

# ANNUAL REVIEW

2012/2013





# Strategic priorities

As the UK's national academy for engineering, we bring together the most successful and talented engineers from across the engineering sectors for a shared purpose: to advance and promote excellence in engineering. We provide analysis and policy support to promote the UK's role as a great place from which to do business. We take a lead on engineering education and we invest in the UK's world class research base to underpin innovation. We work to improve public awareness and understanding of engineering. We are a national academy with a global outlook and use our international partnerships to ensure that the UK benefits from international networks, expertise and investment.

The Academy's work programmes are driven by four strategic challenges, each of which provides a key contribution to a strong and vibrant engineering sector and to the health and wealth of society.

## **Drive faster and more balanced economic growth**

The strategic challenge is to improve the capacity of UK entrepreneurs and enterprises to create innovative products and services, increase wealth and employment and rebalance the economy in favour of productive industry.

## **Lead the profession**

The strategic challenge is to harness the collective expertise, energy and capacity of the engineering profession to enhance the UK's economic and social development.

## **Foster better education and skills**

The strategic challenge is to create a system of engineering education and training that satisfies the aspirations of young people while delivering the high-calibre engineers and technicians that businesses need.

## **Promote engineering at the heart of society**

The strategic challenge is to improve public understanding of engineering, increase awareness of how engineering impacts on lives and increase public recognition for our most talented engineers.



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# President's review



## Engineering for growth

2012 has been a highly successful year for the Academy, with significant achievements in each of the strategic priority areas. There is, however, much more to do - indeed, we have ambitious plans for the growth of the Academy's impact and influence. Two major international events typify that ambition.

The announcement of the winners of the inaugural £1million Queen Elizabeth Prize for Engineering was viewed by 66 million people worldwide. The prize will be awarded to the five engineers behind perhaps the most transforming system in modern life - the internet. The QE Prize is an enormously important initiative and our work to raise global awareness of the prize and the vital role of engineering in society, especially among young people, will continue well into the future.

The Global Grand Challenges Summit, led by the Academy in partnership with our sister academies in China and the US, was another opportunity to highlight engineering achievement, as well as raising awareness of the great tasks ahead for engineers in the 21st century. Some 450 engineers, scientists, economists and other leading intellects from China, the US and the UK met in London to debate the major issues facing the world, from climate change to supporting healthy lives for all. An extraordinary cast of speakers was assembled, from technology luminaries such as Bill Gates and Dean Kamen to the celebrity supporter of technology education, will.i.am. By common consent, the Summit was an outstanding success.

The Academy's relationship with government is multi-faceted and

growing. The role of the Government Chief Scientific Adviser (GCSA) and network of Chief Scientific Advisers is critical to the Academy fulfilling its roles as adviser, critical friend and project partner. We worked closely with Sir John Beddington HonFREng during his term as GCSA; we are now developing our working relationship with his successor, Sir Mark Walport.

The Academy has been a strong voice in articulating the need for government to commit to a rebalanced economy underpinned by a modern industrial strategy. Our position on what an industrial strategy should deliver was developed with the help of a roundtable of Fellows in leading positions in industry. After the Academy had made its submission to Lord Heseltine's review of growth, we were invited to discuss our position with him ahead of publication of his report. To its great credit, government accepted this challenge and a sector-based industrial strategy is being developed.

The Academy continues its work to build UK engineering capacity. Our research programme attracts a high level of support and interest from industry for research that is of strategic importance to business, and independent assessment has confirmed its real value. The programme supports the very best people who undertake world-class research with a high level of potential economic benefit.

The Academy established a new business resource - the Enterprise Hub. This will harness the extraordinary expertise, insight and networks of Academy Fellows to mentor new entrepreneurs and support new engineering and technology start-ups through the expertise of the Fellowship in all aspects of innovation.

The Academy has initiated a partnership campaign, *Engineering for growth*,

to demonstrate the contribution of engineers and engineering to the economy and society. The campaign provides a further opportunity to enhance the Academy's media profile for engineering, which is already over 50% greater than last year.

The Academy's report *Jobs and Growth* gave a well-evidenced account of how engineering skills are essential to helping the UK economy rebalance and grow. It also showed that the demand for engineering skills outstrips supply. While this means that engineers in the UK job market can benefit from competitive salaries, it also highlights the lack of skilled engineers which is a critical issue for employers.

So, a core aim of the Academy remains to attract talented young people to careers in engineering. This will be essential for the future economy but also provides opportunities for young people, whatever their social backgrounds, to enhance their life chances. Much good work has been done, including the fifth successful annual Big Bang Fair, led by our partner EngineeringUK and supported by the Academy. Around 60,000 young people witnessed the excitement that engineering and science careers can offer. For the first time, the Fair was visited by the Prime Minister.

However, there remains much more to do to increase the number and diversity of young people engaging with engineering. We continue to work to change outdated perceptions across society in our drive to make engineering the career of choice. Improving and enhancing the learning experiences and quality qualifications open to young people is also a critical part of that task: during the year, the Academy led the redesign of the national curricula for computing and D&T as well as the updating of the 14-19 Engineering Diploma. We have worked continuously

through the year with the Department for Education to make the case for these changes and, subsequently, to deliver the products that will substantially improve the students' experience.

Prince Philip House was named by His Royal Highness The Duke of Edinburgh at an event in October, at which his triptych portrait, generously commissioned by Dame Stephanie Shirley FREng and painted by Paul Brason RP, was unveiled. The donations of many Fellows and others that enabled the refurbishment of Prince Philip House have brought about an extraordinary transformation of the Academy's visibility through a huge variety of meetings which have engaged many different audiences at the Forum for engineering. The redesigned spaces have proved to be extremely versatile and effective and it is most gratifying that our original vision has so rapidly become reality. Prince Philip House is now a splendid national home for engineering, and I believe that it will be the forum for ever more high-profile and high-impact activities in the years to come.

Part of my role as President is visiting our great companies and universities around the country. I have been enormously impressed by the quality of engineering and engineering research that I have seen. I am greatly encouraged that Academy Fellows - be they in academia or industry - see the need to be part of the growth agenda. I am grateful for our Fellows' leadership and for the contribution that so many make to the aims and objectives of the Academy. In challenging times for the nation, the Academy is proving more than fit to deliver its important objectives.

**Sir John Parker GBE FREng**  
President

# Chief Executive's foreword

The last year has been one of dramatic development for the Academy - it has also presented a number of opportunities for engineering.



The Academy has worked for many years to raise the profile of engineering and to increase awareness among people of every age, background and gender of the positive and pervasive impact of engineering in society. In 2012, we made substantial progress in that direction, with engineering entering the public consciousness in a way not seen for many years. Headlines included: the triumph of the London Olympics, achieved with state-of-the-art facilities designed, constructed and delivered by engineers on time, to the highest of standards and within budget; the announcement of the winners of the first Queen Elizabeth Prize for Engineering, which was seen or read by a huge worldwide audience; and government now very clearly recognising the importance of engineering in driving growth and in shaping national policy.

## An Olympic focus

The Academy delivered a number of activities for diverse audiences that revealed the engineering underpinning the London 2012 Olympic and Paralympic games. These included lectures, an exhibition featuring concepts for new sporting events for people with disabilities and an international conference that explored the role of sport as a driver for engineering innovation.

The Academy also celebrated the achievements of engineers involved in the Games through the presentation of two of its prestigious medals. Sir John Armit CBE FREng, Chairman of the Olympic Delivery Authority, was presented with the Major Project Award for his outstanding leadership in the delivery of the Games. The Sir Frank Whittle medal was presented to Dan Chambers,

Co-Founder and Director of Draft Wheelchairs Ltd, which builds the world's fastest and lightest racing wheelchairs. Their products are used by such great Paralympians as Dame Tanni Grey-Thompson and David Weir CBE.

## Innovation and entrepreneurship

The second cohort of Academy Enterprise Fellowships was awarded to researchers looking to develop the commercial potential of their innovations. The Academy's focus on entrepreneurship has been strengthened through the development of the concept of the Enterprise Hub to provide a range of support for entrepreneurial researchers seeking to commercialise their technologies.

At an altogether different scale, clear and unequivocal demonstration of how engineering, innovation and manufacturing can achieve great success, even in a challenging economic climate, is provided by Jaguar Land Rover, which won the MacRobert Award for the engineering innovation that has made the Range Rover Evoque an outstanding global success.

## Broadening influence

The interests of professional engineers are represented by many specialist institutions. While this means that individual sectors and disciplines are well catered for, it makes it more challenging to harness the profession's collective strengths.

The Academy's Fellowship is drawn from across the full breadth of the profession. However, we undoubtedly create more impact, and our reputation is enhanced, if we work together effectively on some of the key issues. This is mostly achieved through *Engineering the Future*, the partnership between the engineering institutions, the Engineering Council, EngineeringUK and the Academy.

We have simplified and refocused the partnership this year to enable us better to manage matters of collective importance. We have, jointly, submitted proposals to government on issues ranging from e-crime to the future of transport. Together, we have supported government work on developing the nuclear supply chain action plan. A project to identify policy timelines for infrastructure, based on known government plans and independent expert opinion of need was referenced in the updated *National Infrastructure Plan 2012* published by Infrastructure UK. In addition, we have had a number of important successes in arguing for, and then delivering, improvements in schools-level curricula.

In the past year, the Academy has worked closely with its sister national academies on a number of cross-disciplinary projects including policy-focused fringe events at the party conferences, submissions to government on research funding allocation, and a policy study on human enhancement in the context of the workplace.

At the invitation of the Government Chief Scientific Adviser, the Academy and the Royal Society undertook a study into the safety of hydraulic fracturing to access shale gas. The report set out recommendations for ensuring that such activity is carried out in a safe, well-regulated way. Government accepted all the recommendations in the report, which proved an exemplar of how the expertise of Fellows of national academies can directly influence government policy.

Another major policy study considered the effects of extreme space weather on a range of engineered systems - electricity grid, satellites, GPS systems, aviation and mobile communications. The report received considerable media attention worldwide and has led to close engagement with

government on implementing the recommendations of the report.

## A year of change and review

It has been a year of change and review for the Academy. We have refreshed our visual identity and renovated and reopened Prince Philip House, which now provides the Academy and a host of organisations with a national Forum for engineering. This enables us to deliver prestigious events, engage wider audiences and, last year, for the first time, to hold our Annual Research Forum in our own premises.

Dr Tom Enders, CEO of EADS, delivered the Hinton lecture; Nigel Whitehead, Group Managing Director of BAE Systems, gave the Lloyd's Register Educational Trust Lecture; Dr Shirley Ann Jackson FREng, President of the Rensselaer Polytechnic Institute, delivered the ERA International lecture and other events and functions held here were attended by leading figures from the worlds of business and education.

The Academy has embarked upon important reviews of governance, membership and grants management that will significantly improve critical aspects of our operations. Each of these reviews is of fundamental importance in ensuring that the Academy remains efficient and effective, tuned to today's needs and always forward-looking in outlook.

Finally, I thank all the Fellows and supporters of the Academy who provide time and financial support so generously. It is you who enable this Academy to be ambitious in what we can deliver for our profession and for the UK, and who give us the credibility to deliver those ambitions.

**Philip Greenish CBE**  
Chief Executive

# Drive faster and more balanced economic growth

The Academy is committed to supporting sustainable and balanced economic growth. It provides support to excellent researchers tackling problems of importance to society and industry, celebrates and invests in outstanding entrepreneurs and innovators, and brings together academia and business to create the conditions in which innovation can flourish

Engineering already makes up at least 28% of the UK economy and employs over 5.4 million people. It will need to play an even greater role to enable the country to rebalance and deliver economic growth. The past year has seen the Academy redouble its efforts in support of this objective. Key developments have included: promoting the need for an industrial strategy; launching the *Engineering for Growth* campaign; the establishment of a new Enterprise Hub and considerable activity to address the significant engineering and technology skills gap that is affecting UK business and industry – see *Foster better education and skills*. The Academy continues to support excellent engineering researchers in UK universities, funded by both the Department for Business, Innovation and Skills (BIS) and industry.

The Academy launched the *Engineering for Growth* campaign with a report highlighting the £481 billion contribution made by engineering to the UK economy and to 10 key areas of growth. The campaign will be the Academy's theme in 2013, demonstrating the economic impact and societal benefits delivered by engineering and providing a focus for specific activities designed to drive business innovation and address the skills gap.

The President, Sir John Parker GBE FREng, who is leading the campaign, has also been a strong and vocal proponent of the need for the UK to develop an industrial strategy. During the year, he discussed this issue with government and his views were widely reported on in national media.

The Academy made a submission to Lord Heseltine's review of UK competitiveness and subsequently

convened a roundtable of Fellows, at Lord Heseltine's request, to discuss and contribute to the content of his well-received report *No stone unturned – in pursuit of growth*.

The Academy's new Enterprise Hub aims to bring about a step change in the success of entrepreneurial technology businesses and the contribution that they make to UK economic growth. The Hub, which has been developed in the last year but officially launched in April 2013, builds on activities such as the Enterprise Fellowships, which provide funding, mentoring and support to enable commercially-minded researchers to focus on starting a business, as well as on the Academy's portfolio of awards celebrating innovation and entrepreneurial success.

An independent evaluation of the Academy's research schemes conducted over the past year concluded that they are well-targeted and fill an important niche by attracting the best engineering researchers to work on problems that matter to industry. The Academy has also undertaken a range of activities over the past year to facilitate international collaborations in innovation and research.

## Awards

The 2012 MacRobert Award winner was the engineering team behind Land Rover's concept road car, the Range Rover Evoque, for exceptional engineering innovation that has had outstanding commercial success. Land Rover took a concept car from prototype to manufacture and created a new vehicle category, an off-road coupé – as opposed to the more utilitarian all-terrain vehicle. Safety and weight-saving technologies can be found throughout its bodyshell and



**New optical instrumentation**  
The RAEng-ERA Foundation Entrepreneurs Award seeks to identify, encourage and reward UK-based early-career engineering researchers in the broad field of electrotechnology. This year's award was won by Dr Margaret Anne Craig from the University of Glasgow for her research into new optical instrumentation, bespoke software and microsystems technologies for evaluating new drugs validation and testing their toxicity.

The CelloPTIQ system is designed to make it easier for pharmaceutical firms to assess the efficacy of new compounds as potential medicines and reduce late-stage failure of candidate drugs as they move from the lab into later stage trials. Dr Craig collected a £10,000 personal prize, with a further £30,000 to invest in the development of her winning idea.

Dr Margaret Anne Craig collecting her ERA Foundation Entrepreneurs Award

chassis, including an advanced steel monocoque frame that is reinforced with high-strength boron steel.

The Evoque is manufactured at Jaguar Land Rover's Halewood assembly plant on Merseyside. Its worldwide success has created or safeguarded over 30,000 jobs throughout the supply chain. The company put the prize money from the MacRobert Award towards three Range Rover Evoque WISE Scholarships. These £9,000 bursaries will be given to three female students or apprentices who wish to develop a career or further studies in engineering.

The Academy's Silver Medals are awarded to outstanding individuals to recognise their success in creating and bringing to market a particular innovation.

One of the four awardees in 2012 was Suranga Chandratillake, now an Academy Fellow. He led the development of blinkx, a system that data mines the hundreds of thousands of hours of video and audio files uploaded to the internet. Keywords, phrases and faces can be recognised, allowing viewers to browse by content, not just by 'tags'.

Chris Hendy, Technical Director at Atkins, was awarded his Silver Medal for his work on some of the most complex structural engineering projects around the world. These include the design of the Dubai Metro viaducts, strengthening the Penang Bridge in Malaysia, and most recently working as Technical Advisor on the Olympic Park Bridges.



Suranga Chandratillake FREng, founder and former CEO of blinkx plc



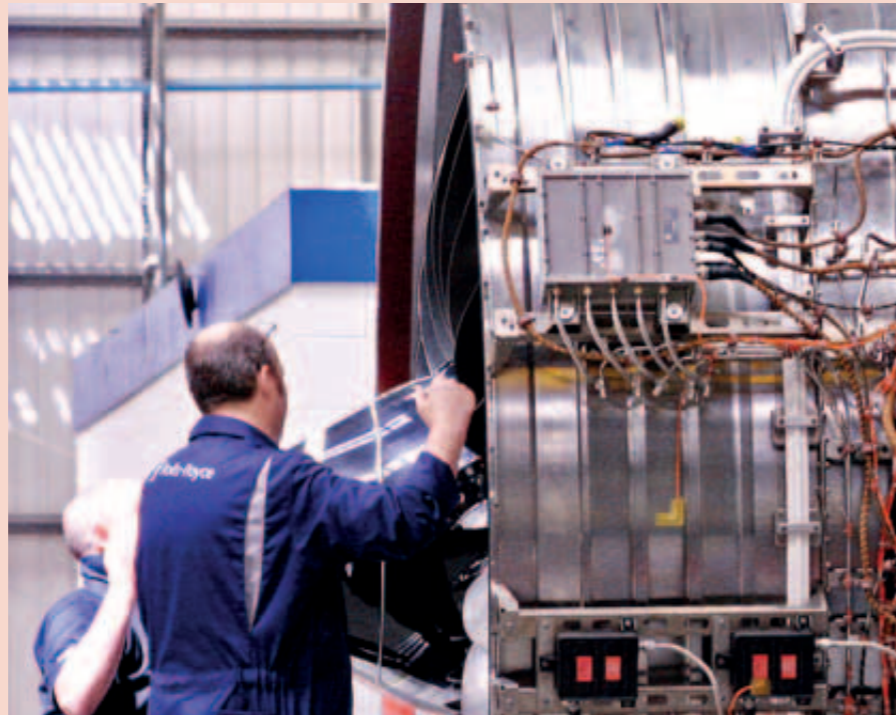
The prototype of the Range Rover Evoque undergoing frozen conditions testing

## Research Chair

Professor Andy Neely is the Royal Academy of Engineering/IBM/BAE Systems Research Chair in Servitization at the University of Cambridge. IBM and BAE Systems are founding members of the Cambridge Service Alliance, which Professor Neely directs. The Cambridge Service Alliance is researching business model innovation, asset management, and performance, information and analytics. These three themes are of direct relevance to businesses that are shifting their focus from a primarily production-based role to incorporating 'servitization'.

Manufacturing firms worldwide are servitizing - selling services as well as products. The latest data suggest around 60% of US manufacturing firms have servitized, while the comparable figure in the UK is around 40%. New technologies, including remote product monitoring, prognostics and diagnostics, are enabling manufacturers to innovate their business models, selling outcomes and solutions, rather than physical products.

By remotely monitoring the health of assets, manufacturers are able to



contract for capability, making guarantees about product availability and performance.

It is the effectiveness of these business models that Professor Neely's research is focusing on, exploring the role that big data plays in enabling business model innovation. By working closely

with his industrial partners, Professor Neely and his team are seeking to develop new insights into how firms can successfully make the shift to services.

The monitoring units on Trent 900 engines allow Rolls-Royce to provide airlines with a predictable service cost for engine operations

## Research

The Research Chairs and Senior Research Fellowships are jointly funded by the Academy and industry partners to enable leading-edge, internationally recognised researchers to develop a centre of excellence in collaborative research. The scheme has continued to attract strong support from industry and over the past year nine new appointments were made, bringing the total number of Research Chairs and Senior Research Fellowships in post to 41.

Another flagship programme, the Research Fellowship scheme, provides young researchers with funding and mentorship over a five-year period to enable them to establish themselves in careers

at the highest level of research. The scheme is highly competitive and over the past year, eight new appointments were made, bringing the total number in post to 50.

The annual Engineering Research Forum brings together UK researchers sponsored by the Academy as well as industry partners, government and Research Council representatives. The guest speaker this year was the Rt Hon David Willetts MP, Minister for Universities and Science, who outlined key elements of the Government's industrial strategy; new EPSRC funding to address major research challenges; the importance of robotics and autonomous systems; and the role of sport as a driver of engineering innovation.

The SET for Britain event is a nationwide poster competition open to all early-stage career researchers in engineering, science and technology. Run by the Parliamentary and Scientific Committee in partnership with the Academy and others, it provides an opportunity for researchers to exhibit their work to both MPs and scientific peers. For the 2013 event, 60 participants presented their research and Dr Valeska Ting from the University of Bath emerged as the winner of the £3,000 first prize and the overall Westminster Medal, for her poster *Pushing hydrogen to the limit: engineering nanomaterial systems for storage of solid-like hydrogen*.

A fringe event was also held at the Conservative Party conference to

increase further political awareness of the need for research to drive economic growth.

## Enterprise Fellowships

The second tranche of Enterprise Fellowships was awarded to five exceptional innovators at UK universities. The projects demonstrate the breadth of opportunities within engineering, with research ranging from printable lasers for anti-counterfeit applications to a novel immuno-assay for food safety testing.

Providing up to £85,000 of funding and support, these awards enable researchers to spend 12 months developing the commercial potential of their research. The Fellowship awardees receive bespoke business training and one-to-one mentoring from entrepreneurial Academy Fellows, as well as access to business angels and venture capitalists through the Enterprise Hub.

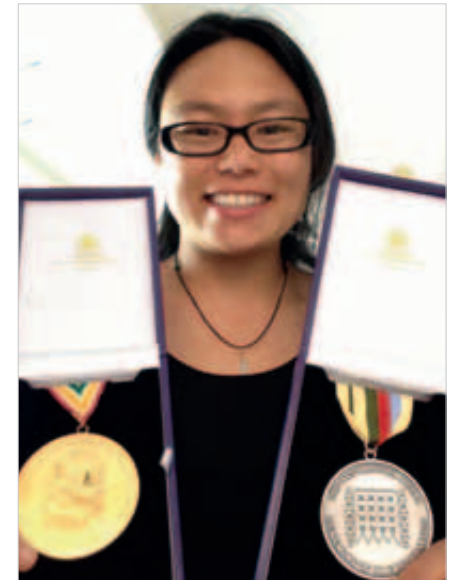
Dr Josh Reiss of Queen Mary, University of London, was awarded one of the first fellowships to commercialise his research on intelligent music production systems. These replicate the large numbers of decisions and actions that sound engineers make when creating professional-grade audio output.

Progress during the period of his fellowship was significant. He received seed funding from a venture fund and formed a company, Automatic Music Production Systems Ltd. The company is generating revenue from licensing and services based around the Mix Genius technology.

## International exchanges with China and India

The Research Exchanges scheme promotes academic collaboration between high quality engineering researchers in the UK, China and India with the aim of strengthening relations between leading partners in these countries and supporting the expansion of international networks of excellence.

The Distinguished Visiting Fellowship scheme provides funding to enable a UK university to host a fellow from an overseas academic centre of excellence for up to a month, and to engage the fellow in a range of mutually beneficial activities. This year, 21 new Research Exchanges with China and India and 14 Distinguished Visiting Fellowships were funded.



Dr Valeska Ting was both a category winner and the overall 2013 SET for Britain poster competition winner



## Research Fellowship

Dr Darren Cosker, who holds a five-year fully funded RAEng/EPSRC Research Fellowship, is a lecturer at the Department of Computer Science at the University of Bath. He has pioneered a new method of analysing expressions across a wide variety of faces using 3D video without the need for markers. He has created a way of computer modelling facial expressions that was originally developed for use in psychology experiments to help understand facial emotion.

The research has several other potential applications, including

identity recognition systems (such as for airport security) and animating people for computer games or films.

Although an engineering researcher, his work uses expertise and knowledge from a number of subjects, including the acquisition of visual information about humans (computer vision), the display and movement of humans (computer graphics) and the experience of truly believing the character is real (psychology).

Front cover of the researcher case studies publication

# Foster better education and skills

An engineering education continues to open doors to some of the most rewarding and best rewarded careers around. The Academy is a vocal champion for engineering education, making the case for more and better trained engineers and technicians to meet the needs of the UK economy and industry, and to diversify the engineering profession

Engineering underpins up to a third of the UK economy. People and companies use science, mathematics and computing to create significant wealth that benefits society. Yet engineering is often poorly understood and undervalued by young people and those who influence them. This is evident in the diversity statistics for the engineering skills base, where fewer than 5% of engineering apprentices and only 13% of engineering undergraduates are women and there is significant underrepresentation among some minority ethnic groups.

The lack of success in recruiting and retaining a diverse group of future engineers and technicians is depriving UK industry of the skills it needs for growth. The Academy's programmes to support science, technology, engineering and mathematics (STEM) education in schools and colleges, with a particular focus on engineering in further and higher education, are bound tightly to its programmes to encourage greater diversity in the pool of skilled workers.

The past year saw the issue of engineering skills take centre stage in the UK. Economists highlighted the

need to rebalance the economy in favour of production, and government looked anew at its industrial skills strategy. The Academy was in a strong position to help inform public policymakers and the media debate with data, evidence and advice, consistently demonstrating the link between economic success and performance in schools, colleges and universities throughout the UK.

## In schools

Alongside the Engineering Council, EngineeringUK, and 36 professional engineering institutions, the Academy continues to make a strong case for the value of progression in STEM subjects and the access to valuable engineering careers that this enables. The *Tomorrow's Engineers* partnership brings more than 30,000 young people into contact with engineering before they make crucial subject choices at ages 13 and 16. The annual young people's science and engineering fair, the Big Bang, connects twice that number with engineering employers, universities and charities.

It was an important year for public policy in education, with the national curriculum for schools in England under review and a host of reforms to the education system in all four nations of the UK. Education for Engineering (E4E), the education policy partnership with the professional engineering institutions hosted by the Academy, highlighted inequalities of access to STEM subjects in its report *Opportunity or Ability?* The report contributed to a national debate on the need to retain a top quality Design & Technology national curriculum.

The Academy, in partnership with the British Computer Society, successfully led the overhaul of the information and communication technology (ICT) curriculum in England, which included

changing the name to 'computing' to reflect the new scope and ambition of the subject. The Academy worked to include computer science in the English Baccalaureate – the most challenging of the criteria on which the performance of schools in England is assessed. The Academy was also asked by government to redevelop the technical core to the 14-19 diploma in engineering, following extensive calls from industry to preserve this unique qualification.

As well as providing policy advice on curricula and qualifications, the Academy has continued its support of STEM teaching and learning in the classroom. The *Engineering Engagement Project*, supported by BAE Systems, and the *Connecting STEM Teachers* programme, supported by BG Group, provided teaching materials and teacher continuing professional development (CPD) for hundreds of schools. The *Steps at Work* programme of teacher placements and the *Barrow Engineering Project* extended that reach further.

## In colleges and universities

The Academy has many leading engineering academics as Fellows and



offers extensive programmes to support engineering education in colleges and universities. The latest initiative is a partnership between government and firms in the UK aerospace sector to offer fee bursaries to 500 Aerospace MSc students in order to accelerate the flow of skilled people into that valuable and export-driven sector of the UK economy. Announced by the Prime Minister the Rt Hon David Cameron MP at the Farnborough Airshow, this new programme complements the

FE lecturers undergoing CPD training in basic mechanical principles in Ware, Hertfordshire

Students completing the Academy's sports wheelchair STEM resource *Winning Medals*



## Jobs and growth report

The Academy's *Jobs and growth* report, published in September 2012, came after a 14-month research programme, drawing inputs from the work of the Academy's Standing Committee for Education and Training and the Technician Council. The report makes a detailed case for the importance of engineering skills to the UK economy. Using econometric analysis it shows how the demand for science, engineering and technology (SET) skills exceeds supply. By analysing the shape of the UK economy and its labour force, the report demonstrates the pervasive deployment of SET skills (80% of which are engineering skills) throughout the economy. Engineers and technicians are in short supply and are in demand for their productivity in

both engineering and non-engineering jobs. The gap between supply and demand is driving a wage premium for engineering skills that increases year on year.

The report was the subject of a leader column in *The Times* on the day of publication and went on to attract media attention for many months including coverage in *China Today* and the *New York Times*. The wealth of econometric data included in the report has been picked up in many parliamentary debates, in speeches by government ministers and in the course of parliamentary inquiries. The report has launched a whole programme of Academy work to quantify the role of engineering skills and to highlight threats to their adequate supply.



well-established Panasonic Trust, Malpas, Petrofac and other Academy bursary schemes.

The Academy provided leadership in engineering higher education in other ways during the year. The translation of its *Achieving excellence in engineering education* report into Spanish has resulted in the report being widely circulated in South America to critical acclaim among the academic community there. Nearer to home, a group of Academy Fellows is working with colleagues at the Royal Statistical Society to foster more teaching of statistics in the undergraduate engineering syllabus.

The Academy is also focused on developing intermediate engineering skills and the formation of excellent engineering technicians. This work is encouraged and supported by the Academy's many industrial Fellows. Academy Visiting Teaching Fellows support teaching and learning in Further Education (FE) Colleges, as

well as universities, mirroring the work undertaken in universities by more than 200 of the Academy's Visiting Professors. BP helped in the creation of the *Engineering Further Education* programme that provides lecturer CPD and student mentoring in FE Colleges.

Working with a range of government agencies, the Academy also leads work to raise standards in engineering further education through supporting the professionalism of FE lecturers and by encouraging excellence through engineering skills competitions. The Academy's *FE STEM Data Project* published its third report in 2012, providing, for the first time, a detailed mapping of the STEM qualifications achieved around the regions of England.

#### Forming professional engineers and technicians

The Academy launched the *Elite Engineering Programme* during the year with funding from the Helsington



#### Meeting the skills challenge

The Academy continues to lead the BIS-funded programme to increase diversity across the engineering profession. The Academy's aims throughout the year have been: to broaden awareness of diversity beyond gender; to encourage greater awareness of diversity challenges and the need for action among our stakeholder community; and to stimulate action and the sharing of good practices within and beyond the engineering profession.

This includes continuing the focus and action on diversifying the

activities of all parts of the Academy itself. The programme also engages the professional engineering institutions, with funded pilot projects underway in the five largest institutions including: investigation of the effectiveness of Higher Apprenticeship as an alternative route into civil engineering; exploring the underlying reasons for lapsing membership in professional institutions from particular groups, diversity trends and actions needed to address them; and an initiative to encourage women to reach CEng and higher levels of membership.

Through work with the STEM Disability Committee, the Academy part-funded a project to develop 116 new British Sign Language (BSL) signs for physics and engineering. Using the five features of BSL's phonology – handshape, orientation, location, movement and facial expression – the new signs have been developed to encourage more students with hearing impairments to study these subjects.

The sign for 'nuclear power station'  
© Scottish Sensory Centre



#### Connecting STEM teachers project

As highlighted by the E4E *Opportunity or Ability?* report, the fact that only half of 16-year-olds in England achieve at least a C grade in mathematics GCSE and a C in two sciences is a threat to the future of the UK economy. In some parts of the country, even fewer young people achieve this basic toolkit for progression in STEM and a large drop in the number taking up GCSE ICT/computing and D&T needs addressing.

The Connecting Teachers project, supported by the BG Group, is aiming to tackle these problems head on by working with a network of excellent teachers across STEM subjects and supporting them to work with a significant number of teachers in other schools. The community of practice that is now emerging is showing signs of the desired effect. Despite the challenges, teachers are providing imaginative STEM learning experiences for their

pupils: motivating and engaging for teacher and pupil alike.

Carol Wooldridge from the Painsley Catholic College is a teacher coordinator for *Connecting Teachers* in the West Midlands. She works with a network of 11 local schools, providing them with professional development and creating excitement about STEM among a team of teachers right across the STEM disciplines.

Carol has created a collaborative project for her network, making use of the Academy's sports wheelchair STEM resource, *Winning Medals*. Carol's idea is to use the *Winning Medals* kit as the focus for an inter-school challenge. The value of the resource is enhanced by enlisting the support of a local wheelchair athlete, a sports wheelchair manufacturer and an engineer.

Two Academy teacher coordinators undertaking training on a new STEM teaching and learning resource which will be disseminated among their networks

Foundation and the Lego Foundation. The programme will help disadvantaged young people access engineering higher education. The bursary and development support given to up to 80 young engineers a year will complement the long-established *Engineering Leadership scheme*. Now in its 18th year, and currently part-funded by Shell, 40 more candidates were selected for an award by a panel of Academy Fellows on the basis of their leadership potential. Award holders undertake a personalised programme of professional and personal development under the mentoring of Sainsbury Management Fellows and Academy Fellows. The holders frequently go on to attend the *Executive Engineers Programme* of development training which has run annually since 2000. The *Engineering Leadership Standard Awards* enabled more than 300 engineering undergraduates to participate in a range of personal and professional development courses.

#### Developing engineering excellence

The Academy has long championed the development of industrial leaders who will drive UK industry in the future. The *Sainsbury Management Fellowship (SMF)* scheme provides exceptional graduate engineers with bursaries to undertake MBA programmes at some of the world's leading business schools. The SMF alumni provide valuable support to the Academy through participation in selection activities and as mentors to undergraduate students in receipt of *Engineering Leadership Advanced Awards*.

The Academy is also concerned with promoting full career development and the continued employability of engineers and technicians once they have entered industry through a number of programmes, including the *Engineering Professional Development Awards* and the *Technician Secondment Programme*.

Such initiatives award training grants to stimulate a culture of ongoing professional development among practising engineers and technicians.

# Lead the profession

The Academy's Fellows are leaders across the engineering profession. This creates a natural role for the organisation to harness the collective strengths of engineering in order to influence and inform policy, lead the debate and contribute to the development of engineering across all sectors

## Policy influence

The Academy's policy programme creates influence, across the UK and beyond, by bringing engineering evidence and expertise to bear on a range of policy issues. Through the work of the Engineering Policy Committee, the Academy addresses policy challenges at a strategic level and provides technical and analytical expertise in specific sectors. Increasingly, the Academy considers the impact of engineering on society and how public acceptability affects uptake of engineering solutions.

The policy outputs primarily aim to influence national government policy; they also inform discussion with a range of stakeholders, including the institutions of parliament across the UK, the main political parties, think tanks, representational bodies and industry forums. The Academy engages with partners across the profession to create an entry point for policymakers into engineering advice.

Work undertaken with sister, national and international academies provides another platform for thought leadership and policy formation. In Europe,

through the International Committee, the Academy engages with the institutions of the EU in collaboration with the European Council of Academies of Applied Science and Engineering (Euro-CASE).

## Energy and environment

One of the first events in the refurbished Prince Philip House was a topical debate chaired by economist and broadcaster Evan Davis on whether UK energy policy represents a burden on business or an opportunity for UK engineering. Panellists, including Academy Fellows, discussed the question *Greening UK energy: business opportunity or brake on growth?*

A roundtable meeting on the decommissioning of oil and gas production platforms and related infrastructure in the UK continental shelf considered major engineering and cost challenges for both industry and the UK government. It generated a report and identified opportunities for UK business in the decommissioning of oil and gas installations continuing around the world.

The Energy Bill was put before government, setting out plans for an

## Shale gas report

The Academy and the Royal Society produced a report on shale gas extraction in the UK. The study, undertaken at the invitation of the Government Chief Scientific Adviser (GCSA), examined the evidence relating to the environmental and health and safety risks associated with the onshore extraction of shale gas.

The study, chaired by Professor Robert Mair CBE FEng FRS, concluded that hydraulic fracturing can be managed effectively in the UK as long as operational best practices are implemented and robustly enforced through regulation.

The report had considerable and immediate impact within government. Meetings were held with Ministers at the Department for Energy and Climate Change (DECC) and Department for Environment, Food and Rural Affairs and with the GCSA and departmental CSAs, who welcomed the report and agreed broadly with the findings. A more detailed response was prepared by DECC that addressed how government planned to implement each of the recommendations. The key messages were also disseminated more widely through a successful media programme, a public engagement event and a fringe event at the Liberal Democrat 2012 annual party conference.



overhaul of the electricity-generating sector including electricity market reform. The Academy made a submission to the committee scrutinising the Bill, emphasising the need for a holistic strategy for UK energy management, encompassing the whole system of generation, supply and use.

In August 2012, the Academy published a report with the Chinese Academy of Sciences on the future of energy storage, following a series of joint workshops. The Academy and the Chinese Academy of Engineering have committed to a series of joint symposia focused around the theme of new energy technologies. This followed a visit by the President of the Chinese Academy of Engineering, Professor Zhou Ji, to explore how emerging technologies are converted into new industries and to sign a memorandum of understanding between both Academies. In November, the Academy President Sir John Parker GBE FEng led a return visit with a top-level delegation of engineering experts to Beijing.

## Industry and infrastructure

*Engineering the Future*, the engineering professional alliance, supported government work on developing the nuclear supply chain action plan by providing access to a number of experts from the professional engineering community. The alliance updated its infrastructure timelines, based on known government plans and independent expert opinion of what longer-term infrastructure issues may need to be considered. This report was referenced in the updated *National Infrastructure Plan 2012* published by Infrastructure UK.

A joint roundtable with The Institution of Engineering and Technology and the Institution of Mechanical Engineers was held in response to the Department for Transport (DfT) study, *Technological impacts on the future of transport*, setting out the key technologies that could affect transport over the next 30 years.

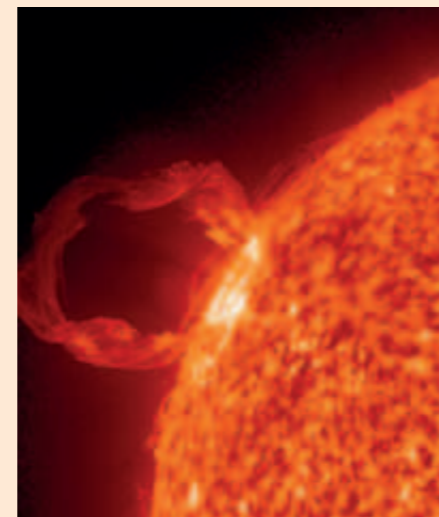
## Extreme space weather

The Academy published a report on the potential impacts on the UK's infrastructure of an extreme solar storm. Such 'superstorms' have the potential to cause severe disruption of engineered systems.

The study covered the risk to the electricity grid, satellites, GPS systems, aviation and mobile communications. It highlighted that, although the UK is better prepared than most countries, there are areas where resilience and preparation strategies need to be improved.

The report, the result of an extensive study led by Professor Paul Cannon FEng, received widespread media attention and has resulted in productive discussion between the Academy and senior levels of government. A meeting on the report's findings was held with the Parliamentary and Scientific Committee.

A solar disruptive prominence as seen through the atmospheric imaging assembly onboard the Solar Dynamics Observatory @ NASA





### Engineers for Africa

In collaboration with the Africa-UK Engineering for Development Partnership, the Academy launched a new report, *Engineers for Africa: Identifying Engineering Capacity Needs in Sub-Saharan Africa*. The report made an important contribution to the sparse body of literature on this topic.

The Africa-UK Engineering for Development Partnership (A-UK) brings together the engineering community in Africa and the UK in a consortium comprising the Africa Engineers Forum,

the Royal Academy of Engineering, the Institution of Civil Engineers and Engineers Against Poverty.

Following the publication of the report, the Academy launched a pilot programme on enhancing engineering education in the region with funding from the Anglo American Group Foundation. The programme will be based in the Universities of Zimbabwe and Dar es Salaam.

### Innovation in...

The Academy held two further events as part of its flagship series looking at innovation across various sectors. *Innovation in technology-based companies*, chaired by the President, Sir John Parker GBE FREng, considered how technology businesses are finding new ways to engage their customers. Leading business academics and senior managers of technology-based companies discussed the latest theories on business innovation.

*Innovation in automotive*, chaired jointly by the President and Professor Richard Parry-Jones CBE FREng, featured a keynote address by Lord Drayson FREng, a former science minister and leading proponent of electric motor sport.

### Engineering and health

A joint project with the Royal Society, British Academy and Academy of Medical Sciences considered the issue of *Human enhancement and the future of work*, concluding that, although human enhancement technologies might improve performance and aid society, their use would raise serious ethical, philosophical, regulatory and economic issues that will need further consideration.

The Academy's Biomedical Engineering Panel and Age UK held

a joint conference in Sheffield on *Cost-effective care for older people: how technology can make a difference*. Speakers considered how engineering could help people with long-term conditions maintain their independence, living at home and staying out of hospital.

The Biomedical Engineering Panel published a series of case studies on biomedical engineering careers. The panel also held a joint roundtable with the Academy of Medical Sciences for engineers, clinicians and regulatory bodies on how best to gather patient data for the regulation of medical devices and engineered systems.

### PolicyNet

PolicyNet is a network for people in science and engineering policy roles at all levels. Events were held on what UK policymakers can learn from developing countries that are heavily investing in science and engineering; the role of scientists and engineers when influencing government; and Professor Sir John Beddington CMG HonFREng FRS reflecting on his time as GCSA.

### Responses and submissions

The Academy responds to government consultations and parliamentary inquiries, many in partnership with the *Engineering the Future* alliance. In total,

nine joint responses were submitted and six by the Academy alone. Responses to the House of Commons Home Affairs Select Committee's inquiry into e-crime and the Energy and Climate Change Select Committee's inquiry into a project to build a barrage across the Severn Estuary led to invitations to present oral evidence to the committees.

### Euro-CASE

The Academy plays an active role within Euro-CASE and is one of a sub-group of member academies that have created an Innovation Platform - a series of five thematic workshops examining and promoting best practice in Europe on various aspects of innovation policy. The third meeting

on *Financing Innovation*, was held at Prince Philip House and addressed by experts including Academy Fellows.

### Global Grand Challenges Summit

In March 2013, the Academy brought together 450 leading engineers, scientists, economists, educators, artists, designers and policymakers from across the globe for the inaugural Global Grand Challenges Summit in London.

The summit, organised by the Academy in partnership with the national engineering academies of the US and China, sought to provide a new global platform for the world's leading thinkers to share their ideas with the next generation of engineers on how to develop the international frameworks, tools and collaborations needed to solve our common global challenges.

The stellar lineup of speakers at the summit included: Dr Craig Venter, Dr Regina Dugan, Professor Jeffrey Sachs and Dean Kamen; and Academy



Fellows Professor Dame Ann Dowling FREng FRS, Dr Paul Golby CBE FREng, Professor Andy Hopper CBE FREng FRS, Professor Calestous Juma HonFREng, Dr Mike Lynch OBE FREng, Professor Robert Mair CBE FREng FRS, Jo da Silva OBE FREng and Professor Chris Wise RDI FREng.

The summit was also addressed by a surprise guest on the first day: the entertainer will.i.am, who challenged the audience of engineers to compete with music and sport for young people's attention.

The three thematic sessions of day one were on health, sustainability

and education. The summit identified significant opportunities for progress on the Grand Challenges, but also areas of deep concern. Sessions on day two covered issues in the areas of enriching life, technology and growth, and resilience. The plenary address was given by Bill Gates, who stressed that engineers will be vital in tackling climate change, creating and delivering new and better solutions for healthcare, and helping solve the problems of the developing world.

**Top:** Bill Gates on video link addressing the Global Grand Challenges audience with the moderator, Professor Jim Al-Khalili, in the foreground  
**Left:** will.i.am was a surprise guest and speaker at the Global Grand Challenges event

# Promote engineering at the heart of society

The Academy aims to increase debate on engineering and its impact on society and build public recognition for our most talented engineers. It is ideally placed to raise awareness of engineering across all disciplines and to bring it to where it belongs – at the heart of society

## Reaching new audiences

Over the last year, the Academy has supported and been involved in a range of programmes and events that have helped reach new audiences. These activities have been led by the Academy, delivered in partnership with others or through the *Ingenious* public engagement grant scheme.

*Ingenious*, funded by BIS, is the Academy's grant scheme for public engagement. This year, 20 new projects were completed across the UK, targeting audiences that included visitors to museums and children in schools. Among the awarded projects was *~Flow*, an innovative floating engineered watermill located on the River Tyne that created sounds and data in response to its changing environment. *Ingenious* allowed the project to extend its events programme, giving audiences the chance to meet the engineers involved in its creation.

The Academy took part in the fifth Big Bang Fair, the largest celebration

of engineering and science for young people in the UK. This year, more than 65,000 visitors attended the event which took place at London's ExCeL centre. The Academy hosted a stand demonstrating the different ways that engineering can help to save lives after natural disasters. The Big Bang Fair was also the recipient of the Academy's Rooke Medal for public promotion of engineering.

The Academy took part in the Cheltenham Science Festival, which reaches out to adult audiences. The Academy supported an engineering comedy and two events on energy: an Oxford-style debate on wind power with Dr Andrew Garrad FREng and a discussion on the challenge of heating our homes in a low carbon era with Dr Roger Kemp FREng and TV presenter Robert Llewellyn.

The opening of Prince Philip House provided an opportunity to welcome new audiences into the Academy for events such as *Tasty Spoons* and *Drinkable Clouds*, in which engineers from both sides of the Atlantic explored

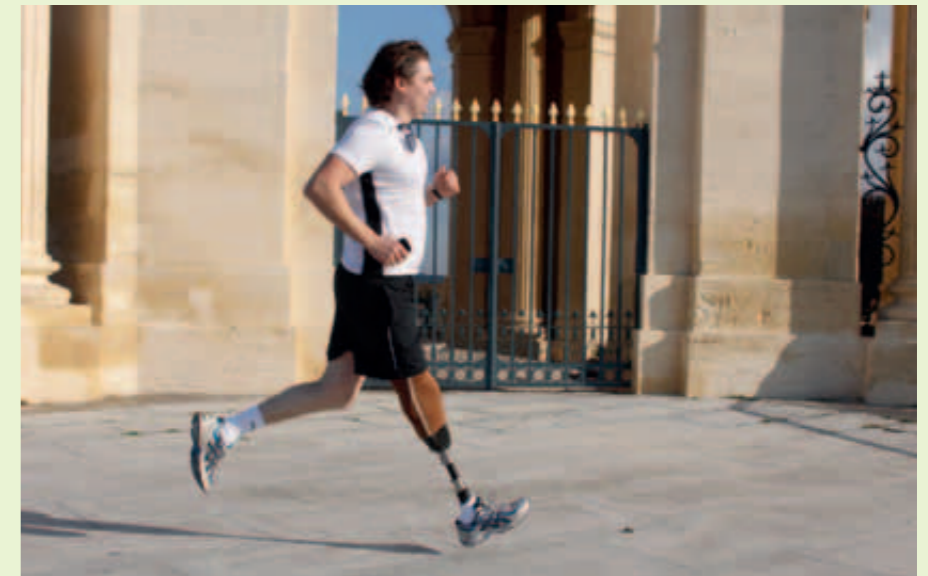


One of the Academy stands at the Big Bang Fair: visitors were challenged to construct their own earthquake-proof structures that could withstand vibrations from the shaker-tables they were built on

## Side by Side

Timed to coincide with the London 2012 Paralympic Games, the Academy organised a programme of events examining engineering and disability sport entitled *Side by Side*. Among these was an international conference on how disability sport can drive engineering innovation. Jointly organised with the Science and Innovation Network and UK Trade and Investment, it featured an exhibition on designs for athletic equipment for Paralympians of the future and radical new sporting events. The programme also included public lectures such as that given by Dr Amit Goffer, inventor of the 'ReWalk' powered exoskeleton that enables wheelchair users with lower-limb disabilities to walk.

The many contributors demonstrated that sport can generate real public



interest in engineering and the Paralympics provided special opportunities for engineers to tell positive stories of sporting achievements.

This combined foot and foot prosthesis, provided by Chas A Blatchford and Sons, was a finalist for the Academy's MacRobert Award. The company's technical director, Dr Saeed Zahedi OBE FREng, helped organise the Academy event *Side by Side*

the link between engineering and the arts. Attendees were invited to experience inhalable chocolate, drinkable cocktail clouds, and cutlery that alters the taste of meals.

In September, the Academy took part in the annual London Design Festival to celebrate the ingenuity and inventiveness of UK engineers and designers.

The Academy supported two debates over the *Battle of Ideas* festival weekend held at London's Barbican Centre in October on fracking and water supply. It also held a satellite event in November, titled *Can technology set you free?* which included global telecoms expert Dr Mo Ibrahim HonFREng as a panel speaker.

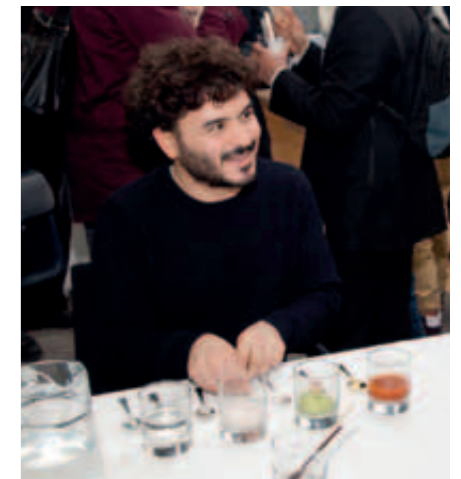
## Celebrating and promoting engineering

The Academy has brought engineering not only to a nationwide audience but also across the globe through the Queen Elizabeth Prize for Engineering (on page 21), the Academy's policy work and a variety of other awards and activities.

The Academy has had considerable success in the last year in showing how engineering is at the heart of society, increasing its media coverage by 55% in 2012-13.

As well as frequent mentions in national, regional and trade print and online press, the Academy has been well represented in over 50 radio news and TV programmes reaching key audiences of opinion formers. For example, in April, the first six Engineering Enterprise Fellowships awarded to outstanding innovators at UK universities were featured on BBC Radio 4's PM programme. Professor Paul Cannon FREng followed his Radio 5 and Radio 4 *Today* programme interviews discussing the impact of solar superstorms with TV appearances on Channel 4 news and the BBC.

Dame Ann Dowling FREng FRS talked to Professor Jim Al-Khalili about her work on acoustics, including the silent aircraft project, on Radio 4's *The Life Scientific* in August. On the same programme, Professor Robert Mair CBE FREng FRS told Al-Khalili about his career in tunnel design, and Dame Sue Ion FREng was



One of the visitors to the *Tasty Spoons* event about to experience how the material of the spoon affects the taste of food. Researchers are looking at how a spoon could be developed that would taste different to a person at the onset of a disease

featured some weeks later, speaking about her work in the nuclear industry.

When Radio 4's *Woman's Hour* showcased 100 of the UK's top women in their 'Power List' in February, it featured four Academy-nominated Fellows: Dame Ann Dowling, Dame Wendy Hall, Dame Sue Ion and Dame Stephanie Shirley.



The Academy Awards dinner, held at the Royal Opera House in June, included journalists and opinion formers among its many attendees, and provided a showcase for its awards. These included presentations of the MacRobert Award, as well as the Prince Philip Medal, given to Arup's Naeem Hussain, designer of iconic bridges including the Øresund crossing linking Sweden and Denmark.

Professor Stephen Salter, the celebrated inventor of 'Salter's Ducks', which convert wave power into electricity, received the Sustained Achievement Award for his contribution to the development of renewable energy systems.

Dr Alessandra Carriero, of Imperial College London, won the Sir George Macfarlane Award for early career engineers. Her ground-breaking research on bone fractures and abnormal bone growth helps inform clinicians on ways to correct or prevent bone abnormalities in children.

Dan Chambers, Co-Founder and Director of Draft Wheelchairs Ltd received the Sir Frank Whittle Medal in September. One of Draft's customers, David Weir MBE, won his third gold medal of the Paralympics on the same evening and the Academy audience watched the event live as he stormed to victory in the T54 800m.

**Above:** Academy President, Sir John Parker GBE FREng, presents Dr Alessandra Carriero with her certificate for the 2012 Sir George Macfarlane Award

**Right:** Dr Shirley Ann Jackson delivering the ERA Foundation International Lecture in January 2013

## Technology and society

The impacts of engineering and technology on innovation, healthcare, society and sport were some of the themes of the Academy's programme of events. In a joint lecture with the Royal Society of Edinburgh, Ian Stevens, CEO of Touch Bionics, talked about how the i-Limb bionic hand was brought to market and has evolved to meet the needs of its users.

Dr Shirley Ann Jackson FREng, President of the US Rensselaer Polytechnic Institute, shared her vision of multidisciplinary collaboration when she delivered the ERA Foundation International Lecture. She described how today's pressing global challenges were too complex to be resolved in isolation, and highlighted the need for increased collaboration across all disciplines and sectors.



Dr Tarek Elabbady, Senior Director of Microsoft Research Technology Labs, based in Cairo, talked about the key role played by technology in the Arab Spring movements, as part of the Vodafone Lecture Series.

Dr Tom Enders, CEO of EADS, gave the Hinton Lecture on engineering innovation and skills in the aerospace industry. He called for approaches to education, innovation and cooperation to deliver the kind of pragmatic engineering that drives responsible growth, improves people's lives and captures their imaginations.

## The Queen Elizabeth Prize for Engineering

The first winners of the Queen Elizabeth Prize for Engineering (QE Prize) were announced in March 2013 by Lord Browne of Madingley FREng FRS, Chair of the Prize Trustees, in the presence of HRH The Princess Royal. The biannual, £1 million prize was awarded to Robert Kahn, Vinton Cerf, and Louis Pouzin, Sir Tim Berners-Lee FREng, and Marc Andreessen for their respective contributions to the creation of the internet, the World Wide Web and the Mosaic browser.

The announcement reached 22 million readers via 40 print articles and 66 million viewers in 12 countries. In the UK the broadcast coverage included Sky News, Channel 4 news and a significant item on the BBC TV news at 6pm and 10pm which promoted the importance and breadth of modern engineering.

On the day of the announcement, HRH Princess Anne said: "This prize has already cracked one of the problems, which is to raise the profile of engineering. Every time I've opened a paper recently I've seen more articles and more discussion about engineering and the (QE) prize specifically, and the recognition it gives engineers".

The QE Prize was established in 2011 and supported by all three party leaders. The vision of the prize is to become the world's preeminent award for engineering and to create a societal shift in the perception of engineers and engineering.

The Prime Minister led the launch of the prize. The Rt Hon Nick Clegg MP attended a Prize launch in Berlin, sharing the stage with QE Prize judge, Professor Reinhard Huettl. There were also events in Paris, Singapore, Tokyo, Melbourne, Nairobi and Slovenia.

The QE Prize drew hundreds of nominations from across the globe



with the help of an international search group, chaired by Sir William Wakeham FREng. A panel of Academy Fellows chaired by Dame Sue Ion FREng sifted the nominations and the results were passed to the judging panel, chaired by Lord Broers FREng. The international panel of 15 QE Prize judges carried out due diligence, debated the entries in great detail, then made their decision in March 2013.

Throughout the year, the QE Prize team was involved in a number of activities designed to raise awareness of engineering and of the prize itself.



These included a competition inviting 16- to 24-year-olds in the UK to design the trophy for the QE Prize, using an online tool created with cutting-edge gaming technology.

The London Olympics and Paralympics provided another platform for the QE Prize to promote engineering, and in the run-up to the announcement of winner, the QE Prize generated significant interest in the UK media, including a feature on BBC Radio 4's *Material World*, articles in the *Sunday Telegraph* and a full-length feature in *The Sunday Times* magazine. This coverage was supported by significant traffic on social media channels.

The award of the prize at Buckingham Palace by the Queen in June 2013 is being followed by work to ensure that the engineering awareness created by the QE Prize will be developed and maintained globally and permanently.

**Top:** Immediate Academy Past President Lord Browne, with Queen Elizabeth Prize for Engineering winners Dr Robert Kahn and Louis Pouzin

**Left:** Jennifer Leggett, winner of the Create the Trophy competition, with her tree-like trophy design which symbolises the growth of engineering and represents the way in which all areas of engineering are interlinked

# Building organisational capacity

The Academy endeavours to find the best engineers from a wide range of backgrounds for nomination to the Fellowship. To provide a quality venue for its events and resources for its wide-ranging education and engagement work, the Academy also seeks funding and in-kind support from a range of partners



## Membership review

The Academy's Fellowship is drawn from the best engineers in the country and candidates are nominated by existing Fellows of the Academy. One consequence of peer-only nomination is a tendency for nominations to come from more familiar areas of engineering and from companies, universities and sectors where Fellows already work.

The Proactive Membership Committee (PMC) is tasked with seeking out and supporting the nomination of candidates from areas and sectors of engineering and society not well represented within the Fellowship. In the international domain, a similar activity is performed by the Proactive International Fellowship Group.

Six years on from the previous Membership Review, Dame Sue Ion FREng led a new review team that reported to the Academy's Council in January 2013. The review concluded that valuable progress had been made, commending the PMC for its work in supporting more new nominations for women and engineers in industry. However, it also uncovered areas for improvement.

As a result, the current five panels, based on the broad sectors of mechanical, civil, electrical, chemical and computing engineering, are to be reformed into a larger group of eleven panels with greater granularity of sub-disciplines.

The Proactive Membership Committee's important work will continue, since, in addition to industrial candidates, there remains a persisting need for more nominations for women engineers, younger engineers and those from black and minority ethnic groups.

## Governance review

A group of Fellows chaired by Academy Senior Vice President, Sir William Wakeham FREng, formed a review group to consider the current governance structure of the Academy. Items under consideration by the group include the current composition of Council and the Academy's committees, and better means of engagement with Fellows around the country. Ultimately the group will report to the Academy Council with its recommendations to reform the governance of the Academy to ensure it is fit for purpose in support of its charitable objectives.

## New visual identity



After consultation with designers, Fellows and staff, the Academy has refreshed its visual identity with a new typeface, and an updated logo and 'thread' graphic, for use across all publications and outputs. The new identity has been developed for increased effectiveness across print and online publications. It also allows more flexibility, enabling branded materials to be targeted to specific groups within the broad spectrum of Academy audiences.

## Prince Philip House

Work on the £6.5million *Forum for engineering* capital project was completed in April 2012 to a very high standard, on schedule and to budget. Donors to this project have been acknowledged on a board in the Academy's reception area. In October, the building was formally opened as Prince Philip House by HRH The Duke of Edinburgh, the Academy's Senior Fellow. He also unveiled his own portrait, a triptych by Paul Brason RP, which had been generously commissioned by Dame Stephanie Shirley FREng.

The *Forum for engineering* project has enhanced the Academy's ability to attract and engage key audiences in state-of-the-art facilities. Fellows and visitors alike have made very positive responses to the refurbishment. In addition, the income from third party hire of the facilities is already providing support for the Academy's charitable activities.

## Development

In the year, the Academy raised £2 million in new commitments to further its education and engagement work: the generosity of all donors and sponsors is greatly appreciated.

The Academy has continued to benefit from Fellows' support in the form of direct donations as well as in helping to attract new funders and strengthen existing relationships.

A new Annual Fund appeal to the Fellowship attracted £60,000 in initial donations, with pledges bringing uplift in capacity to three programmes. During the year, the Academy also received a number of generous legacies.

A series of small dinner-discussion events, hosted by Fellows, was arranged with the purpose of raising the Academy's profile and initiating new support. These thematic events attracted high-level participation from the worlds of shipping, oil and gas, automotive and international development.

Several major donors renewed or expanded their support including new multi-year commitments from Petrofac and BAE Systems. The Anglo American Group Foundation committed funds to a major new initiative to support and improve tertiary engineering education in Sub-Saharan Africa. ConocoPhillips in Nigeria and Dr Mo Ibrahim HonFREng also kindly contributed to the Academy's engineering capacity-building work in the region.

The Welsh Assembly Government made a grant for the distribution of a Welsh version of the Academy's 'Engineering ideas in a box' teaching resource.

The London Skills and Improvement Service made a grant for engineering professional development resources. Government and industry provided joint funding for an additional 500 MSc Aerospace course places to help provide the expertise the aerospace sector needs in the UK and support on a matching basis from The Helsington Foundation will be provided to the newly launched Elite Engineering Programme.

NATS, QinetiQ, BAE Systems and IBM became the inaugural supporters of the Forum Partnership programme, which will include high-quality thought leadership events series at Prince Philip House throughout the year.

The Academy's annual awards dinner is a prime opportunity to showcase engineering and highlight its multifaceted contribution to the wealth and wellbeing of the nation. The Academy thanks BG Group, Petrofac, Arup, BAE Systems, Bosch, Shell, BP and Thales for making the 2012 event possible.

With the successful completion of the Development Campaign Board's goals, a new Development Advisory Board, chaired by Richard Olver FREng has been convened to help fulfil the Academy's new goals of further diversifying its funding sources and raising £2 million a year for programme support.

**Above:** Above: Academy President, Sir John Parker GBE FREng, the Academy's Senior Fellow, HRH the Duke of Edinburgh, and the Chief Executive, Philip Greenish CBE, at the official opening of Prince Philip House

**Below:** The Academy updated its visual identity in June 2012 giving its branded materials a more contemporary image with added impact on digital platforms. The thread (below) represents the Academy's work which runs through the fabric of society

# Academy event highlights

## May 2012

**Memorandum of Understanding signing with the President of the Chinese Academy of Engineering**

**Designing better care for older people: how technology can make a difference**

**Annual Soiree and Exhibition** - in the presence of HRH The Princess Royal, Royal Fellow

## June 2012

**Cheltenham Science Festival** - featuring three Academy events

**Greening UK energy: business opportunity or brake on growth?**

**Academy Awards Dinner** at the Royal Opera House

**What can UK policymakers learn from developing countries that are investing heavily in science and engineering?**

## July 2012

**The MacRobert Award winner and finalists 2012 exhibition**

**Vodafone Lecture** - *The use of mobile phones in crises: social media technologies during the Arab Spring*

**UK research: building bridges, building prosperity** - a joint event featuring Dr Vince Cable, the Secretary of State for Business, Innovation and Skills

**Academy's Annual General Meeting** - chaired by Sir John Parker GBE FREng

**Innovation in technology-based companies: reinventing the business ecosystem**

## September 2012

**Rio Tinto sports innovation challenge exhibition**

**How can sport drive engineering innovation?**

**Powered exoskeletons: overcoming vertical mobility impairments**

**Engineering Research Forum** - the annual showcase of engineering research sponsored by the Academy

**London Design Festival** - a series of lectures and exhibitions held at 3 Carlton House Terrace

**Humans v Nature: Engineering FTW** - *Ingenious* award holders wrote and performed a new engineering comedy

## October 2012

**Hinton Lecture** - *Breaking the Barriers* by Dr Tom Enders, CEO, EADS

**Battle of Ideas 2012** - featuring two Academy-sponsored events: *Water, water, everywhere: not allowed to use it* and *Gas galore? Fracking and the future of energy*

**Putting the E-word into engagement**

**Engineering capacity needs in Sub-Saharan Africa**

## November 2012

**FameLab Engineering**

**Technology Visionaries Lecture** - *How does software change engineering?*

**Engineers in a sustainable world: are they making enough of a difference?**

**Can technology set you free?** - a Battle of Ideas satellite event

**Vodafone Lecture** - *Mobile phones, society and interconnectivity*

## December 2012

**Tasty spoons and drinkable clouds: the art of engineering**

**The Lloyd's Register Educational Trust Lecture** - *Reducing technical risk for unmanned aircraft systems*

## January 2013

**New Year Reception** - *Behind the scenes at the BBC*

**ERA International Lecture** - *Clouds, crowds, jams and data: a new polytechnic to address global challenges*

**Building futures - inspiring the next generation of engineers and innovators**

**Innovation in automotive conference**

## March 2013

**Joint annual lecture with the Royal Society of Edinburgh** - Growing healthcare technology businesses

**Regional Lecture** - *Shining a light on materials behaviour* at the University of Manchester

**D&T and ICT in the National Curriculum** - an E4E conference examining the new curricula for technology subjects

**Global Grand Challenges Summit** - two-day conference organised by the Academy, the US National Academy of Engineering and the Chinese Academy of Engineering

**Queen Elizabeth Prize for Engineering** - inaugural prize winners announced

Video or audio recording available at [www.RAEng.tv](http://www.RAEng.tv)

Transcripts and publications from most of the lectures and seminars mentioned are available at: [www.raeng.org.uk](http://www.raeng.org.uk)

# Academy publications

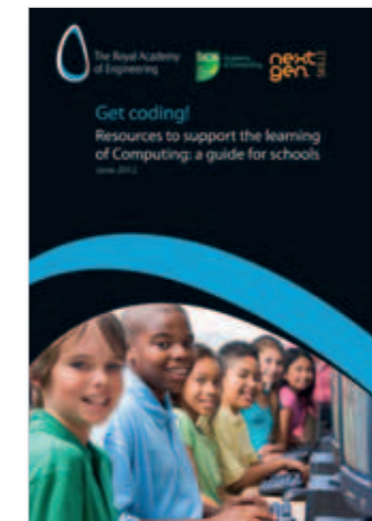
These reports were published during the last financial year and are available to download at: [www.raeng.org.uk](http://www.raeng.org.uk)

## April 2012

**Nuclear Construction Lessons Learned: Guidance on best practice**

**Educating engineers to drive the innovation economy**

**Engineering the future of water - review of the 2011 discussion series**



## May 2012

**The case for Centres of Excellence in sustainable building design**

**Designing cost-effective care for older people: how technology can make a difference**

## June 2012

**Greening UK energy: business opportunity or brake on growth?**

**Shale gas extraction in the UK: a review of hydraulic fracturing** - a joint report for government produced by the Academy and the Royal Society

## July 2012

**Enhancing Engineering Higher Education: Outputs of the National HE STEM Programme**

**Computing qualifications included in the 2014 Key Stage 4 performance tables: a guide for schools**



**Get coding! - resources to support the teaching of computing qualifications included in the 2014 Key Stage 4 performance tables**

## August 2012

**Future of energy storage: technologies and policy** - a report of UK-China workshops

**Opportunity and Ability?** - E4E report on Key Stage 4 science and mathematics participation and attainment in England 2010

## September 2012

**Jobs and growth: the importance of engineering skills to the UK economy**

**Young researchers futures meeting: abstract from a three-day conference on neural engineering**

**How can sport drive engineering innovation?**

## October 2012

**Innovation in technology-based companies: reinventing the business ecosystem**

**Engineering capacity needs in Sub-Saharan Africa**

## November 2012

**Human enhancement and the future of work**

## February 2013

**Extreme space weather: impacts on engineered systems and infrastructure**

## March 2013

**E4E Design and Technology report - identifying the core knowledge and skills components across the subject's sub-disciplines**

**Meet the innovators: researcher case studies**

**Decommissioning in the North Sea**



# Highlights of the year by theme

## Research support

For every **£1** that the Academy spends on Research Chairs, industry and other sources provide an additional **£11.30**

Academy researchers collaborated with 302 companies during the year

6 Enterprise Fellowships supported with **£500,000** of Academy seed funding attracted an additional **£1.5 million** of investment

## Queen Elizabeth Prize for Engineering

5 engineers received the first **£1 million** prize for creating the internet and the World Wide Web

Over **66 million** people reached by broadcast media worldwide

**18.8 million** reached via Twitter

## Hinton Lecture

Presented by Dr Tom Enders, CEO of leading aerospace and defence company EADS

Took place on 1 October - the anniversary of Concorde breaking the sound barrier for the first time

Full-capacity audience with widespread national media coverage including *BBC News at Ten*

## Global Grand Challenges Summit

Bill Gates, Craig Venter and will.i.am addressed **500** international guests at 'Davos for engineering'

Live streaming of event was viewed **12,700** times, including satellite events at **10** universities and businesses across India and the US

## Jobs and growth report

Demand for engineers outstrips supply across all sectors of the economy and drives a wage premium

**1.25 million** science, engineering and technology (SET) professionals and technicians will be needed by 2020, including a high proportion of engineers

Covered in *The Times* leader column, *The New York Times* and *China Today* and continues to gather media attention

## Major Projects Award

Presented to Sir John Armitt FREng for leading the delivery of the 2012 London Olympics Park on time and under budget

The Park's Olympic Village provided accommodation for **10,500** Olympic and **4,200** Paralympic athletes

**98%** of construction waste was reused, recycled or recovered

## Extreme space weather

Academy produced the UK's first in-depth study of the impacts of solar 'superstorms' on engineered systems

**2,680+** downloads of the report, **105** articles worldwide including **32** UK publications

Report presented at events in Cheltenham, Beijing, London, Rome and Stockholm

## Diversity Programme

**117** British Sign Language terms developed to support hearing impaired people to participate in the study of engineering

**6** Professional Engineering Institutions (PEIs) worked together to produce a concordat agreement for diversity in engineering - **9** have now signed up

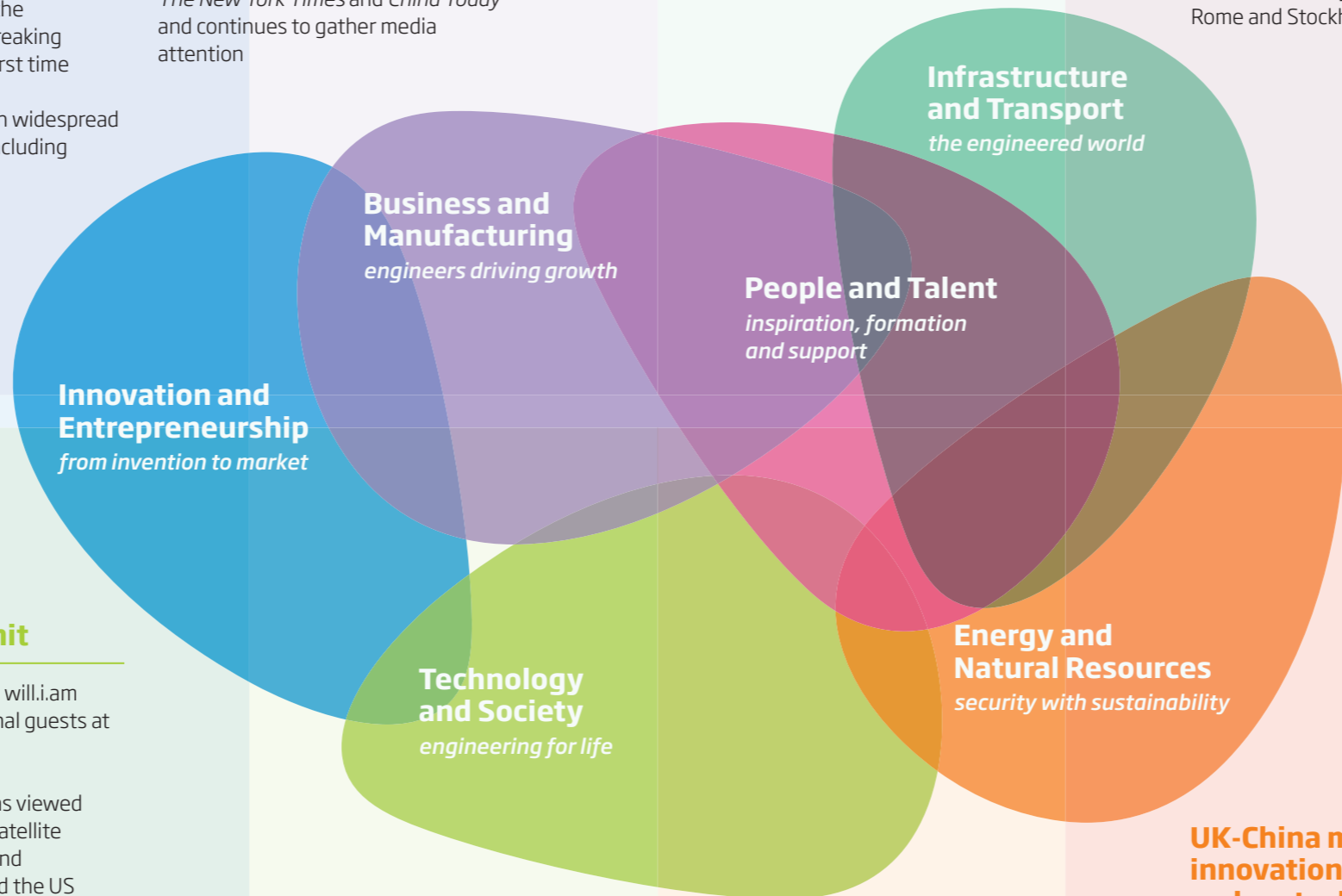
**50** engineering companies and **5** PEIs are involved with Diversity Programme pilot projects to increase access to engineering

## Influencing education policy

The Academy was influential in the government's call to redevelop the **Engineering Diploma** into a suite of separate qualifications

Oversaw the creation of a new computing curriculum that focuses on programming and coding. Computer Science is now a feature of the *English Baccalaureate*.

Education for Engineering (E4E) and the Academy successfully campaigned for, and shaped, the rewriting of the **Design & Technology** curriculum to ensure it was fit for the twenty-first century.



## Academy media coverage

**1,548** cuttings: 345 print, 1,152 online, 13 TV and 38 radio

**55%** increase on last financial year

## Study on shale gas

A joint study with the Royal Society commissioned by the Government Chief Scientific Adviser

The government accepted all **10** of the report's recommendations

## UK-China missions on innovation in low carbon technologies

Engaged senior Chinese stakeholders, including Chairman of Chinese Development Bank

Exposed Chinese policymakers to UK expertise on key energy technologies



# Group funding

## Sources of income and destination of expenditure

(includes Academy subsidiaries: the Queen Elizabeth Prize for Engineering Foundation and RAEng Trading Ltd)

For the financial year ended 31 March	2013 £ million	2012 £ million
<b>Sources of income</b>		
Grants	7.9	11.9
Contracts	3.9	4.5
Gifts and donations	10.8	2.9
Investment income	1.1	0.9
Other income	1.3	0.7
	<b>25.0</b>	<b>20.9</b>

### Destination of expenditure

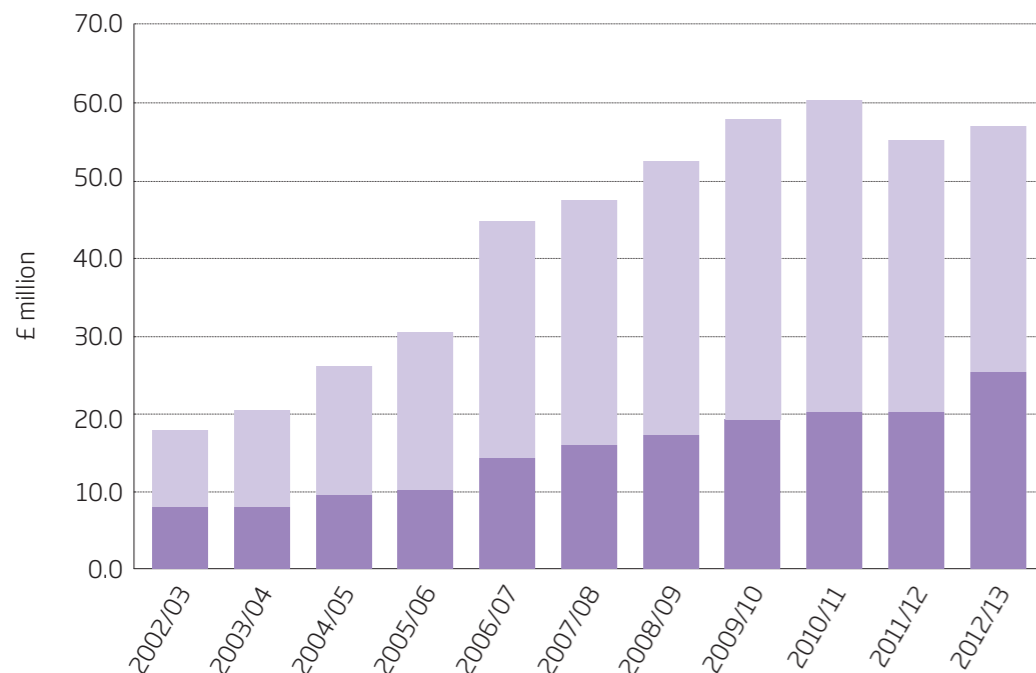
Charitable activities:	2013 £ million	2012 £ million
- Promotion of and leadership in engineering	2.8	3.2
- Leading and shaping engineering policy	1.6	3.5
- Enhancing engineering capacity	7.5	9.7
- Inspiring young people and nurturing education skills	1.3	0.8
- Queen Elizabeth Prize for Engineering	1.3	0
- Costs of generating funds and governance costs	1.2	0.3
	<b>15.8</b>	<b>17.5</b>

Third party support attracted to Academy programmes*	2013 £ million	2012 £ million
	<b>31.2</b>	<b>33.9</b>

Numbers are rounded to £0.1 million

\*Note: Third party income arises from donors who agree to support Academy projects but make contributions directly to those projects without passing through the Academy's books. Although these funds are not under the direct control of the Academy, they would not have become available without the involvement of the Academy.

## Group income



### Recent trends in the level of Academy activity

- Third party support
- Direct income

# Annex to the Annual Review

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# Fellows

Fellows of the Academy are leading engineers in the UK drawn from academia, industry and the not-for-profit sectors. Fellowship is a national honour, awarded for outstanding personal engineering achievements, exemplified by individual leadership in organisations demonstrating significant technical engineering responsibility and by influential contributions to major committees and agencies concerned with engineering policy or practice. Election to the Fellowship is managed by current Fellows of the Academy.

## HONORARY FELLOWS

### Elected in 2012 were:

#### **Sir John Beddington CMG**

Chief Scientific Adviser to HM Government and Head of the Government Office for Science

#### **Sir Paul Nurse**

President, the Royal Society, and Director, Francis Crick Institute

#### **Ratan Naval Tata KBE**

Chairman, Tata Sons Limited, Chairman, Jaguar Land Rover plc UK, and Board member of Alcoa Inc.

## FELLOWS

### Elected in 2012 were:

#### **Chinemelu Jidenka Anumba**

Professor and Head, Department of Architectural Engineering, Pennsylvania State University, USA

#### **Colin Gareth Bailey**

Vice President and Dean of the Faculty of Engineering and Physical Sciences, The University of Manchester

#### **Serena Michelle Best**

Professor of Materials Science, Department of Materials Science and Metallurgy, and Fellow, St John's College, Cambridge

#### **Peter William Bonfield OBE**

Chief Executive, Building Research Establishment

#### **David Braben**

Founder and CEO of Frontier Developments Ltd; Co-Founding Trustee, The Raspberry Pi Foundation

#### **William Tudor Brown**

Formerly President, ARM Holdings plc

#### **Rob Buckingham**

Co-Founder and Managing Director, OCRobotics

#### **Kenneth Walter Burrage**

Independent Consultant; Formerly Director of S&T Engineering BRB, and Controller Safety Standards, Railtrack, Director, Westinghouse Signals Ltd

#### **David Cardwell**

Professor of Superconducting Engineering, Department of Engineering, University of Cambridge

#### **Cynthia Carroll**

Chief Executive, Anglo American plc

#### **Jonathon Arthur Chambers**

Professor of Communications and Signal Processing, Associate Dean (Research) and Head of Advanced Signal Processing Research Group, Loughborough University

#### **Andrew Ka Ching Chan**

Deputy Chairman, Arup Group Ltd

#### **Suranga Chandratillake**

Founder, President and Chief Strategy Officer, blinkx plc

#### **Sir Frank Chapman**

Chief Executive, BG Group plc and Non-Executive Director, Rolls-Royce plc

#### **Peter John Clarkson**

Professor of Engineering Design, University of Cambridge, Director, Cambridge Engineering Design Centre, Professorial Fellow and Vice-Master, Trinity Hall, Cambridge

#### **Iain Conn**

Group Managing Director and Chief Executive, Refining and Marketing, BP plc

#### **Stephen Thomas Elston**

Chief Engineer Critical Parts, Rolls-Royce plc

#### **Anthony Charles Wiener Finkelstein**

Dean, Faculty of Engineering Sciences, Professor of Software Systems Engineering and Head of Department of Computer Science, University College London

#### **Peter FitzGerald CBE**

Managing Director, Radox Laboratories

#### **Martin Grant**

Chief Executive Officer, Energy, WS Atkins plc

#### **Oubay Hassan MBE**

Head of Civil and Computational Engineering Centre, Swansea University

#### **Xiangqian (Jane) Jiang**

Director, EPSRC Centre of Innovative Manufacturing in Advanced Metrology and Chair of Precision Metrology, University of Huddersfield

#### **Paul William Jowitt CBE**

Professor of Civil Engineering Systems, Heriot Watt University

#### **Gautam Kalghatgi**

Senior Science Research Consultant, Saudi Aramco

#### **Douglas Alexander King**

Principal, Doug King Consulting Ltd; Chief Science and Engineering Advisor, Building Research Establishment, and RAEng Visiting Professor of Building Physics, University of Bath

#### **Anthony Miles Kinghorn**

Chief Technical Officer, RF Systems, Selex ES

#### **David Michael Lane**

Professor, School of Engineering and Physical Science, and Director, Ocean Systems Laboratory, Heriot-Watt University

#### **Allen Frederick Leatt**

Senior VP Engineering, Subsea 7

#### **William Edward Lee**

Professor of Ceramics, Co-Director of Centre of Nuclear Engineering, Imperial College London and Deputy Chair, Committee on Radioactive Waste Management (CoRWM)

#### **Sir Kevin Leeson KCB CBE**

Retired - formerly Chief of Materiel (Air), MoD DE&S; Air Member for Materiel, Royal Air Force Board; Deputy National Armament Director (Air Programmes), MoD UK, and Chief Engineer (RAF), Royal Air Force

#### **Timothy Grant Leighton**

Professor of Ultrasonics and Underwater Acoustics, Associate Dean (Research), Faculty of Engineering and the Environment, and Chair, Fluid Dynamics and Acoustics Research Group, Institute of Sound and Vibration Research, University of Southampton

#### **Wayne Luk**

Professor of Computer Engineering, Imperial College London

#### **Elaine Barbara Martin OBE**

Professor of Industrial Statistics and Director, Biopharmaceutical Bioprocessing Technology Centre, Newcastle University

#### **Allan Matthews**

Professor of Surface Engineering, Executive Director of the Leonardo Centre for Tribology and Surface Technology and Director of the Research Centre in Surface Engineering, University of Sheffield

#### **Robert Maxwell McMeeking**

Professor of Mechanical Engineering and Professor of Materials, University of California; Sixth Century Professor of Engineering Materials, University of Aberdeen

#### **Ian Saxley Metcalfe**

Professor of Chemical Engineering, Newcastle University

#### **Stephen Myers**

Director of Accelerators and Technology, CERN

#### **Richard Vincent Penty**

Professor of Photonics, Engineering Department, University of Cambridge

#### **Jane Ann Plant CBE**

Anglo American Professor of Geochemistry, Imperial College London

#### **Ian Pratt**

Co-Founder and Senior Vice President, Bromium Inc; Chairman of Xen.org

#### **William Hugh Salvin Rampen**

Managing Director, Artemis Intelligent Power

#### **Peter Charles Robery**

Technical Director, Concrete Materials, Halcrow Group Ltd

#### **Nigel Seaton**

Principal and Vice-Chancellor, University of Abertay Dundee

#### **Malcolm Clive Smith**

Professor and Head of Control Group, University of Cambridge

#### **Michael Geoffrey Somekh**

Professor of Optical Engineering and Director of Institute of Biophysics, Imaging and Optical Science, University of Nottingham

**Hugh Spikes**

Senior Research Fellow, Imperial College London

**Austin Tate**

Professor of Knowledge-Based Systems, Director, Artificial Intelligence Applications Institute, and Coordinator of the Virtual University of Edinburgh (Vue) and Coordinator for Distance Education, School of Informatics, University of Edinburgh

**Richard P Whittington**

Director and Chief Strategy Officer, MooD International Limited

**Gareth Williams**

Vice President, Research and Technology Business Development and Partnerships, Airbus

**Paul Wrobel**

Chairman of the Membership Committee and Member of Executive and Council, Royal Institution of Naval Architects

**Eric Morgan Yeatman**

Professor of Microengineering and Deputy Head, Department of Electrical and Electronic Engineering, Imperial College London, and Chairman, Microsaic Systems plc

**Saeed Zahedi OBE**

Technical Director, Chas A Blatchford and Sons Ltd, and Visiting Professor, University of Surrey and University of Bournemouth

**INTERNATIONAL FELLOWS****Elected in 2012 were:****Tony Gibbs**

Secretary General, Council of Caribbean Engineering Organisations; Trustee and Board member of The Institution of Structural Engineers; Member of the Disaster Mitigation Advisory Group of PAHO (World Health Organisation)

**Shirley Ann Jackson**

President, Rensselaer Polytechnic Institute

**Allyson Lawless**

Director, Allyson Lawless and Associates (Pty) Ltd

**Michel Virlogeux**

Consultant

# Council

The Council – which held four ordinary meetings during the year – directs and manages the Academy and governs and controls its affairs, delegating as appropriate some of its functions to Standing Committees, each of which reports regularly to Council. As the Academy is a registered charity, the Officers and Members of Council fulfill the role of Trustees. As at 31 March 2013 the Council consisted of those listed below.

**OFFICERS AND MEMBERS OF COUNCIL**

President

**Sir John Parker GBE FREng**

Immediate Past President (ex officio)

**Lord Browne of Madingley FREng FRS**

Senior Vice President

**Professor Sir William Wakeham FREng**

Vice Presidents

**Professor H V Atkinson FREng**

**Professor B Cantor CBE FREng**

**Mrs D Mitchell FREng**

**Sir Christopher Snowden FREng FRS**

**Dr M Thomas CBE FREng**

Honorary Treasurer

**Mr I R Ritchie CBE FREng FRSE**

Hon Sec for International Activities

**Professor Sir William Wakeham FREng**

Hon Sec for Education and Training

**Professor H Atkinson FREng**

Ordinary Members

**Professor G A J Amaratunga FREng**

**Dr S E Bold FREng**

**Mrs C R Burke FREng**

**Professor B S Collins CB FREng**

**Dr P Golby CBE FREng**

**Professor P J Goodhew FREng**

**Mr S Howison FREng**

**Professor J N Loughhead OBE FREng**

**Dr M Lynch OBE FREng**

**Dr I D Nussey OBE FREng**

**Professor R Parry-Jones CBE FREng**

**Professor Sir David Payne CBE FREng FRS**

**Dr J Venables CBE FREng**

**Ms F Wainwright MBE FREng**

**Mr N Whitehead FREng**

Chair, Membership Committee

(ex officio)

**Dr J E Roberts CBE FREng**

Chair, Proactive Membership Committee

(ex officio)

**Rear Admiral N C F Guild CB FREng**

**IN ATTENDANCE**

Chief Executive

**Mr Philip Greenish CBE**

Director, Finance and Corporate Services

(Council Secretary)

**Mr Howard Beeston**

# Academy Standing Committees

## AWARDS COMMITTEE

The Awards Committee is responsible for identifying and recommending to Council appropriate candidates for all relevant prizes and awards, whether in the Academy's gift or not, with the exception of National Honours, the MacRobert Award and International Medal.

Chair:

**Mrs D Mitchell FREng**

Members:

**Dr R Buckingham FREng**  
**Professor C Christopoulos FREng**  
**Professor J Cilliers FREng**  
**Dr D A Clarke FREng**  
**Mr A M Kinghorn FREng**  
**Mr N J Perry FREng**  
**Professor W Powrie FREng**  
**Professor J M Reese FREng FRSE**  
**Mr J H Robinson FREng**  
**Professor S K Spurgeon FREng**  
**Professor J A Williams FREng**  
**Professor J C P Woodcock FREng**

Secretariat:

**Mr Philip Greenish CBE**

Committee Secretariat:

**Miss Sylvia Hampartumian**

## EDUCATION AND TRAINING COMMITTEE

The Education and Training Committee's role is to oversee and be responsible for the Academy's activities in engineering education and training and to maintain links with other bodies working in these fields.

Chair:

**Professor H V Atkinson FREng**

Members:

**Mrs J Bryant FREng**  
**Dr M J Cook FREng**  
**Professor J K Fidler FREng**  
**Mr J W Lazar FREng**  
**Professor J P K Seville FREng**  
**Professor H R Thomas FREng**  
**FRS FLSW**  
**Professor G R Tomlinson OBE FREng**  
**Ms F Wainwright MBE FREng**  
**Professor B L Weiss FREng**

Ex Officio:

**Professor N M Alford FREng**  
**Professor P J Goodhew FREng**  
**Dr S W Huntington FREng**  
**Professor Dame Julia King DBE FREng**

Committee Secretariat:

**Professor M Harrison**

## ENGINEERING POLICY COMMITTEE

The Engineering Policy Committee's role is to advise and be responsible to Council for the engineering policy of the Academy and for all matters concerned with the application of engineering knowledge and principles (other than education and training). It should identify, monitor and promote attention to emerging and generic issues of importance to engineering in pursuit of this role.

Chair:

**Sir Christopher Snowden FREng FRS**

Members:

**Professor P S Cannon FREng**  
**Professor S J Garwood FREng**  
**Professor G N Gilbert FREng**  
**Dr A Jamiesson OBE FREng**  
**Professor R J Kemp FREng**  
**Mr R H Maudslay CBE FREng**  
**Professor A G McNaughton FREng**  
**Professor A H Sherry FREng**  
**Dr M Short CBE FREng**  
**Mr I Shott CBE FREng**  
**Dr M Thomas CBE FREng**  
**Ms J M Wernick FREng**  
**Professor J D M Watson FREng**

Ex Officio:

**Professor L Tarassenko CBE FREng**

Committee Secretariat:

**Dr Natasha McCarthy**

## EXTERNAL AFFAIRS COMMITTEE

The role of the Committee is to provide strategic direction to the Academy's communications activities on behalf of the Council, with particular emphasis on ensuring the soundness of the Academy's reputation and on developing the Academy's profile. It oversees all aspects of the Academy's communications and public engagement activities, ensuring they are delivered in line with Royal Charter and business plan commitments.

Chair:

**Dr M Thomas CBE FREng**

Members (Fellows):

**Mr K Clarke CBE HonFREng**  
**Dr P Cochrane OBE FREng**  
**Dr D J Goodman OBE FREng**  
**Professor D A King FREng**  
**Dr G Masterton OBE FREng FRSE**  
**Professor J A Noble FREng**  
**Professor S Spurgeon FREng**  
**Dr S Steedman CBE FREng**  
**Mr D Waboso FREng**

Members (Non-Fellows):

**Mr J Greaves**  
**Dr R Highfield**  
**Sir Roland Jackson**  
**Ms L Shepherd**

Committee Secretariat:

**Miss Iffat Memon**

## FINANCE AND AUDIT COMMITTEE

The Finance and Audit Committee is responsible for all financial and auditorial affairs of the Royal Academy of Engineering. This includes management of Academy budgets, external investment fund managers, insurance policy, risk register, audit arrangements and compliance with external financial reporting standards.

Chair:

**Mr I C Ritchie CBE FREng FRSE**

Members:

**Dr S E Bold FREng**  
**Professor P J Goodhew FREng**  
**Professor Sir David Payne CBE FREng FRS**  
**Dr J Venables CBE FREng**  
**Mr N Whitehead FREng**

Committee Secretariat:

**Mr Howard Beeston**

## INTERNATIONAL COMMITTEE

The International Committee's role is to advise and be responsible to Council for promoting the international interests of the Academy. In pursuit of this role, the Committee's interests include oversight of the Academy's relations with the Council of Academies of Engineering and Technological Sciences (CAETS) and the European Council of Academies of Applied Sciences, Technologies and Engineering (Euro-CASE).

Chair:

**Professor Sir William Wakeham FREng**

Members:

**Mr T E A Askew FREng**  
**Professor I D L Bogle FREng**  
**Professor N P Brandon OBE FREng**  
**Professor B S Collins CB FREng**  
**Dr D G Cronin FREng**  
**Professor A J G Hey CBE FREng**  
**Professor J V McCanny CBE FREng FRS**  
**Professor A Neville FREng FRSE**  
**Professor R J Parker CBE FREng**  
**Professor Sir Martin Sweeting OBE FREng FRS**  
**Professor H S Wheeler FREng**

Committee Secretariat:

**Mr Shane McHugh**

## MEMBERSHIP COMMITTEE

The Membership Committee is responsible for considering candidates for election to the Royal Academy of Engineering and for submitting a list of not more than 60 names to Council for approval before each Annual General Meeting. Each of the five Members of the Committee chairs a Panel covering a specific area of expertise. These include:

**Panel 1** (Mechanical, aeronautical, marine and manufacturing engineering)

**Panel 2** (Civil, structural, public works and building services engineering)

**Panel 3** (Electrical, electronic, control engineering and computing)

**Panel 4** (Chemical, fuel, process, mining and materials engineering)

**Panel 5** (Informatics)

Chair:  
**Dr J E Roberts CBE FREng**

Ex Officio:  
**Sir John Parker GBE FREng**

Panel Chairs:  
**Panel 1**  
**Mr N Cooper FREng**

**Panel 2**  
**Professor T W Broyd FREng**

**Panel 3**  
**Sir Patrick Haren FREng**

**Panel 4**  
**Ms J Hackitt CBE FREng**

**Panel 5**  
**Mr M D Carr FREng**

Members:  
**Panel 1**  
**Mr C Burrows FREng**

**Professor P Cawley FREng FRS**  
**Professor S W Cameron MBE FREng**  
**Professor R J Godwin FREng**  
**Professor E Harkin-Jones FREng**  
**Vice Admiral Sir Andrew Mathews KCB FREng**  
**Professor J A McGeough FREng FRSE**

**Panel 2**  
**Dr M J Cook FREng**  
**Mr C M Eddie FREng**  
**Professor J W Hall FREng**  
**Mr N D Haste OBE FREng**  
**Ms M J McDowell MBE FREng**  
**Professor K Morgan FREng FLSW**  
**Professor W Powrie FREng**  
**Professor I H Townend FREng**

**Panel 3**  
**Mr D W A East FREng**  
**Professor H McCann FREng**  
**Professor S McLaughlin FREng FRSE**  
**Professor R I Muttram FREng**  
**Dr M Perkins FREng**  
**Dr F C Saunders CB FREng**  
**Professor T Wilson FREng**  
**Professor G Z Yang FREng**

**Panel 4**  
**Professor D J Bacon FREng**  
**Professor J Cilliers FREng**  
**Mr M J Goulette FREng**  
**Dr A Jamieson OBE FREng**  
**Professor T F Page FREng**  
**Professor N Titchener-Hooker FREng**  
**Dr C Wiesner FREng**

**Panel 5**  
**Professor A Bradley FREng**  
**Professor A Bundy CBE FREng FRSE FRS**  
**Dr D D Clevely CBE FREng**  
**Mr G N Hobbs FREng**  
**Mr N P Holt FREng**  
**Professor I Leslie FREng**  
**Professor S H Muggleton FREng**

Committee Secretariat:  
**Ms Jo Ryley**

## PROACTIVE MEMBERSHIP COMMITTEE

The Proactive Membership Committee is responsible for ensuring that the pool of candidates proposed for election as Fellows better reflects the society within which the Academy exists. Activities include identifying and tracking potential candidates from novel and overlooked areas, and engaging more existing Fellows in the process.

Chair:  
**Rear Admiral N C F Guild CB FREng**

Ex Officio:  
**Sir John Parker GBE FREng**

Members:  
**Mr K E Batchelor FREng**  
**Dr P A Bennett FREng**  
**Professor M C Forde FREng FRSE**  
**Dr R I Laming FREng**  
**Mr C Mairs FREng**  
**Professor G C Maitland FREng**  
**Mr D Oakervee CBE FREng**  
**Professor K Ridgway CBE FREng**  
**Mr I C Ritchie CBE FREng FRSE**  
**Mr A D Roche FREng**  
**Professor E Tanner FREng**  
**Professor A Unsworth FREng**  
**Professor B L Weiss FREng**

Committee Secretariat:  
**Dr Chris Coulter**

## RESEARCH AND SECONDMENTS SCHEMES COMMITTEE

The role of the Research and Secondment Schemes Committee is to advise and be responsible to Council for the supervision of research and secondment schemes other than those concerned with education and training.

Chair:  
**Professor B Cantor CBE FREng**

Members:  
**Professor J Fisher CBE FREng**  
**Professor P J Fryer FREng**  
**Professor C A Goble FREng**  
**Professor K T V Grattan FREng**  
**Dr A J Hosty FREng**  
**Mr S Howison FREng**  
**Professor A J Kinloch FREng FRS**  
**Professor I Leslie FREng**  
**Professor A J Sellen FREng**  
**Professor S M Springman CBE FREng**  
**Professor J D M Watson FREng**  
**Professor S Williamson FREng**  
**Professor P L Younger DL FREng**

Committee Secretariat:  
**Mr Robert Barrett**

## Awards

The Academy recognises excellence through the presentation of awards and medals. The Academy's wide range of awards covers every aspect of engineering.

**2012 MacRobert Award**  
The premier award for UK innovation in engineering, with a prize of £50,000. The award recognises the successful development of innovative ideas in engineering, together with commercial success and societal benefit.  
*Awarded to: Jaguar Land Rover for the Range Rover Evoque*

**2012 Prince Philip Medal**  
Awarded biennially to an engineer of any nationality who has made an exceptional contribution to engineering as a whole through practice, management or education.  
*Awarded to: Naeem Hussain, Global Bridge Design Practice Leader, Arup*

**2012 Major Projects Award**  
Recognises the contribution of an engineer who has led or played a critical role in a major engineering project that has substantial impact on society.  
*Awarded to: Sir John Armitt CBE FREng, Chairman, Olympic Delivery Authority*

**2012 Sir Frank Whittle Medal**  
Awarded to an engineer, normally resident in the UK, for outstanding and sustained achievement which has contributed to the wellbeing of the nation. The field of activity changes annually and in 2012 the medal was awarded for innovations in sports performance engineering.  
*Awarded to: Dan Chambers, Co-Founder and Director, Draft Wheelchairs Ltd*

**2012 Silver Medals**  
Awarded to individuals in recognition of outstanding and demonstrated personal contribution to British engineering which is resulting in successful market exploitation. Up to four medals may be awarded in any one year.  
*Awarded to: Suranga Chandratillake FREng, Chief Executive Officer, blinkx plc*

**Chris Hendy, Technical Director, Head of Bridge Design and Technology, Highways and Transportation, Atkins**

**Robert Salter, Design Authority for Falcon Communications System, BAE Systems, Defence Information**

**Professor Florin Udrea, Professor of Semiconductor Device Engineering,**

**University of Cambridge; Chief Executive Officer, Cambridge CMOS Sensors**

**2012 Rooke Medal for public promotion of engineering**  
Awarded to an individual, small team or organisation who has contributed to the Academy's aims and work through their initiative in promoting engineering to the public.  
*Awarded to: The Big Bang UK Young Scientists and Engineers Fair*

**2012 Sustained Achievement Award**  
Awarded to an engineer, normally resident in the UK, whose sustained achievements over a number of projects have had a profound impact upon their engineering discipline.  
*Awarded to: Professor Stephen Salter, Emeritus Professor of Engineering Design, University of Edinburgh*

**2012 Sir George Macfarlane Award**  
Awarded to younger engineers working in the UK, who have demonstrated excellence in the early stage of their career.  
*Awarded to: Dr Alessandra Carriero, Research Associate, Department of Bioengineering, Imperial College London*

**2012 ERA Foundation Entrepreneurs Award**  
The £40,000 award identifies entrepreneurial researchers, working in UK universities, in the field of electro-technology, who are at an early stage in their career. The award is presented to an individual or small team demonstrating considerable entrepreneurial promise and the potential to benefit the UK's future prosperity.  
*Awarded to: Dr Margaret Anne Craig, Chief Executive Officer, Clyde Biosciences; BBSRC/RSE Enterprise Fellow, University of Glasgow*

# Academy staff As at 3 June 2013

Chief Executive  
**Philip Greenish CBE**

## QUEEN ELIZABETH PRIZE FOR ENGINEERING

Director, QEPrize  
**Anji Hunter**

Deputy Director, QEPrize  
**Caroline Evans**

Projects Manager, QEPrize  
**Katya-yani Vyas**

## DEVELOPMENT

Director, Development  
**Sarah Philbrick**

Trusts Manager  
**Dominic Geyer**

Corporate Development Manager  
**Jon O'Neill**

## POLICY AND EXTERNAL AFFAIRS

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**Beverley Parkin**

Head of Communications and Engagement  
**Dr Lesley Paterson**

Manager, Communications  
**Jane Sutton**

Press and Communications Officer  
**Sarah Griffiths**

Assistant Manager, Public Engagement  
**Manisha Laloo**

Manager, Public Affairs  
**Iffat Memon**

Publications and Web Editor  
**Dominic Joyeux**

Copy Editor for Print and Web  
**Emily Bick**

Head of Events  
**Graham Blair**

Events Manager  
**Helen Berrington**

Events Assistant  
**Selina Chan**

Head of Engineering Policy  
**Dr Natasha McCarthy**

Senior Policy Advisors  
**Dr Alan Walker**  
**Richard Ploszek**

Policy Advisors  
**Sahar Danesh**

**Katherine MacGregor**  
**Philippa Shelton**

## PROGRAMMES AND FELLOWSHIP

Director, Programmes and Fellowship  
**Dr Hayaatun Sillem**

Head of International Activities  
**Shane McHugh**

Assistant Manager, International  
**Catherine Lawrence**

Assistant Manager, International  
**Cuong Dang**

International Policy Advisor  
**Mark Caine**

International Assistant  
**Eleanor Hood**

Head of Research Programmes  
**Robert Barrett**

Assistant Managers, Research Programmes  
**Angus Baker**

**Tapsi Khambra**  
**Katie Melton**

Fellowship Manager  
**Dr Chris Coulter**

Membership Manager  
**Jo Ryley**

Membership Administrator/Librarian  
**Hema Lingham**

Awards Manager  
**Sylvia Hampartumian**

Head of Professional Formation  
**Dr Mark Bambury**

Senior Administrator, Professional Formation  
**Pauline Stillman**

Senior Administrator, Education Programmes  
**Eunice Hung**

Administrative Assistant, Education Programmes  
**Joanne Page**

Administrative Assistant, Professional Formation  
**Anne Mahabal**

Administrative Assistant, Professional Formation  
**Anne Mahabal**

**Anne Mahabal**

## ENGINEERING AND EDUCATION

Director, Engineering and Education  
**Matthew Harrison**

Head of 5-19 Education  
**Lynda Mann**

Manager, Education and Skills Policy PEF  
**Dr Rhys Morgan**

Manager, Engineering Policy PEF  
**Thomas Man**

STEM Subject Specialist  
**Miriam Chaplin**

Head of Further and Higher Education  
**Stylli Charalampous**

Manager, STEM Curricula  
**Dominic Nolan**

Manager, Diversity  
**Jenny Young**  
**Bola Fatimilehin**

## FINANCE AND CORPORATE SERVICES

Director, Finance and Corporate Services  
**Howard Beeston**

Head of Finance  
**Lisa Kiew**

Finance Assistant  
**Sanjay Jethwa**

Finance Assistant  
**Michelle Lai**

Finance Assistant  
**Nazia Malik**

Head of Executive Services  
**Kim Turner**

Executive Assistants  
**Karen Childe**  
**Alyx Clarke**

Senior Administrator  
**Christine Dowling**

Head of IT  
**Hakan Altinisik**

IT and Web Officer  
**Kadir Goksen**

Lead Web Developer  
**Syed Adeel**

Facilities Manager  
**Nigel Palmer**

AV and Web Administrator  
**Barry Weekes**

Receptionist  
**Paul Morant**

**Paul Morant**

# Grants, fellowships and programmes

## INGENIOUS PUBLIC ENGAGEMENT AWARDS ROUND 7 AWARDS

*Ingenious* provides funding for projects that enable engineers to enhance their public engagement skills, consider the societal implications of their work and take part in debate with the public on engineering and its impact on society.

Awardee	Organisation	Project title
Niri Arambepola	Structurally found	Structurally found
Professor John Clarkson FREng	University of Cambridge	Designing our tomorrow (DOT) – using authentic problems to improve engagement
Dr João Fonseca	The School of Materials, The University of Manchester	The LATEST2 ultimate car challenge
Kevin Forshaw	University of Southampton	Marine engineering connections
Dr Simon Gage	Edinburgh International Science Festival	Mini Maker Faire
Philip Garsed	Corpus Christi College, University of Cambridge	Cambridge hands-on science (CHaOS) summer science roadshow 2013
Professor Stephanie Glendinning	University of Newcastle	Decision theatre for creative engagement
Professor Rex Harris FREng	School of Metallurgy and Materials, University of Birmingham	The Protium Project: hydrogen, magnets, sustainability, and industrial heritage: the Ross Barlow canal boat
Dr Mark Haw	Department of Chemical and Process Engineering, University of Strathclyde	Bionanoengineering: or how molecules make me and you
Dr Joanna Heaton-Marriott	University of Central Lancashire	HeroLab: engineer your own superhero
Dr Caspar Hewett	The Great Debate	ETUDE: engineering transmission using deliberative events
Colette Hiller	Sing London	How British engineering changed the world (as part of The Travelling Museum of British Invention)
Emma Kench-Porter	Northern Architecture	BRIDGE: engineering education
Dr Fiona Larner	Space Science and Engineering Foundation	UK space settlement design competition
Mónica Lobo	British Science Association	Engineers: engage!
Dr Elizabeth Miles	Coventry University	The global humanitarian engineering workshops
Katy Nehammer	At-Bristol	Take Off! – design your own helicopter special theme day
Maggie Philbin	TeenTech CIC	TeenTech CIC – engineers upfront
Wendy Sadler	science made simple	Making the future
Dr Sara Santos	Maths Busking	<i>Ingenious</i> busking
Dr David Standingford	Zenotech Ltd	SPEED – schools project: e-engineering for design
Wendy Stern	Action For Involvement	Engineering – reaching out and out on the street
Gregory Watson	Children's Radio UK Ltd	Inspiring engineering!
Professor Paul Williams	University of Leeds	Dreams of a low carbon future

## RESEARCH CHAIRS

Research Chairs and Senior Research Fellowships provide funding, together with industry and other research organisations, to support strategically important research in UK universities. The Academy provides funding, initially for a period of five years.

Name	Co-sponsor	Subject	University
Professor G Aglietti	Surrey Satellite Technology/ EADS Astrium	Space engineering	Surrey
Professor R Akid	BP	Corrosion and materials	Manchester
Professor J Andrews	Network Rail	Infrastructure asset management	Nottingham
Professor A Ayoub	Pell Frischmann	Nuclear infrastructure engineering	City
Professor S Biggs	National Nuclear Laboratory	Particle science and technology	Leeds
Dr L Bisby	Ove Arup Foundation	Structures and fire	Edinburgh
Professor R Butler	GKN Composites	Composites manufacturing	Bath
Dr J Carrotte	Rolls-Royce	Next generation gas-turbine combustion system aerothermal processes	Loughborough
Professor J Cooper	Airbus	Integrated design of advanced novel wing architectures	Bristol
Professor C Dickerson	BAE Systems	Systems engineering	Loughborough
Professor J Everard	BAE Systems	Low phase noise signal generation	York
Professor B Falzon	Bombardier	Aerospace composites	Queen's University Belfast
Professor A Forsyth	Rolls-Royce	Electrical systems for extreme environments	Manchester
Professor C Garner	Perkins Engines/Caterpillar	Applied thermodynamics	Loughborough
Professor A Gibb	European Construction Institute	Management of complex projects	Loughborough
Professor H Griffiths FREng	Thales UK	Radio frequency sensor systems	University College London
Professor S Grimes	SITA	Environmental waste management	Imperial College
Professor L He	Rolls-Royce	Computational aerothermal engineering	Oxford
Professor I Hunter	Radio Design Limited	Microwave signal processing	Leeds
Professor N Hyatt	National Nuclear Laboratory	Nuclear waste immobilisation science and engineering	Sheffield
Professor S Madathil	Rolls-Royce	Power electronic systems	Sheffield
Professor P Mawby	Convertteam	Power electronics	Warwick
Professor J Miles	Arup	Energy transitions	Cambridge
Professor J Moore	Bagrit Trust	Medical devices	Imperial College

Name	Co-sponsor	Subject	University
Professor B Mulgrew FREng	SELEX Galileo	Multi-sensor signal processing	Edinburgh
Professor A Neely	IBM/BAE Systems	Complex engineering services	Cambridge
Professor K Nikbin	EDF Energy	Structural integrity assessment	Imperial College
Professor P O'Hearn	Microsoft Research	Logic software verification	University College London
Professor S Seetheraman	TATA Steel	Low carbon technologies	Warwick
Professor A Sheno	Lloyd's Register Educational Trust	Lightweight structures	Southampton
Professor S Sherwin	McLaren Racing	Transient flow simulation for advanced race and road cars	Imperial College
Professor D Smith	Rolls-Royce	Structural performance of energy systems	Bristol
Professor N Thornhill FREng	ABB	Process automation	Imperial College
Professor P Webb	Airbus	Aerostructures design for assembly and systems installation	Cranfield
Professor A Ziolkowski	PGS Geophysical	Petroleum geoscience	Edinburgh
Professor Zi-Qiang Zhu	Siemens Wind Energy	High efficiency and power density wind power generating systems	Sheffield
Appointment Pending	Bragg/Infineum	Advanced structural and chemical analysis of engineering material	Leeds
Appointment Pending	Laing O'Rourke	Construction automation	Oxford
Appointment Pending	SELEX Galileo	<b>Laser devices and engineering</b>	Heriot Watt

## RESEARCH CHAIRS IN EMERGING TECHNOLOGIES

The Chair allows recipients to develop an area of early-stage research into a new technology to the extent that it engages the wider research community, and subsequently can be taken forward by industry.

Name	Subject	University
Professor A Neville FRSE FREng	Bioinspiration for functional surface design	Leeds
Professor J O'Brien	Photonic quantum ICT	Bristol

## SENIOR RESEARCH FELLOWSHIPS

The Senior Research Fellowships (SRFs) scheme provides funding for senior lecturer/reader level appointments. Like Research Chairs, SRFs are funded jointly with industry for a period of five years.

Name	Co-sponsor	Subject	University
Dr C Gerada	Cummins Generator Technologies	Electrical machine technology	Nottingham
Dr B Grieve	Syngenta	Biosensors and remote detection	Manchester
Dr N Hills	Rolls-Royce	Computational engineering	Surrey
Dr L Iannucci	Dstl	Multiscale composite armour design	Imperial College
Dr S Neethling	Rio Tinto	Heap and in-situ leaching	Imperial College
Dr R Qin	TATA Steel	Steel research	Imperial College
dr mc schraefel	Microsoft Research	Supporting work in progress for innovation and discovery	Southampton
Dr G Spinardi	Ove Arup Foundation	Integrating technical and social aspects of fire safety engineering	Edinburgh
Dr S Vijayakumar	Microsoft Research	Learning robotics	Edinburgh

## LEVERHULME TRUST SENIOR RESEARCH FELLOWSHIPS

These Fellowships provide mid-career engineers working in UK academic institutions with the opportunity to focus on research activities for a period of up to 12 months with their academic and administrative responsibilities being taken over by an early-career academic.

Name	Project title	University
Dr Panagiota Angeli	Ionic liquids for intensifying nuclear fuel separations	University College London
Dr Li Bai	Computational studies of neurovascular pathways to neurodegeneration	Nottingham
Dr Atul Bhaskar	Local effects in the statics and dynamics of random cellular material	Southampton
Dr Steve Burrow	Energy harvesting for wireless sensors in turbulent flows	Bristol
Dr Damien Coyle	Assessing the neural correlates of motor learning and control: towards adaptive brain-computer interfaces for assistance and rehabilitation	Ulster
Dr Alexandro Feresidis	THz reconfigurable antennas for communication and imaging systems	Birmingham
Dr Henrik Gollee	Abdominal stimulation technology to enhance respiratory performance and maximise health benefits in tetraplegia	Glasgow
Dr Julie Gough	Magnesium alloys for orthopaedic applications	Manchester
Dr Paul Grassia	Rheology and dewatering of sheared suspensions	Manchester

Name	Project title	University
Dr Gillian Menzies	An optimisation model for pre-construction embodied carbon auditing in the built environment: an energy, carbon and monetary cost model	Heriot-Watt
Dr David McPhail	Surface and interface analysis in materials engineering using TOF SIMS, FIB SIMS and LEIS	Imperial College
Dr Geoff Moggridge	Engineering anisotropic polymer nano-composites for improved prosthetic heart valves	Cambridge
Professor Pagona Papakonstantinou	Doped graphene: new generation cathode materials for fuel cells	Ulster
Dr Nick Pears	3D face modelling for surgical planning, guidance and assessment	York
Dr Lev Sarkisov	Computer simulation of adsorption in flexible and stimuli responsive metal-organic frameworks	Edinburgh
Dr Wendel Sebastian	An intelligent computational approach to determine advanced composite strengthening for sustainable concrete structures	Bristol
Dr Helen Treharne	Formal modelling technology for the analysis of European rail traffic management systems	Surrey
Dr Pieter de Wilde	Simulated and measured building performance: bridging the gap	Plymouth
Dr Rachel Williams	A cross-disciplinary approach to address vision loss - development of bioengineering for ocular surface and retinal disease	Liverpool
Dr Dagou Zeze	Nanoscale characterisation and integration platform for nanowires	Durham
Dr Yonghao Zhang	A platform for enabling highly automated and integrated microdroplet technologies	Strathclyde

## DAPHNE JACKSON TRUST FELLOWSHIPS

These Fellowships enable engineers to return to work following a career break.

Name	Subject	University
Dr H Cornwell	Estimating the through-life-in-service costs for long-life high value assets in the water industry	Bath
Dr N Dube	Characterisation of organic solar cells	Imperial College
Dr R Ward	Greenhouse: decarbonising the Royal Botanical Gardens, Kew	Cambridge



## RAENG/EPSRC RESEARCH FELLOWSHIPS

These Fellowships, which are funded jointly with the EPSRC, are aimed at outstanding researchers from all branches of engineering who are about to finish their PhDs or have up to three years' post-doctoral experience.

Name	Subject	University
Dr S Arafat	Foundations research in information retrieval inspired by quantum theory	Glasgow
Dr H Bridle	Biosensors in engineering: from in situ pathogen detection to global impacts	Heriot-Watt
Dr T Butlin	Modelling the vibration of complex structures with localised non-linearities	Cambridge
Dr M Cataluna	Compact and ultra-versatile lasers based on quantum-dot materials	Dundee
Dr D Clark	Random-set filtering techniques for multi-sensor multi-object tracking and data fusion	Heriot-Watt
Dr R Cobley	Pushing forward scanning probe techniques to meet the new challenges of optoelectronics and nanotechnology	Swansea
Dr D Cosker	Exploiting 4D data for creating next generation facial modelling and animation techniques	Bath
Dr S Cotton	Next generation body-centric communications: a joint analytical-statistical approach to modelling quasi-cyclostationary anisotropic signal reception	Queen's University Belfast
Professor D Distefano	Software model checking with separation logic	Queen Mary, University of London
Dr C Dubach	Adaptable processor architecture and software for energy-efficient computing	Edinburgh
Dr M Eaton	Integrating design and uncertainty within a common modelling framework: applications to nuclear engineering	Imperial College
Dr H El Mubarek	Point defects engineering: a new method of dopant diffusion suppression in semiconductors	Manchester
Dr F Fazi	Electroacoustical inverse problems	Southampton
Dr M Galano	Development of aluminium metal matrix complex nanocomposites for high strength applications	Oxford
Dr C Gourlay	The granular rheology of partially solidified alloys and defect formation in advanced metal casting processes	Queen's University Belfast
Dr D Gunning	Neural interfaces for studying cortical processes	Strathclyde
Dr R Hatton	Hybrid nano-structured electrodes for organic photovoltaics	Warwick
Dr I Hernandez	Halogenated organic mixed lanthanide and transition metal ion complexes for infrared opto-electronic devices	Queen Mary, University of London
Dr M Himsworth	Atom-chip integration for quantum-enabled devices	Southampton
Dr T Jones	Power-aware compilation in a multi-core era	Cambridge
Dr V Lazarov	Polar oxide interfaces: from fundamentals to spintronic applications	York

Name	Subject	University
Dr H Leather	Optimising the mobile net	Edinburgh
Dr I Lestas	Analysis of complex heterogeneous networks: scalability, robustness and fundamental limitations	Cambridge
Dr A Marshall	Exploiting emerging interface misfit epitaxy to engineer cheaper, higher performance photodiodes for imaging, communications and gas monitoring	Lancaster
Dr D Mattia	Nanoparticle factory-on-a-chip	Bath
Dr M McLachlan	Three-dimensional nanosphere templating: a novel method for the preparation of nanostructured photovoltaics	Imperial College
Dr J Murphy	Improved multi-crystalline silicon for solar cell applications	Warwick
Dr S Neale	Micro-actuators controlled by optoelectronic tweezers (MACOET)	Glasgow
Dr F Parmigiani	Optical processing of high spectral efficiency phase encoded signals for future generation optical networks	Southampton
Dr A Peacock	Fiberised semiconductor devices: a new platform for nonlinear photonics and applications	Southampton
Dr N Rinetzky	Disciplined concurrent programming for verification	Queen Mary, University of London
Dr A Robertson	Intelligent interactive musical performance systems	Queen Mary, University of London
Professor R Sandberg	Numerical investigation of the hydrodynamic and acoustic fields of compressible axisymmetric flows	Southampton
Dr S Schievano	FEM before FIM - finite element modelling prior to first-in-man in heart valve technology	University College London
Dr A Shitvov	Distributed passive intermodulation phenomena in microwave circuits	Queen's University Belfast
Dr A Sobester	Towards the 21st century 'Whisper-Jet' - a machine learning approach to design for fan noise deflection	Southampton
Dr S Speller	Superconducting metamaterials for near field NMR microscopy applications	Oxford
Dr D Stoyanov	Real-time intra-operative navigation for robotic assisted minimally invasive surgery	University College London
Dr M Tassieri	Rheology at the microscale: new tools for bio-analysis	Glasgow
Dr K Tsakmakidis	Ultraslow and stopped light in metamaterials	Imperial College
Dr K Webb	Optical stimulation for the long-term control and monitoring of neural network activity	Nottingham
Dr A Wright	New horizons in adaptive optics for life science research: adaptive microscopy	Strathclyde
Dr S Zhou	Statistical topological studies on large-scale complex communication networks	University College London

## 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, aims to strengthen relations between leading partners in these countries, and supports the expansion of international networks of excellence, offering funding (to cover travel, accommodation and subsistence) for projects of 3-12 months.

### RESEARCH EXCHANGES WITH CHINA/INDIA AWARDS

UK Academic	Chinese/Indian Academic	Project
Professor David Butler (University of Exeter)	Dr Xingzhang Luo (Fudan University)	Integrated water quality management in a mixed rural and urban catchment
Professor Robert Field (University of Oxford)	Professor Kaisong Zhang (Institute of Urban Environment, Chinese Academy of Sciences)	Biofilm control: developing the role of nano-silver and the modelling of biofilm development
Professor John Gough (University of Aberystwyth)	Dr Guofeng Zhang (Hong Kong Polytechnic University)	Multi-photon state processing and signal estimation for linear quantum optical systems
Professor Bhushan Karihaloo (Cardiff University)	Dr Vidya Sagar Remalli (Indian Institute of Science)	Virtual testing of high performance fibre-reinforced concrete structures by lattice modelling
Professor Peter Lee (University of Manchester)	Dr Zhipeng Guo (Tsinghua University)	Engineering a new generation of magnesium alloys via combined in situ synchrotron observation and numerical modelling of precipitate nucleation and growth dynamics
Professor Arokia Nathan (University of Cambridge)	Dr Mingzhi Dai (Ningbo Institute of Material Technology and Engineering, Chinese Academy of Sciences)	Carbon nanotube-based TFTs modelling, processing and designing
Dr Vinayagamorthy Sivakumar (Queen's University Belfast)	Dr Nihar Ranjan Patra (Indian Institute of Technology Kanpur)	Behaviour of compacted fills used for engineering applications
Dr Wanqing Tu (Nottingham Trent University)	Professor Qian Zhang (Hong Kong University of Science and Technology)	Multimedia multicasting in cognitive radiomesh networks
Dr Jun Wang (UCL)	Professor Xiaofan Wang (Shanghai Jiao Tong University)	Continuous-time information retrieval modelling: a control-theoretic approach
Dr Jinghao Xue (UCL)	Professor Weichaun Yu (Hong Kong University of Science and Technology)	Stability of marker selection for ultra high dimensional data
Dr Huiling Zhu (University of Kent)	Professor Lin Dai (City University of Hong Kong)	Energy-efficient radio resource allocation for broadband wireless video transmissions

## RAENG RESEARCH FELLOWSHIPS

These Fellowships are aimed at outstanding researchers from all branches of engineering who are about to finish their PhDs or have up to three years' postdoctoral experience.

Name	Subject	University
Dr M Ainslie	Engineering interactions of magnetic and superconducting materials for electrical applications	Cambridge
Dr M Azarpeyvand	Source and propagation modelling for wind turbine and turbomachinery noise	Cambridge
Dr P Carrington	High-efficiency mid-infrared semiconductor materials and devices grown on silicon	Lancaster
Dr A Clark	Plasmon enhanced pyroelectrodynamical nanoscale trapping and sensing	Glasgow
Dr C Fensch	Auto-tuned programming patterns and the programmability gap	Edinburgh
Dr P Gammon	Novel interlayer cooling for harsh environment (NICHE) devices and circuitry	Warwick
Dr T Hasan	Graphlex: fully flexible graphene-based transparent conductors	Cambridge
Dr M Kersaudy-Kerhoas	Towards better pregnancy monitoring: miniaturised tools for non-invasive prenatal diagnosis in clinics and hospitals	Heriot-Watt
Dr E Laird	Quantum computing devices based on carbon nanomaterials	Oxford
Dr G Loukides	Privacy protection in event-based data sharing and analysis	Cardiff
Dr M Lucquiaud	Future-proofing fossil power stations with CO <sub>2</sub> capture	Edinburgh
Dr C Masouros	Interference as a source of green signal energy in wireless communications	University College London
Dr M Mauch	Software systems for computer-aided music understanding	Queen Mary, University of London
Dr R Misener	Towards rational chemotherapy strategies: a hybrid computational/experimental approach	Imperial College
Dr M Moazen	Predicting skull growth in craniosynostosis for improved surgical treatment	Hull
Dr A Perruzo	Quantum processors for quantum chemical engineering	Bristol
Dr P Shearing	4-Dimensional tomography of electrochemical devices	University College London
Dr R Sporea	Novel high performance transistors for use in large area electronics	Surrey
Dr N Tzevelekos	Game semantics for program analysis	Queen Mary, University of London

## RAENG/MINISTRY OF DEFENCE RESEARCH FELLOWSHIP

This Fellowship offers an innovative engineer opportunities to work with research, development and modelling teams within the Defence Science and Technology Laboratory and some of the Laboratory's industrial and academic partners.

Name	Subject	University
Dr Benjamin Russell	Energy mitigation in blast and impact loading	Cambridge

## GLOBAL RESEARCH AWARDS

This scheme enables engineers to spend up to one year working at overseas organisations that are leading the development of new or enhanced technology, or conducting engineering research not currently pursued in the UK.

Award holders current during the year.

Award holder	University	Subject	Host(s)
Professor S Burgess	Bristol	Biologically inspired mechanisms for autonomous robotic vehicles	Liberty University, USA
Dr A Clark	University of the West of England, Bristol	Industrial extensions to production planning and scheduling	Universidade Federal de São Carlos, Brazil and Universidade Federal de São Paulo, Brazil
Dr P Harrison	Glasgow	Forming of tailored thermoplastic composites	Institute of Mechanical Engineering and Industrial Management, Portugal
Dr K Sefiane	Edinburgh	Energy transport during evaporation and wetting phenomena: use of statistical rate theory (SRT) and adsorption x-isotherm	Toronto University, Canada
Dr M Smith	EDF Energy	Synthesising residual stress measurement and modelling for welds	Australian Nuclear Science and Technology Corporation (ANSTO)
Dr S Taylor	Queen's University Belfast	Structural health monitoring of FlexiArch under seismic loading using optical sensors	University of California, Irvine and University of California, San Diego, USA
Dr J Wu	Durham	Age and vision: combating sight loss	MIT and Texas A&M University, USA
Professor F Zheng	Reading	Relay transmission in cellular networks: its impact on energy efficiency	Georgia Institute of Technology, USA

## ENTERPRISE FELLOWSHIPS

Enterprise Fellowships provide funding and support to outstanding entrepreneurial researchers, working at a UK university, to enable them to spend 12 months developing the commercial potential of their research.

Name	Project title	University
Dr Neil Buchanan	Flish - the flat satellite dish	Queen's University Belfast

Name	Project title	University
Dr Susannah Clarke	Low-cost, high-accuracy surgical instrumentation for acetabular cup alignment	Imperial College
Dr Daniel Elford	Novel noise barrier technology	Loughborough
Dr Damian Gardiner	Commercialisation of magneto immuno-assay technology for food safety testing	Cambridge
Dr Ruchi Gupta	Printable lasers for anti-counterfeit applications	Manchester
Professor Janice Kiely	A novel optical system for label-free assays	University of the West of England
Dr Peter Kollensperger	A diagnostic test platform for clinical use and home monitoring	Imperial College
Dr Adar Pelah	Asuuta: medical and consumer technology for gait analysis, rehabilitation and training	York
Dr Joshua Reiss	Automatic music production system	Queen Mary, University of London
Dr Steve Smith	Diagnosing, differentiating and monitoring neurodegenerative diseases	York
Professor Rhodri Williams	New test for early detection of blood clotting abnormalities	Swansea

## DISTINGUISHED VISITING FELLOWSHIPS

The Distinguished Visiting Fellowship scheme provides funding to enable an academic engineering department in a UK university to be a host for up to a month to a Distinguished Visiting Fellow from an overseas academic centre of excellence, and to engage the fellow in a range of mutually beneficial activities. The scheme aims to promote sharing of the latest developments and allow the participating organisations to discover common and complementary skills and initiatives that could form the foundation for future collaborations, thereby strengthening UK capacity and international standing.

Award holder	Distinguished Visitor	Area of collaboration
Professor Simon Blackmore (Harper Adams University College)	Professor Noboru Noguchi (Hokkaido University, Japan)	Development of 3rd generation of agricultural robots
Professor Joao Cabral (Imperial College London)	Dr Jack Douglas (National Institute of Standards and Technology, USA)	Engineering polymer and nanocomposite glasses
Dr Isaac Chang (University of Birmingham)	Professor Jianzhong Jiang (Zhejiang University, China)	Bulk metallic glasses: a new class of tooling material for micro and nanofabrication applications
Dr Philip Davies (Aston University)	Dr Sadhan Kumar Ghosh (Javadpur University, India)	Energy recovery from municipal solid waste
Dr Karl Dearn (University of Birmingham)	Professor Xianguo Hu (Hefei University of Technology, China)	Tribological analysis of fuel quality and the effect on fuel injection equipment
Dr Leroy Gardner (Imperial College London)	Professor Xiao-Ling Zhao (Monash University, Australia)	Stainless steel and high strength steel subject to impact and blast loading
Professor Igor Guz (University of Aberdeen)	Professor Dr.-Ing. Habil Reinhold Kienzler (University of Bremen, Germany)	Consistent theories for nanoreinforced anisotropic plates and shells
Professor Edwin Hancock (University of York)	Professor Horst Bunke (University of Bern, Switzerland)	Scaling structural pattern recognition to the complex network domain
Dr Anthony Kenyon (UCL)	Professor Enrique Miranda (Universitat Autònoma de Barcelona, Spain)	Resistive switching in silicon-rich oxide films for future memory devices

Award holder	Distinguished Visitor	Area of collaboration
Dr Farbod Khoshnoud (University of Hertfordshire)	Professor Clarence De Silva (University of British Columbia, Canada)	Energy harvesting and biologically inspired design of dynamic systems
Professor Ross King (University of Manchester)	Ashwin Srinivasan (South Asia University, India)	Improved drug design methods for neglected tropical diseases
Professor Konstantinos Kontis (University of Manchester)	Professor Subrata Roy (University of Florida, USA)	Joint studies on plasma flow technologies for low speed separation control and drag reduction
Professor Kin Leung (Imperial College London)	Professor Vincent Poor (Princeton University, USA)	Security and privacy in wireless networking
Dr Georges Limbert (University of Southampton)	Professor Amit Gefen (Tel Aviv University, Israel)	Multiphysics modelling of skin microclimate in relation to pressure ulcers
Professor Epaminondas Mastorakos (University of Cambridge)	Professor Clinton Groth (University of Toronto, Canada)	Development of adaptive mesh refinement (AMR) techniques for gas turbine combustion simulations
Professor Geyong Min (University of Bradford)	Professor Albert Y Zomaya (University of Sydney, Australia)	Performance modelling and optimization of interconnection networks in multimedia cloud computing systems
Dr Dmitry Nerukh (Aston University)	Professor Makoto Taiji (RIKEN, Japan)	High performance special purpose computers for scientific simulations: crossing the boundaries between atomistic and continuum representation of liquid systems
Professor Dimitrios Nikolopoulos (Queen's University Belfast)	Professor Nikos Chrisochoides (Old Dominion University, USA)	Exascale mesh generation runtime systems for medical imaging
Professor Li Ran (University of Warwick)	Professor James Kirtley (Massachusetts Institute of Technology, USA)	Design and operation of future electrical power systems
Professor Sarah Spurgeon FREng (University of Kent)	Professor Bijnan Bandyopadhyay (Indian Institute of Technology, India)	Robust finite time control of autonomous systems
Dr Junwang Tang (UCL)	Dr Michael Hoffmann (California Institute of Technology, USA)	Solar fuel synthesis
Professor Sergei Turitsyn (Aston University)	Professor Leonid A Melnikov (State Technical University, Russia)	A new high-precision rotating sensing technology based on ultra-long ring-cavity fibre laser
Professor Jiangzhou Wang (University of Kent)	Professor Jing Wang (Tsinghua University, China)	Present and future in wireless mobile communications in China
Professor Alexander L Wolf (Imperial College London)	Professor Hai Zhuge (Institute of Computing Technology, Chinese Academy of Sciences, China)	Measurability of cyber-physical-socio systems
Dr Haitao Ye (Aston University)	Professor Jun Sun (Xi'an Jiaotong University, China)	Diamond strain sensors for harsh, high temperature environments
Professor Zi-Qiang Zhu (University of Sheffield)	Professor Thomas Jahns (University of Wisconsin-Madison, USA)	Novel permanent magnet machines and power electronics for electric vehicles
Dr Huiling Zhu (University of Kent)	Professor Aiqun Hu (Southeast University, China)	Advances in information security for broadband mobile communication
Dr Qing-Chang Zhong (University of Sheffield)	Professor Miroslav Krstic (University of California, San Diego (UCSD), USA)	Robust control of systems with delays and control applications in energy systems

## INDUSTRIAL SECONDMENTS SCHEME

This scheme facilitates knowledge transfer between engineering academia and UK industry by providing engineering academic staff exposure to industrial and commercial practice.

Name	University	Project title	Host
Mr Mike Anusas	Strathclyde	Product design engineering: advanced techniques in creative form generation	4c Design
Dr Victor Becerra	Reading	Optimisation tools for gasoline engine temperature model estimation and throttle control	Ford Motor Company
Dr Nick Bryan-Kinns	Queen Mary, University of London	Tools for low-cost evaluation of mobile and social user experiences	Togeva
Professor Matt Clark	Nottingham	Applications of advanced NDE/T techniques to aeroengine components	Rolls-Royce
Dr Ian Cotton	Manchester	Re-wiring the nation	National Grid
Dr James Covington	Warwick	Design to commercialisation of a new generation of gas sensors	Alphasense
Dr Robin Curtis	Manchester	Measurements of protein-protein interactions in formulation science	MedImmune
Dr Giuseppina Di Lorenzo	Cranfield	Clean, efficient gas turbine power plants for today and tomorrow	E.ON New Build and Technology
Dr Stuart Edwards	Newcastle	Offshore surveying: enhancing the student experience	Fugro UK
Professor Mojtaba Ghadiri	Leeds	Industrial challenges in particle technology	Proctor and Gamble
Dr Patrick Harkness	Glasgow	AEOLDOS - development to TRL 6	Clyde Space
Dr Tim Katz	Brighton	Developing a new medical instrument from concept to the market	GB Electronics
Dr Jongrae Kim	Glasgow	Robustness analysis of spacecraft altitude control systems	Clyde Space
Dr Roger Lewis	Sheffield	Advanced materials for traction enhancement	LB Foster Friction Management
Dr Chau Man-chun	Kingston	Hybrid buses in London: monitoring and improving their performance	Abellio London
Dr Sundar Marimuthu	Loughborough	Numerical and experimental investigation of the laser drilling process	Manufacturing Technology Centre (MTC)
Dr Arnaud Marmier	Exeter	Cardboard surfboards: design and manufacture	Smurfit Kappa Barnstaple
Dr Carolina Mateo-Segura	Heriot-Watt	Radiation protection of wideband active electronically scanned arrays	SELEX Galileo
Dr Donal McNally	Nottingham	Additive manufacture of spinal implants	3T RPD

Name	University	Project title	Host
Professor Stephen Morgan	Nottingham	Skin imaging and sensing	Alliance Boots
Dr Sreejith Nanukuttan	Queen's University Belfast	Development of performance focused maintenance management strategies for concrete structures	Roads Service, Department of Regional Development, Northern Ireland
Dr Tom Rendall	Bristol	Setting aerodynamics education in industrial context	Airbus
Dr Daniela Romano	Sheffield	Applications of agent-based modelling	COSTAIN Group
Dr Andrea Szymkowiak	Abertay Dundee	The application of human-like agents in self-service technology	NCR Financial Solutions Group
Dr Alan Wood	York	Cloud computing in the computer science curriculum	IBM

#### VISITING PROFESSORS IN PRINCIPLES OF ENGINEERING DESIGN

This initiative remains one of the Academy's flagship schemes and is a pioneer in the field of experience-led engineering education.

##### During 2012-13 the scheme operated at the following universities:

Aston University; University of Bradford; University of Bristol; Brunel University; University of Cambridge; City University; Coventry University; Cranfield University; De Montfort University; University of Derby; University of Dundee; University of Durham; University of Hertfordshire; University of Hull; Kingston University; University of Leeds; University of Leicester; University of Liverpool; Loughborough University; University of Manchester; University of Newcastle; University of Nottingham; Open University; University of Oxford; University of Plymouth; Queen Mary, University of London; Queen's University Belfast; University of Salford; University of Sheffield; University of Southampton; University of Strathclyde; University of Surrey; University of Sussex; University College London and University of Warwick.

#### VISITING PROFESSORS IN ENGINEERING DESIGN FOR SUSTAINABLE ENVIRONMENT

This scheme promotes the integration of sustainable development into the engineering curriculum in universities.

##### During 2012-13 the scheme operated at the following universities:

University of Bath; University of Birmingham; University of Bournemouth; University of Bradford; University of Brighton; University of Cardiff; University of Edinburgh; University of Leeds; University of Liverpool; University of Newcastle and Queen's University Belfast.

#### VISITING PROFESSORS IN INTEGRATED SYSTEMS DESIGN

This scheme promotes the understanding of integrated systems design in undergraduate engineering courses.

##### During 2012-13 the scheme operated at the following universities:

Aston University; University of Bath; University of Bradford; University of Bristol; Brunel University; University of Cambridge; City University; Cranfield University; University of Edinburgh; University of Glasgow; University of Hertfordshire; Imperial College

London; University of Kent; University of Liverpool; University of Newcastle; University of Nottingham; University of Plymouth; Queen's University Belfast; University of Strathclyde; University of Ulster; University College London; University of Warwick and University of York.

#### VISITING PROFESSORS IN DESIGN AND INNOVATION

This Visiting Professors scheme seeks to improve the innovation content in undergraduate teaching and give a better understanding of the innovation processes that are utilised by industry in turning ideas and prototypes into wealth-creating products.

##### During the 2012-13 the scheme operated at the following universities:

Aston University; University of Bath; University of Birmingham; University of Bournemouth; University of Bristol; Brunel University; University of Cambridge; Coventry University; Cranfield University; University of Derby; University of Durham; University of East Anglia; Heriot-Watt University; University of Hertfordshire; University of Huddersfield; University of Hull; University of Leicester; University of Liverpool; London South Bank University; Loughborough University; University of Northumbria; University of Nottingham; University of Plymouth; Queen Mary, University of London; Royal College of Art/Imperial College London; University of Salford; University of Sheffield; University of Southampton; University of Strathclyde; University of Surrey; University College London and University of Warwick.

#### VISITING PROFESSORS IN BUILDING ENGINEERING PHYSICS

This scheme aims to encourage engineering undergraduates to pursue a career in the field of building engineering physics, a new discipline which is concerned with achieving sustainability in the built environment and an understanding of energy efficiency.

##### During 2012-13 the scheme operated at the following universities:

University of Bath; University of Bristol; University of Cambridge; Loughborough University; University of Sheffield and University College London.

#### NATIONAL NUCLEAR LABORATORY/RAENG VISITING PROFESSORS IN NUCLEAR ENGINEERING

This joint activity between the Academy and the National Nuclear Laboratory seeks to enrich the teaching curriculum in all aspects of technology associated with the nuclear industry and encourages students to take up careers in the industry upon graduation.

##### During 2012-13 the scheme operated at the following universities:

University of Liverpool and University of Manchester.

#### COMMERCIAL EDUCATION TRUST/RAENG VISITING PROFESSORS IN SUSTAINABLE WEALTH CREATION

These posts are tenured at a business school with undergraduate business and MBA students being the primary audience, to educate future business leaders about the pivotal role of the UK's wealth-creating industries, particularly high-tech manufacturing, to achieve a sustainable economy.

##### During 2012-13 the scheme operated at the following business school:

Nottingham University Business School.

## VISITING TEACHING FELLOWS

This scheme seeks to enrich the engineering curriculum and education experience by placing hands-on engineering practitioners in universities. Visiting Teaching Fellows are appointed for a period of two years and are expected to spend between four and ten days working at their host university involved in at least one teaching activity every day.

### During 2012-13 the scheme operated at the following universities:

University of Aberdeen; Aston University; University of Bath; University of Bradford; University of Cambridge; University of Cardiff; Coventry University; Cranfield University; University of Durham; University of Edinburgh; Heriot-Watt University; University of Hertfordshire; University of Hull; Imperial College London; University of Leeds; University of Liverpool; London South Bank University; Loughborough University; University of Manchester; University of Newcastle upon Tyne; University of Nottingham; University of Plymouth; Queen's University Belfast; University of Strathclyde; University of Central Lancashire and University College London.

## METASWITCH/ROYAL ACADEMY OF ENGINEERING VISITING TEACHING FELLOWS

### During 2012-13 the scheme operated at the following university:

University of Oxford.

## SHELL/ROYAL ACADEMY OF ENGINEERING VISITING TEACHING FELLOWS

Shell has generously funded a scheme to enrich the curriculum in the technologies associated with the upstream and downstream operations of the petrochemical industry.

### During 2012-13 the scheme operated at the following universities:

University of Aberdeen and Cranfield University.

## SAINSBURY MANAGEMENT FELLOWSHIPS IN ENGINEERING

This scheme seeks to enhance the national potential of UK engineering industry by providing a human resource of high career potential chartered engineers who have complemented their technical training and knowledge with an MBA degree from a leading international business school.

### Eleven fellowships were awarded during the year, the recipients being:

Recipient	Organisation	Recipient	Organisation
Rafael Cepeda Lopez	Rotterdam School of Management	Robin Northcott	London Business School
Penny Cox	INSEAD	Oritsedere Ogbe	London Business School
Mahipal Ganeshmal	IMD	Edward Sclater	Kellogg School of Management
Ross Gordon	Rotterdam School of Management	Avijit Singh	London Business School
Julia Nammuni	London Business School	Ozan Yalniz	MIT

## ENGINEERING PROFESSIONAL DEVELOPMENT AWARDS

These awards continue the Academy's commitment to enhancing the potential of UK industrial engineers by supporting their professional development. Financial assistance is offered towards the cost of appropriate training and development programmes linked to an organisation's business plan or strategy, with an emphasis on reaching out to high-tech small and medium-sized businesses.

### The companies receiving awards in 2012-13 were:

Abraham Consulting	Furmanite	Ratcliff Palfinger
Aker Solutions	Gregs PLC	React Engineering Ltd
BPE Design and Support Ltd	Grimley Smith Associates Ltd	Rig Control Products Ltd
British Engines Ltd	Infront Solutions Ltd	Somers Forge Ltd
Chris Thomas Consulting Ltd	ICM Fire & Security Ltd	Subsea 7
Dakin Flathers Ltd	Itsus Consulting Ltd	Technical Support Associates Ltd
Davy Process Technology	Kellogg, Brown & Root Ltd	True North Process Solutions Ltd
Dawson Precision Components	Lagan Construction Ltd	Waterman Energy
Donaldson Filtration	Malvern Instruments Ltd	West Mercia Fork Trucks Ltd
Doosan Power Systems	Morgan Tucker Ltd	Xtrac Ltd
Eastbourne District Hospital	Optimus Services Ltd	Young Calibration Ltd
ETA Projects Ltd	Pall Life Sciences	

## PETROFAC FELLOWSHIPS FOR THE ENHANCED GRADUATE ENGINEER

The Enhanced Graduate Engineer is developed through a combination of an appropriate full-time postgraduate Masters' level degree coupled with additional learning and development opportunities provided by a company, in this case Petrofac.

### In 2012-13 fellowships were awarded to:

Isaac Afonughe - University of Sheffield	Samuel Lisney - Cranfield University
Tania Fernandez - University of Newcastle upon Tyne	Oliver Seelis - University of Newcastle upon Tyne

## EXXONMOBIL EXCELLENCE IN ENGINEERING TEACHING AWARDS

These awards reward university engineering lecturers and facilitate opportunities for their students. Each award consists of an individual prize of £10,000, which is supplemented with a package of in-kind opportunities worth up to £50,000.

### In 2012-13, prizes were awarded to:

Recipient	Organisation	Recipient	Organisation
Dr Eva Sorenson	University College London	Mr Sean Moran	University of Nottingham
Dr Jerry Heng	Imperial College London	Dr Tim Minshall	University of Cambridge
Dr Johannes Kiefer	University of Aberdeen	Dr Suleiman Sharkh	University of Southampton
Dr Rachel Horne	University of Sheffield	Dr Trevor Robinson	Queen's University Belfast
Dr Tina Duren	University of Edinburgh	Dr Sue Haile	University of Newcastle upon Tyne

### NATIONAL NUCLEAR LABORATORY/ROYAL ACADEMY OF ENGINEERING TEACHING FELLOWS

This joint activity between the Academy and the National Nuclear Laboratory is a sponsored university post, set up as a complement to the joint Visiting Professor scheme in nuclear engineering.

**During 2012-13 the scheme operated at the following universities:**

University of Central Lancashire, University of Leeds and University of Liverpool.

### SIR ROBERT MALPAS BURSARIES

This bursary has been established by Sir Robert Malpas CBE FREng to enable outstanding graduate engineers to study for a full time MSc course in creative engineering at a UK university.

**The inaugural bursaries were awarded to:**

Sandeep Ahluwalia      University College London  
Andreas Bilicki      Royal College of Art/Imperial College London

### PANASONIC TRUST PRESENTATION PRIZE

This prize is awarded to an engineer for their end of course project presentation on the MSc course in Renewable Energy: Sustainability and Technology at the University of Reading.

**One prize was awarded in 2012-13 to the following student at the University of Reading:**

Rachel Mason      Renewable energy technologies at Mapledurham Estate

### PANASONIC TRUST FELLOWSHIPS

The Panasonic Trust supports graduate engineers to acquire skills in environmental technology by supporting full-time study of appropriate Master's courses.

**In 2012-13 Fellowships were awarded to:**

Gerard Casey      University of Cambridge  
Matthew Field-Lucas      University of Durham  
Rhona Marsland      Imperial College London

### HERTHA MARKS AYRTON FELLOWSHIP

This prestigious award was established by the Panasonic Trust to encourage members of under-represented groups to reach their full technical potential by supporting them to study a full-time Master's course in a new technology subject.

Matilda Lenartowicz      Imperial College London

### SIR ANGUS PATON BURSARY

The Panasonic Trust continued to award the Sir Angus Paton Bursary on behalf of the Academy. Enabled by an endowment in 1986 from Sir Angus Paton CMG FREng FRS, this annual bursary recognises excellence and seeks to inspire a suitably-qualified engineer to undertake a full-time Master's course related to water engineering.

Oluwafeyikemi Akinola      Imperial College London

### OVE ARUP FOUNDATION/ROYAL ACADEMY OF ENGINEERING VISITING TEACHING FELLOWS

The Ove Arup foundation is generously funding Visiting Teaching Fellow posts in a variety of technical disciplines, mainly relating to civil, structural, and coastal engineering.

**During 2012-13 the scheme operated at the following universities:**

Aston University; University of Bath; University of Bristol; Brunel University; University of Cambridge; City University; University of Edinburgh; Heriot-Watt University; Loughborough University; University of Manchester; University of Nottingham; Queen's University Belfast; Royal College of Art/Imperial College London; University of Sheffield and University College London.

# Development and fundraising

## QUEEN ELIZABETH PRIZE FOR ENGINEERING JUDGES

The Queen Elizabeth Prize for Engineering is a new global award which celebrates outstanding innovations in engineering that have created significant benefit to humanity. The £1 million prize is awarded to an individual or team of people, of any nationality, directly responsible for a groundbreaking advance in engineering.

Lord Alec Broers FREng FRS Chair of Judges	Electrical Engineer, Past President, The Royal Academy of Engineering, UK
Professor Frances Arnold	Chemical Engineer, Professor of Chemical Engineering, Bioengineering and Biochemistry at Caltech, USA
Professor Brian Cox OBE	Particle Physicist, Royal Society Research Fellow, University of Manchester, UK
Madam Deng Nan	Former Executive Vice President and Current Chief Executive Secretary of China Association for Science and Technology
Professor Lynn Gladden CBE FREng FRS	Chemical Engineer, Pro Vice Chancellor for Research at University of Cambridge, UK
Diane Greene	Director of Intuit, Director of Google, USA
Professor John Hennessy	Electrical Engineer, President, Stanford University, USA
Professor Dr Dr hc Reinhard Huettl	Civil Engineer, President of acatech, Germany
Professor Calestous Juma HonFREng FRS	International development expert and Director of the Science, Technology and Globalisation Project, Harvard University, USA
Professor Hiroshi Komiyama	Chemical Engineer, President of Engineering Academy, Japan
Dr Dan Mote	President Elect, National Academy of Engineering, USA
Narayana Murthy	Electronic Engineer, Founder, Infosys, India
Dr Nathan Myhrvold	Formerly Chief Technology Officer at Microsoft, co-founder of Intellectual Ventures, USA
Professor Choon Fong Shih	Mechanical Engineer, President King Abdullah University of Science and Technology, Saudi Arabia
Paul Westbury CBE FREng	Civil Engineer, CEO Buro Happold, UK

## DEVELOPMENT ADVISORY BOARD

The role of the Development Advisory Board is to support the realisation of the Academy's goals and in particular its fundraising efforts. Board members are:

Richard Olver FREng – Chair	Vivienne Cox	Dr Mike Lynch OBE FREng
Professor Haroon Ahmed FREng	Andrew Gould	Professor Richard Parry-Jones CBE FREng
Ian Barlow	Dr David Grant CBE FREng	Roberto Quarta
Malcolm Brinded CBE FREng	Steve Holliday FREng	Simon Robey
Iain Conn FREng FRSE	Fred Kindle	David Thomlinson FREng

## CONTRIBUTORS TO EDUCATION AND ENGAGEMENT PROGRAMMES

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- Anglo American Group Foundation
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- BP plc
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- Commercial Education Trust
- ConocoPhillips Nigeria
- The ERA Foundation
- ExxonMobil International
- The Sir John Fisher Foundation
- Garfield Weston Foundation
- Gatsby Charitable Foundation
- Helsington Foundation
- Higher Education Funding Council for England
- John Hornibrook FREng
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- The Leverhulme Trust
- Lloyd's Register Foundation
- Sir Robert Malpas CBE FREng
- Metaswitch Networks
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- National Grid plc
- NATS
- Nuffield Foundation
- The Ove Arup Foundation
- The Panasonic Trust
- Petrofac Ltd
- QinetiQ plc
- Rolls-Royce plc
- Royal Commission for the Exhibition of 1851
- Shell International
- Unigraphics Support Group

## ROYAL ACADEMY OF ENGINEERING 2012 ANNUAL FUND

In October 2012, the Academy launched its first Annual Fund to its Fellowship, and also invited Fellows to inform the Academy of any legacy intentions. It would like to thank the following for their gifts\* including those Fellows who have made regular annual gifts for some years:

Hugh Allen FREng	Dr David Jones FREng	Gwilym Roberts CBE FREng
Charles Betts CB FREng	Joseph Locke MBE FREng	Victor Rogers CBE FREng
Brian Cook OBE FREng	Geoffrey Lomer CBE FREng	Professor Peter Rowe FREng
Dr Cecil French FREng	Professor Patrick McKeown OBE FREng	Dr Scott Steedman CBE FREng
Richard Haryott FREng	Professor Bernard Neal FREng	Dr Robert Sansom FREng
Professor Sir Antony Hoare FREng FRS	Michael Reeve FREng	Dr John Walling MBE FREng

\*a further 18 Fellows wished their gifts to remain anonymous.

The Academy also wishes to acknowledge legacies left by:

Sir William Barlow FREng	Bernard Mills FREng	Mrs A R M Robson
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