across the UK, work that is central to the success of the Academy's Connecting STEM Teachers (CST) programme.

Teacher coordinators are practising STEM teachers who work for the Academy in addition to their teaching and school leadership responsibilities. To recognise this contribution, the Academy holds an event each year to thank them for their efforts and celebrate their achievements.

During the 2014/2015 academic year, the Academy's teacher coordinators

provided training and resources for 639 STEM teachers, which will benefit 32,985 pupils.

The celebration held this July was the most successful yet, with over 70 attendees and key speakers from the STEM learning community and major engineering employers, such as BG Group (principal CST project funders), National Grid and Sony.



## Engineering uncovered summer school

The Academy has collaborated for over a year with a group of 13 engineering employers to create an Engineering Engagement Programme (EEP) aimed at attracting undergraduates from diverse backgrounds into the profession.

The first phase of the EEP, which ran from 20-24 July, was the Engineering Uncovered Summer School, a three-day development programme for 50 undergraduates followed by two days of company visits. The second phase,

Engineering Fast Track, consists of a series of workshops for 150 undergraduates running between September 2015 and February 2016. Both phases of the EEP are designed to increase understanding of career paths, connect students with mentors, explain selection processes and increase exposure to employers through an intensive speed networking session. On 22 July, the launch of the EEP was celebrated at an event hosted at the Academy.

The EEP is delivered in partnership with the Academy's external partner,



Sponsors for Educational Opportunity (SEO), London.

▲ Students at the EEP launch event

## Aero MSc bursary scheme

The Aerospace MSc bursary scheme, which was announced by the Prime Minister in 2012, has just passed its headline target by awarding 500 MSc tuition fee bursaries over three years.

Backed and funded by a partnership of UK government departments and major

aerospace employers, the scheme was developed in response to engineering skills needs identified by the sector. The bursaries were awarded in aerospace engineering and closely related subjects.

Once qualified, the bursary holders offer new and higher levels skills to UK aerospace companies. The initiatives undertaken so far to link these newly qualified engineers to potential

employers include the provision of a specific recruitment portal, a LinkedIn group for networking, the promotion of the scheme to small to medium sized companies through the Aerospace, Defence, Security and Space Industries trade organization, ADS. Government and industry partners in the scheme are particularly keen to benefit from the availability of these newly skilled engineers.

## National Women in Engineering Day

On 23 June, for the second successive year, National Women in Engineering Day (NWED) provided an opportunity to promote gender equality in engineering and celebrate the great achievements of women engineers. Hundreds of schools and organisations across the country hosted their own events, with the aim of helping more women to consider engineering as a career.

NWED was a success with significant coverage on Twitter under the official

hashtag #NWED. The Academy actively contributed as one of the main sponsors, with Jenny Young speaking at the Women's Engineering Society *Engineering Women: Are they Returning to Work?* conference at the Institution of Mechanical Engineers. A highlight of the day was a mass photo call at Horse Guards Parade, where 864 people in transport, engineering and technology roles broke the Guinness World Record for the most people performing a jumping high-five simultaneously. To get involved with NWED 2016, visit [www.nwed.org.uk](http://www.nwed.org.uk)



▲ The record-breaking jump at Horse Guards Parade

## Engineering experience toolkit

Charged with inspiring the next generation of engineers, the Academy's Diversity Leadership Group has worked with Tomorrow's Engineers and a number of engineering companies and Education for Engineering (E4E) to produce a guide for engineering employers wishing to offer work experience to students.

The toolkit offers guidance, examples of good practice and includes downloadable

templates on application forms, permission letters and other useful information for employers.

Offering opportunities to young people beyond friends and family of employees is an essential part of an inclusive culture, and the guide provides hands-on advice on how that can be achieved. The full version of the toolkit is available at [www.tomorrowsengineers.org.uk/employertoolkit/workexperience](http://www.tomorrowsengineers.org.uk/employertoolkit/workexperience)

**Tomorrow's Engineers**

### Engineering work experience



An employer's guide

## Diversity in governance

On 8 June, the Academy joined forces with the Royal Society and the Engineering and Physical Sciences Research Council (EPSRC) to stage a pilot event aimed at increasing the diversity of the pool of candidates applying for public appointments in science and engineering.

The session brought together senior women, all of whom had the potential to apply for governance roles within public bodies such as Research Council boards.

Run as a development masterclass, contributors to the event included Fellows of the Academy, senior representatives from the EPSRC and the Cabinet Office.



Professors Dame Ann Dowling FREng and Ottoline Leyser CBE FRS, Professor of Plant Development at the University of Cambridge and the Director of the Sainsbury Laboratory, contributed to the drinks reception and after dinner speech.

The event focused on explaining the existence and requirements of leadership roles in science and engineering governance.

▲ Attendees at the diversity in science and engineering governance event at the Academy

## Visiting Professors

23 new Visiting Professorships have recently been announced at 18 Universities across England, Scotland and Northern Ireland. Each Visiting Professor will spend at least 10 days a year over three years at the university to enhance the teaching and learning of undergraduate students and to improve the employability and skills of UK engineering graduates.

Visiting Professors are senior industrialists working in a wide range of sectors in engineering, and come from

senior positions in a variety of companies, including Rolls-Royce, Microsoft Research and the National Nuclear Laboratory.

Engineering Council and 30 of the 35 professional engineering institutions have signed.

## Diversity monitoring

In the autumn, a new system for collecting diversity data online will begin rolling out across the Academy. A standard form will appear each time individuals interact with the Academy, whether via our grants, events or Fellowship. This form is based on the existing guidance in our Engineering Diversity Concordat, a voluntary agreement that the Academy,

In line with industry's best practice, completion of the form will be entirely optional, but by routinely requesting diversity data, the Academy will increase understanding of how effectively activities reach a diverse audience. Academy teams will also be able to monitor any evidence of unconscious bias in internal processes.

## Research Fellowship



Through the RAEng Research Fellowships, the Academy supports outstanding early-career researchers to become future research leaders. The fellowships provide funding for a period of five years. In addition to financial support, the fellows also benefit from the experience of a mentor and a reduction of their teaching and administration duties. In 2014, the Academy has awarded eight new Research Fellowships, including one to Dr Amanda Foust from Imperial College, London.

Dr Foust is engineering a bridge between photonics research and neuroscience to discover how brain circuits are wired. With multidisciplinary training in neurophysiology, and electrical and optical engineering, she champions design of instruments to unlock the mystery of how electrical and chemical communication between neurons

underlies our sensations, perceptions, emotions, thoughts, and actions. As a RAEng Research Fellow, she will leverage the advice and collaboration of physicists, neuroscientists, electrical and mechanical engineers throughout Imperial College to adapt and optimise holographic technology into systems capable of, for the first time, manipulating neural circuits on spatial and temporal scales mimicking naturally occurring activity.

The next funding round for Research Fellowships is now closed for applications, but will reopen in 2016.

The Academy is anticipating making up to eight awards this year. Please see [www.raeng.org.uk/raeng-research-fellowship](http://www.raeng.org.uk/raeng-research-fellowship) for more information about the Research Fellowships scheme.

◀ Dr Amanda Foust

## Media roundup

During the summer, the Academy received wide coverage of its award winners. Artemis Intelligent Power, winner of the 2015 MacRobert Award, secured significant print coverage in *The Independent* and *The Scotsman* as well as online articles from *The Daily Telegraph* and BBC News. It also received industry coverage in publications including *The Engineer* and *The Manufacturer*. Silver Medal winner Dr Susannah Clarke mentioned her earlier Enterprise Fellowship and the Enterprise Hub in an article on entrepreneurship in *The Guardian*, while Silver Medal winners also picked up coverage in industry outlets including *Professional Engineering* and **V3.co.uk**. Trade and local press also featured other Academy award winners, including the Sir Frank Whittle Medal winner Professor Peter Clarricoats in *Electronics Weekly* and the Sir George Macfarlane Medal winner Dr Matt Cole in *Eureka* magazine.

Rooke Award winner Dr Hugh Hunt was profiled in a *Times Higher Education* article on inspiring engineers. Dame Sue Ion, recipient of the President's Medal, featured in a *Daily Telegraph* article on opportunities in the nuclear industry.

The *Dowling Review of Business-University Research Collaborations* was regularly covered by the media since its publication in July. Publications including *The Guardian* and *The Financial Times* have cited its evidence

in articles on research and enterprise, and *The Times* reported on the review when it was launched in July.

Figures from the Academy's *Pathways to success in engineering degrees and careers* report, also launched in July, have been frequently cited, with *The Guardian*, *The Mirror*, *The Huffington Post* and others quoting its findings. During August, as GCSE and A Level results were announced, several articles reported on the shortage of technical skills in the UK, and highlighted the need for a more diverse workforce, with women accounting for less than 13% of engineering graduates. Academy chief executive Philip Greenish was quoted in *The Times*, mentioning the need for schools to connect with industry to teach students practical skills.

The 2012 review on hydraulic fracturing ('fracking'), by the Academy and the Royal Society, continues to receive mentions in articles on shale gas, particularly in August when it was announced that the government was offering 27 new blocks of land for shale gas exploration. The Academy's Head of Policy, Dr Alan Walker, was quoted in a *Guardian* article exploring the shale gas debate.

On a lighter note, the Academy's Director of Engineering and Education, Dr Rhys Morgan, was widely quoted in both regional and national press, and appeared on a number of television and radio shows, discussing a formula for the "perfect Poohstick" ahead of the August Bank Holiday weekend.

## Party conferences

With our sister national Academies, the Academy will host breakfast roundtable discussions at the Labour, Conservative and SNP conferences in late September and the first half of October. Focusing on the theme *Research and innovation: solving*

*the productivity puzzle*, the events, which will be addressed by Fellows, will explore the role of research and innovation in boosting UK productivity.

Artemis Intelligent Power, winner of the 2015 MacRobert Award, will outline its path to success as a case study at the SNP event.

## ERA Foundation Entrepreneurs Award

The ERA Foundation Entrepreneurs Award is now open for applications. This scheme encourages and rewards creativity and innovation among early-career engineering researchers working in UK universities in the broad field of electro-technology. The award of

£40,000 is presented annually to an individual or team who demonstrates considerable entrepreneurial potential. In addition, the awardee is invited to become a member of the Enterprise Hub, where they receive a package of bespoke mentoring and training.

For more information see [www.raeng.org.uk/era](http://www.raeng.org.uk/era)

## News of Fellows

**Dr Peter Bonfield OBE** has been appointed by the Department of Energy and Climate Change to lead a governmental review of consumer protection, advice, standards and enforcement for UK housing energy efficiency

**Dr David Braben OBE** has been awarded an honorary degree by the University of York

**Professor Andrew Blake FRS** has been appointed director of the Alan Turing Institute for the development and use of advanced mathematics, computer science, algorithms and 'big data'

**Cynthia Carroll** has been appointed adviser to Vedanta Resources plc

**Nicholas Donofrio** has been elected as a director of the US National Association of Corporate Directors

**Bob Dudley, Warren East CBE** and **Steve Wadey** have been appointed to the government's Business Advisory Board

**Professor Peter Flewitt** has been awarded an honorary doctorate from the University of Surrey

**Professor Richard Holdaway CBE** has been appointed Chairman and CEO of Lone Star Space Associates

**Allen Leatt** has been appointed CEO of the International Marine Contractors Association

**Professor Joseph HW Lee** has been awarded Honorary Membership of the International Association for Hydro-Environment Engineering and Research

**Professor Sergio Pellegrino** has been elected President of the International Association for Shell and Spatial Structures

**Dr Martyn Thomas CBE** has been appointed a specialist adviser to the House of Commons Treasury Committee

**Professor William Webb** has been awarded an honorary Doctor of Science degree by the University of Southampton

## Call for award nominations

The following 2015 Royal Academy of Engineering Awards are now open for nominations:

### Major Project Award

Awarded to a team of engineers, based in the UK, who have delivered a major engineering project that has had a substantial impact on society.

### President's Medal

Awarded to an Academy Fellow who has contributed significantly to the Academy's aims and work.

### Prince Philip Medal

Awarded to an engineer for exceptional contributions to engineering through practice, management or education.

### Silver Medal

Awarded an early- to mid-career engineer for outstanding personal contribution to UK engineering, which results in successful market exploitation.

Closing date: 9 November 2015

To make a nomination, please visit: [www.raeng.org.uk/grants-and-prizes/prizes-and-medals](http://www.raeng.org.uk/grants-and-prizes/prizes-and-medals)

For more information please call the awards team on **020 766 0648** or email [awards@raeng.org.uk](mailto:awards@raeng.org.uk)

### 2016 Royal Academy of Engineering MacRobert Award

Supported by the *Worshipful Company of Engineers*

Applications for the MacRobert Award 2016 are now open.

The MacRobert Award is the premier prize for UK engineering innovation. It is given annually for an outstanding innovation, commercial success and benefit to the community.

The Award, first presented in 1969, honours the winning organisation with a gold medal and the team members with a prize of £50,000. The presentation of the Award recognises the successful development of innovative ideas in engineering.

For further information please visit [www.raeng.org.uk/prizes/macrobot](http://www.raeng.org.uk/prizes/macrobot) or email [macrobert@raeng.org.uk](mailto:macrobert@raeng.org.uk)

Closing date: 31 January 2016

## Forthcoming events

This is a selection of Academy events. For a complete list, visit [www.raeng.org.uk/events](http://www.raeng.org.uk/events)

21 October 2015

### New Fellows' Briefing

Venue: Prince Philip House

### New Fellows' Dinner

Venue: Drapers' Hall

3 November 2015

### Autumn Lecture: The Dambusters and escape from Colditz Castle - the engineering from two famous feats of WWII

Speaker: Dr Hugh Hunt

Venue: Prince Philip House

12 November 2015

### Ingenia live!

Speaker: Dr Caroline Hargrove, McLaren Technologies

24 November 2015

### Hinton Lecture

Speaker: Professor Robert Mair CBE FREng FRS

Venue: Prince Philip House

## Publications received

*The Engineering of Human Joint Replacements*, by J A McGeough, has been donated by the author and added to the library in the Fellows' room.

A book entitled *50 City Stories Explored* has been donated by ARUP and is available to read in the Fellows' room.

Professor James Trevelyan has donated his book, entitled *The Making of an Expert Engineer*, to the Academy. It is available to read in the Fellows' room.



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The Academy now has a page on Facebook: [www.facebook.com/RAEngineering](http://www.facebook.com/RAEngineering)

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## Obituaries

### Professor Ronald Jarman Bridle

FreEng died on 2 Sept 2015, aged 85.

He was formerly Consultant and Visiting Professor, University of Wales, Cardiff.

### Sir Colin Hope FREng

died on 31 August 2015, aged 83. He was formerly Chairman, Bryant Group plc.

### Professor Kenneth Langstreth Johnson

FreEng FRS died on 21 Sept, aged 90.

He was formerly Emeritus Professor of Engineering, University of Cambridge.

### Professor Terence Valentine Jones

FreEng died on 14 September 2015, aged 76. He was formerly Donald Schultz Professor of Turbomachinery, University of Oxford.

### Dr Nobuhide Kasagi FREng

died on 29 July 2015, aged 68. He was formerly Professor Emeritus, the University of Tokyo.

### Mr John William Harold Morgan CBE

FreEng died on 18 September 2015, aged 87. He was formerly Director, GEC Plc.

Mr Thomas Smith FREng died on 17 August 2015, aged 85. He was formerly

Senior Partner, Steensen, Varming, Mulcahy and Partners.

### Dr George Somerville OBE FREng

died on 4 September 2015, aged 80. He was formerly Director of Engineering, British Cement Association.

### Professor Denis Royston Towill FREng

died on 29 August 2015, aged 82. He was formerly Research Professor, University of Cardiff.

### Mr Ivan Ray Yates CBE FREng

died on 2 August 2015, aged 86. He was formerly Deputy Chief Executive, British Aerospace Plc.