

AnnualReview

2015/2016



Strategic challenges

As the UK's national academy for engineering, we bring together the most successful and talented engineers 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 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.

We have four strategic objectives, each of which provides a key contribution to a strong and vibrant engineering sector and to the health and wealth of society.

Make the UK the leading nation for engineering innovation

Supporting the development of successful engineering innovation and businesses in the UK in order to create wealth, employment and benefit for the nation.

Address the engineering skills crisis

Meeting the UK's needs by inspiring a generation of young people from all backgrounds and equipping them with the high quality skills they need for a rewarding career in engineering.

Position engineering at the heart of society

Improving public awareness and recognition of the crucial role of engineers everywhere.

Lead the profession

Harnessing the expertise, energy and capacity of the profession to provide strategic direction for engineering and collaborate on solutions to engineering grand challenges.

The Royal Academy of Engineering
Incorporated by Royal Charter

HRH The Prince Philip Duke of Edinburgh KG KT OM GBE
Senior Fellow

HRH The Princess Royal KG KT GCVO QSO
Royal Fellow

HRH The Duke of Kent KG GCMG GCVO
Royal Fellow

Professor Dame Ann Dowling OM DBE FREng FRS
President

Front cover image courtesy of Alvise Simondetti at Arup



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Dame Ann Dowling

OM DBE FREng FRS, President



Dame Ann Dowling has been the Academy's president since September 2014. She looks back on recent achievements and what the Academy will need to focus on in the coming year.

Q What have been your particular priorities for the last year?

A A lot of our work in the run-up to the general election was focused on communicating the value of investment in engineering research and innovation. This work continued as the new government was formed and conducted a comprehensive Spending Review in which all government expenditure was scrutinised, including the grants given to the national academies. We had to put together a very clear and compelling case for maintaining public investment in the Academy's work across research and innovation, policy advice, international networks, engineering education and skills and engaging the public with engineering. I'm very grateful for all the hard work put in by Fellows and staff to make this happen.

The outcome of the Spending Review for science and engineering and for the national academies was positive. The Academy's settlement will allow us

to continue our work up to 2020 and considerably expands the base of our government-funded activity by making us a delivery partner for the new Global Challenges Research Fund.

Another important task arose when government asked me to lead a review of how relationships between UK businesses and the UK's world-leading university researchers could be better supported. I was very grateful for the 215 submissions I received and to the numerous others, from both academia and business, who provided input for the review, which identified how the complexity of the landscape is a major barrier to collaboration. The resulting recommendations (see page 9) were well received by Jo Johnson MP, Minister of State for Universities and Science, have been cited in the Chancellor's Productivity Plan, the 2015 Budget and the white paper on higher education, *Success as a Knowledge Economy: Teaching Excellence, Social Mobility and Student Choice*, and at the time of writing, were



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helping to shape the government's National Innovation Plan.

There have of course been many other success stories besides. With support from the Worshipful Company of Engineers, we have launched the RAEng Engineers Trust Young Engineer of the Year awards, which aim to recognise engineers who have made a significant contribution at the start of their career. The Enterprise Hub has introduced the Royal Academy of Engineering 1851 Royal Commission Enterprise Fellowships scheme, its first grant exclusively aimed at supporting recent UK engineering graduates. It has also established the Innovators' Network, which aims to create a community of SMEs and corporates seeking to overcome the challenges associated with innovation in engineering through knowledge sharing. We have established a new engineering project in Lowestoft to bring the excitement of engineering into the classroom in a disadvantaged area of the country with an engineering heritage (see page 14). The Academy also played a part in organising and supporting the Global Grand Challenges Summit in Beijing in September 2015 (see page 25). It has been a big year and it has set us up for some even more exciting times ahead.

Q Where do you think that the Academy could do better?

A We can always learn from our experiences and we continually look to improve what we do based on careful evaluation and learning from experience.

We know that our Fellows have an appetite to drive growth and change for the UK and across the world, and so our strategic plan maps ambitious objectives. We will be launching a major campaign to create the partnerships and sources of funding to deliver a step change in the Academy's delivery capacity to support this.

One of the objectives still to tackle is the worrying shortfall of young people joining the profession at every level. This is a challenge that the whole of engineering

needs to be better at addressing, and we are developing the Engineering Talent Project (see page 15) to bring together all the good work already being done in the profession and transform perceptions of engineering.

We continue work to ensure that we are engaging a greater number of our Fellows in our activities, and we are currently reviewing what works best for them. The Fellowship is the lifeblood of the Academy and I really want to find a way to increase their involvement even more.

Q What will your priorities be over the next year?

A The research and innovation landscape continues to evolve, and having reviewed business-university research collaborations for the government and advised on the proposed changes to the landscape, I would like to remain closely involved in ensuring that recommendations that were discussed are implemented in a way that boosts the growth and impact of the engineering sector.

This year, we also have a significant opportunity to expand our impact internationally. We are the UK's national academy for engineering but having a global outlook is crucial to our mission. The projects we are developing to deliver the Global Challenges Research Fund and Newton Fund build on our experience and expertise in supporting innovation and growing engineering capacity both in the UK and in the developing world.

In September 2016, we host a major conference focusing on the impact of engineering on international development, which will mark the launch of several new initiatives and the beginning of a longer term initiative to encourage closer working between the engineering and international development professions on major global challenges.

Finally, while it fell after the end of the financial year, our greatest priority for

the year ahead was determined by the result of the EU Referendum on 23 June. As the UK's national academy of engineering, we will be leading efforts to provide the government with clear, evidence-based information to inform the forthcoming negotiations and ensure that the needs of all sectors that have a dependence on engineering are represented and understood. This work unites all 38 organisations representing the engineering profession to secure the best possible outcome for the UK.

Q The Academy turned 40 in June 2016. What do you think is the Academy's most significant achievement since it was founded?

A It would be almost impossible to define the Academy's success through a single moment or initiative. I think it would be fair to say that the organisation now enjoys a higher reputation and more positive impact and influence than ever before.

A snapshot of our work in the last year gives a flavour of what we have achieved: we have a wonderful Fellowship of 1,500 of the most eminent engineers who give 12,000 hours of their time voluntarily for the national good; we have directly supported teachers in 500 UK schools; we have collaborated with 30 countries on over 100 international projects to foster engineering and innovation; we engaged 4,000 members of the public through more than 60 events, achieved 3,000 pieces of media coverage and had 1.2 million visits to our website. We are a small organisation and we should be very proud of that achievement.

Philip Greenish CBE

Chief Executive



Philip Greenish talks about the challenges that the engineering community has faced and the Academy's role in placing engineering at the heart of society.

Q What have been the challenges for the Academy's management team and staff this year?

A A number of important changes have been introduced to support the Academy's performance as we develop and grow. The Trustee Board agreed to the creation of a new post of Director of Strategy and Deputy CEO to support change management and help drive the strategic plan. Dr Hayaatun Sillem, formerly Director of Programmes and Fellowship, was appointed to this role in 2016.

As the number of programmes and initiatives we administer has increased, we have needed to make sure that we have the staff to work with Fellows and partners and keep pace with that growth. So we have welcomed a number of talented new people to the organisation to grow our capacity.

A larger number of staff requires new and more consistent ways of working.

An important change to our approach was a review of our remuneration framework which allowed us to create a transparent, consistent approach to how we set staff salaries. We have overhauled our internal communications procedures to ensure that they support effective and efficient working and have reviewed a number of our staff policies so that they are in line with best practice.

Preparations for the redevelopment of the Academy's lower ground floor to provide a state-of-the-art home for the Enterprise Hub, together with new kitchens and services, took most of the year and work is now well underway. There is real complexity in creating fully useable space from a large, undeveloped and leaky basement in a Grade 1 listed building. However, I am confident that we will deliver a vibrant, appealing place for the Hub and where Fellows and budding entrepreneurs will meet, network and share ideas. The work, which is set to complete at the end of 2016, has been

kick-started by generous donations from Dr John C Taylor OBE FREng and the late Geoffrey Argent FREng.

Q How would you describe the Academy's networks?

A Partnership working is absolutely critical to the Academy's mission and so we put a lot of emphasis on ensuring that we have thriving working relationships with our very wide range of partners and supporters across the profession, in business and industry, academia, the third sector and government.

Our ambitious strategic plan means that we are always looking to broaden our reach and create new partnerships both in the UK and overseas.

We want to ensure that we work more closely with our wider family of awardees and grant recipients and we are looking to develop a more formal alumni network to support this.

ensure that our own practice is as open and transparent as possible and to avoid unconscious bias in our selection processes.

Q The Academy turned 40 in June 2016. What would you like to see it achieve in the next 40 years?

A The Academy has a leadership role in the profession and it will be important to develop this aspect of our work so that the profession is fit to tackle the challenges of the future. We can and should be creating a louder voice for engineering and driving changes in policy, perceptions of engineering and engineering practice that allow society and the economy to thrive. My vision is of a fuller pipeline of inspired and talented young people joining the profession, and a nation with engineering at its heart and recognising it. As engineering grows, society will too: that is hugely exciting.

Q What progress has the Academy made in its work on diversity in engineering?

A The last year saw the conclusion of the first phase of our Diversity Programme, which the Academy established in 2011 with support from the Department for Business, Innovation and Skills to drive action on diversity across the profession. Independent evaluation has shown us that the programme (see pages 16-17) has successfully raised awareness, shared best practice and driven change across the profession. The programme has directly engaged 50 employers and employer-led organisations through the Diversity Leadership Group and established an Engineering Diversity Concordat, which 32 organisations have signed in support of increasing diversity and inclusion across professional engineering institutions.

We have rolled out diversity awareness and training across the Academy's committees and among the staff to



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Highlights of the year by theme

Energy system study

A critical time for UK energy policy: what must be done now to deliver the UK's future energy system was the third in a series of reports for the Prime Minister's Council for Science and Technology, and assesses the actions needed now to secure a sustainable future energy supply for the UK.

Overall, the report found that delivery of the UK's future energy system is under serious threat and substantial investment is needed.

The report gained widespread media coverage, with more than **70** mentions in print and on TV and radio.

Other energy highlights

The MacRobert Award for innovation in UK engineering was awarded to a team from Artemis Intelligent Power for its Digital Displacement power system using digitally controlled hydraulics, which has the potential to transform the viability of offshore wind power and low-carbon transportation.

The Academy appeared before the Economy, Energy and Tourism Committee of the Scottish Parliament to discuss energy security.

Enterprise Hub

Eight new Enterprise Fellows were awarded grants of up to **£60,000** each.

The Enterprise Hub launched two new initiatives. 1851 Royal Commission Enterprise Fellowships, supported by the Royal Commission for the Exhibition of 1851, offer three engineering graduates a **£50,000** grant as well as Hub membership; the Innovators' Network brings together innovation champions within larger corporates and SMEs to share best practice and drive improvements in performance.

International schemes

176 innovators from **12** emerging economies were trained by the Academy under the Newton Fund Leaders in Innovation Fellowship programme.

Dr Askwar Hilonga, a chemical engineer from rural Tanzania, won the first Africa Prize for his innovation using nanotechnology to create bespoke water filters for particular contaminants. Dr Hilonga was then invited to participate in the inaugural Pitch@Palace Africa competition and was declared overall winner.

University programmes

More than **100** Research Chairs and Research Fellowships were in post, and **6** new Industrial Secondment Scheme awards were made.

41 universities hosted Academy Visiting Professors who are practising engineers working to improve the relevance of engineering teaching for undergraduates.

Academy President, Dame Ann Dowling OM DBE FREng FRS, published her *Review of Business-University Research Collaborations* for the government, which offered advice and recommendations on how relationships between businesses and universities could be better supported.

The Aerospace MSc Bursary Scheme awarded its **500th** bursary for new entrants to the UK aerospace industry and for upskilling people already in the sector.

Supporting smaller businesses

Pathways to Growth grants were awarded to **18** SMEs to help them upskill their engineers and technicians.

The Launchpad Competition enabled budding engineering entrepreneurs aged 16 to 25 to start a new business. All four finalists in the competition were invited to join the Enterprise Hub.

Business and
manufacturing

Energy and
natural resources

Innovation and
entrepreneurship

Built environment study

Published in July 2015, this report explored the relationship between the design of the built environment and human behaviour as well as the implications for design practice, research needs and policymaking.

The report highlighted how design and human behaviour are interlinked, and concluded that stakeholders need to collaborate to capitalise on what is already known about both.

Its publication followed three workshops that looked at ways in which the design of the built environment can have a significant impact on resource use, health and wellbeing, and performance and productivity.

Transport congestion

The Academy's first 'challenge paper' addressed the growing problem of congestion on the UK's road and rail networks.

Led by Fellows with expertise in transport, the discussion document focused on the costs and congestion reduction potential of a number of different measures and identified **18** 'frontrunners' that offer the best value for money.

Infrastructure
and transport

Technology and
society

People and talent

Queen Elizabeth Prize for Engineering

In October, Dr Robert Langer FREng received the Queen Elizabeth Prize for Engineering trophy from HM The Queen during a ceremony at Buckingham Palace.

The ceremony generated global media coverage across outlets including the wider BBC networks, *The Times*, the *Washington Post*, *China Daily* and the *Times of India*, reaching a worldwide audience of more than **1.25** billion people.

The first QEPrize report *Create the Future* was published, revealing the changing nature of engineering perceptions and providing insights into the differences in these perceptions between countries.

Partnerships

Seven major engineering employers convened to provide strategic support for the Academy-led Engineering Talent Project, a social marketing programme designed to change perceptions of engineering and address the engineering skills crisis.

Alongside other national academies, the Academy hosted roundtable meetings at the Conservative, Labour and Scottish National Party conferences.

Eight Academy Fellows and awardees spoke at the second Global Grand Challenges Summit, part of a three-year collaboration between the UK, USA and Chinese national academies on the contribution engineering can make to meeting common global challenges.

Influencing education policy

The *Does teaching advance your academic career?* report found that UK engineering academics believe that the quality of their teaching has little value on their careers, and identified a series of issues deeply ingrained in university culture, including the overwhelming emphasis on research reputation and income when it comes to promotion, academic mobility and allocation of resources.

The Academy-hosted Education for Engineering alliance provided expert advice on apprenticeships, and new content for engineering qualifications and enabling subjects at GCSE and A level.

Diversity

The Diversity Leadership Group launched a toolkit developed with and for employers called *Increasing diversity and inclusion in engineering* at an event attended by more than **100** stakeholders.

The Academy hosted around **160** students at a combination of a summer school and engineering fast-track workshops as part of the Engineering Engagement Programme, which aims to attract undergraduates from diverse backgrounds into engineering employment.

Make the UK the leading nation for engineering innovation

The Academy's first strategic challenge is to support the development of successful engineering innovation and businesses in the UK in order to create employment, wealth and benefit for the nation.

Ahead of the 2015 Spending Review, it became apparent that there was a need for an evidence-based case for continued investment in UK research and innovation, demonstrating the value of government support to secure the UK's future growth. The resulting report, *Investing in Innovation*, published by the Academy in September 2015, received significant coverage in the media, as well as forming the basis for the Academy's submission to the House of Commons Science & Technology Committee's science budget inquiry.

The outcomes of the 2015 Spending Review were broadly positive for research and innovation. However, significant changes to the UK's research and innovation landscape were proposed. The Academy provided major input to the government's consultations on its proposals, submitting responses and

convening relevant stakeholders; work that is ongoing. An overarching message from the Academy is the need for a clearly articulated and stable strategic policy framework from government to accompany the changes.

Complementing this work, the Academy, along with its sister national academies, organised a series of four public *Policy Lab* events to bring together relevant stakeholders to discuss the future of the UK's research and innovation landscape following the 2015 Spending Review.

During the course of the year, the Academy substantially increased its contribution to policy discussions on research, innovation and enterprise, ensuring that the engineering voice was heard in a crucial year for the community.

Research

The Research Fellowship scheme provides outstanding early-career researchers with five years' funding and mentorship to help them establish themselves as future research leaders. The scheme is highly competitive and eight new appointments were made during the year, with one supported by the Lloyd's Register Foundation. The Academy's Research Fellows are currently distributed across 20 different universities. The Research Chairs and Senior Research Fellowships scheme, co-funded by industry, helps to establish and enhance world-leading 'use-inspired' collaborative research programmes at UK universities. The scheme currently supports more than 40 partnerships covering a wide range of engineering disciplines and technology areas, from low carbon technologies to interfacial nanoscience for engineering systems.

The Leverhulme Trust Senior Research Fellowships scheme, funded by The Leverhulme Trust, enables mid-career



Dr Patricia Perez Esteban (centre) is presented with her gold medal award at the SET for Britain poster competition at Parliament by (L-R) Dr Stephen Benn, 3rd Viscount Stansgate, Royal Society of Biology Director of Parliamentary Affairs and SET for Britain Master of Ceremonies; Academy President Dame Ann Dowling OM DBE FREng FRS; Colin Dixon, Head of Marketing at Essar Oil UK; and Stephen Metcalfe MP, Chairman of the Parliamentary and Scientific Committee

The Dowling Review

In July 2015, the President launched her *Review of Business-University Research Collaborations* at the House of Commons, where it was welcomed by Jo Johnson MP, Minister of State for Universities and Science.

In December 2014, the President had been invited by the then Minister for Universities, Science and Cities, Rt Hon Greg Clark MP, to lead a review to develop advice and recommendations on how relationships between UK businesses and the UK's world-leading university researchers could be better supported.

The President assembled a review group comprising experts and practitioners in collaboration from a wide range of disciplines, representing both industry and academia. The level of participation from the research and business community exceeded expectations. Over 200 written submissions from across a broad spectrum of stakeholders were received, and more than 200 individuals participated in meetings held across the country. This engagement generated recommendations that clustered into six broad topics: complexity, people, brokerage, growing

critical mass, terms of engagement and government strategy.

The overarching recommendation was that, wherever possible, government should seek to reduce complexity in the public support system for collaboration. Where it is not possible, every effort should be made to 'hide the wiring' from those seeking support.

The reception was positive and the review was cited in the Chancellor's Productivity Plan, the 2015 Budget and the white paper on higher education, *Success as a Knowledge Economy: Teaching Excellence, Social Mobility and Student Choice*.

An official response from government is expected, but in the meantime it appears that many recommendations have been embraced by the wider research and innovation community.

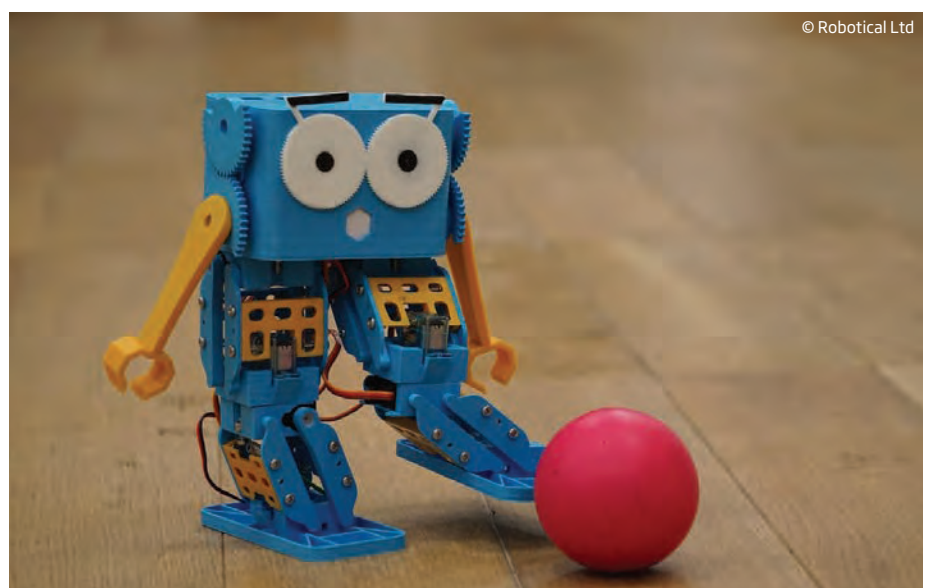
academics with a proven track record in research to be relieved of their day-to-day activities in order to concentrate full time on research. Each Fellowship pays for a replacement academic to cover their teaching and administrative workloads for up to one year. In February 2016, seven Leverhulme Trust Senior Research Fellowships were awarded. The Academy's Industrial Secondment Scheme supports early- to mid-career academics wishing to undertake a collaborative research project in an industrial environment, which can help to improve the quality and industrial relevance of their teaching and promote research collaboration. In July 2015, 10 new secondments were awarded.

The Academy's annual Research Forum brings together Fellows, beneficiaries, engineering researchers, industry partners, research funders and government representatives to celebrate excellence in engineering research. The September 2015 event, hosted by Professor Ric Parker CBE FREng, provided an opportunity for individuals undertaking cutting-edge engineering research, their industry sponsors and a host of interested parties to meet and hear about the wide range of work that is currently underway. The day concluded with a lively panel discussion on the impact of world-leading research and innovation on growth and productivity. Panel members included: Professor Sir Peter Gregson DL FREng, Vice Chancellor of Cranfield University; Professor Philip Nelson FREng, Chief Executive of the Engineering and Physical Sciences Research Council; Professor Mary Ryan FREng, Shell/Royal Academy of Engineering Research Chair at Imperial College London; and Paul Mason, Head of Development at Innovate UK.

SET for Britain is a national poster competition open to early-career researchers in science, technology, engineering and maths (STEM). Run by the Parliamentary and Scientific Committee in partnership with the Academy and other science and engineering organisations, the event provides a valuable opportunity for Parliamentarians to engage directly with scientists and engineers. At the March 2016 event, 60 engineering applicants presented their posters and the President awarded the gold, silver and bronze medal winners their prizes. The gold medal and £3,000 prize were awarded to Dr Patricia Perez Esteban, a chemical engineer from the University of Bath, for her poster on developing an animal-free cosmetic testing model to better predict how compounds enter the bloodstream.

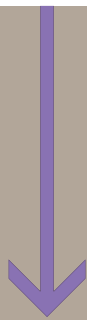
Enterprise Hub

The Enterprise Hub forms a key part of the Academy's commitment to stimulating excellence and promoting creativity and innovation in engineering. It identifies the founders and leaders of tomorrow's technology companies and provides bespoke support and mentoring from the Academy's Fellowship. To date, the 38 early-stage Hub members have raised around £23 million of external funding, with more than 90 employees associated with their companies. The Hub portfolio is diverse, supporting a wide spectrum of engineering and technology start-ups on their entrepreneurial journey, from modifiable robots teaching children to code to 'breathing bricks' to reduce waste in construction.



© Robotical Ltd

Enterprise Fellow Dr Alex Enoch's 3D-printed robot can be programmed to walk, dance or even play football



At a glance

Enterprise Fellows and their innovations

Alexander Enoch, University of Edinburgh

Educational walking robots that can be wirelessly reprogrammed, modified with new 3D-printed parts and controlled via smartphone.

Damien Coyle, Ulster University

NeuroCONCISE wearable technology measures and translates brainwaves into control signals that allow physically impaired people to communicate and interact with computers.

Yiang Li, University of Southampton

Using software to automatically generate transcript and captions from audio or video to make lectures accessible at a lower cost and faster.

Andrew Marsden, University of Cambridge

Nano-materials for gas storage and separation that could dramatically lower the cost of storing, separating and transporting gases.

Samuel Chapman, Heriot-Watt University

Unfired bricks that reduce waste and CO₂ in the construction sector by using traditional earth-construction methods, 90% recycled content and no cement.

Oliver Stevens, University of Bristol, University of Exeter and Gloucestershire Hospitals NHS Foundation Trust

Revolutionary technology for cancer screening, enabling on-the-spot cancer diagnosis with minimal discomfort for patients.

Nick Everdell, University College London

A pioneering mobile imaging system that enables imaging of the brain while the subject engages in normal activities, rather than being confined to a scanner.

Silo Meoto, University College London

A dental bone graft substitute that repairs bone defects prior to dental implant placement and can potentially achieve 95% integration with surrounding bone in just three months.



Finalists in the Enterprise Hub's 2015 Launchpad Competition

Over the past year, the Enterprise Hub has emerged from its own start-up stage and established its reputation so that its programmes now attract a record number of engineering applicants from around the country. In response to the evolving needs of engineering and technology entrepreneurs, the Hub has launched two new initiatives:

- **1851 Royal Commission Enterprise Fellowships:** with generous support from the Royal Commission for the Exhibition of 1851, this new programme offers engineering graduates a £50,000 grant as well as Enterprise Hub membership.
- **Innovators' Network:** chaired by Elspeth Finch, an entrepreneur and former Director of Innovation (UK & Europe) at Atkins, the network brings together innovation champions within corporates and SMEs to share best practice and drive improvements in innovation performance across sectors and technology areas.

The Academy's Launchpad Competition enables a budding engineering entrepreneur aged 16 to 25 to start a new business based on their engineering innovation. This year, all four Launchpad Competition finalists were invited to join the Hub. The 2015 winner, James Roberts, developed his low-cost inflatable incubator with the aim of preventing premature baby deaths in the developing world. Finalist Sorin Popa went on to win the 2016 Royal Academy of Engineering ERA Foundation Entrepreneurs Award for his stent placement technology that improves outcomes for kidney dialysis patients. Another 18 SMEs have been awarded training grants from the Hub's Pathways to Growth scheme to help them upskill their engineers and technicians as new technologies and business needs emerge.

The Blavatnik Family Foundation Alumni Awards celebrate progress made by Enterprise Fellows during and after their Fellowships. The most recent winners were Dr Daniel Plant, Dr Toby Basey-Fisher and Dr Stephen Smith. All were recognised for their

efforts to turn their innovative technologies into viable businesses and their continued commitment to acting as role models for the next generation of entrepreneurial engineers.

Two Hub members also secured agreements for investments at the 2015 showcase, which featured keynote talks by speakers from Raspberry Pi and Google DeepMind. In January 2016, the Chair of the Enterprise Committee, Ian Shott CBE FREng, hosted a 'reverse pitching' event giving Enterprise Hub members and Pathways to Growth SMEs a chance to turn the tables and put the investors in the hot seat. The event was aimed at demystifying the funding landscape for earlier-stage entrepreneurs, and introduced Hub members to a powerful network of potential backers.

There has been significant media interest in the engineering technologies pioneered by Hub members in local and national newspapers, industry press, online and national television. The announcement of the cohort of Enterprise Fellows in March 2016 was featured in *The Daily Telegraph* and on BBC News. Hub members have also achieved widespread success elsewhere. George Frodsham's drug-free malaria treatment start-up MediSieve was a runner-up at the Pitch@Palace event; Dr Susannah Clarke, co-founder of a company that develops precision instrumentation for orthopaedic surgery, was awarded a Royal Academy of Engineering Silver Medal; and Bethan Wolfenden's portable DNA testing kit, Bento Lab, reached its Kickstarter funding goal in less than 36 hours.

The Hub continues to build a strong network of partners, including investment groups, specialist advisory firms and corporate organisations, and its activities continue to grow in scale and impact. By early 2017, the lower ground floor of Prince Philip House will have been developed into a physical home for the Hub, providing a welcoming space where Hub members, Hub partners and Academy



A member of the Artemis Intelligent Power team tests the performance of a 1.5 MW Digital Displacement motor

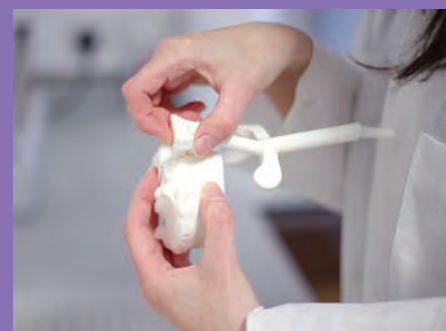
Awards

The Academy's awards celebrate the significant contribution of engineering to the nation's wealth, health and wellbeing, and recognise engineers at all stages of their careers.

MacRobert Award

The MacRobert Award is a £50,000 prize awarded annually to a team of engineers for an exceptional innovation in UK engineering that has been commercially successful and delivered benefits to society.

In June 2015, the winner was a team from Edinburgh-based Artemis Intelligent Power for its Digital Displacement power system using digitally controlled hydraulics, which has the potential to transform the viability of offshore wind power and low-carbon transportation. As well as dramatically improving power capacity, the smart, modular system has been designed to overcome the significant reliability issues associated with existing turbines.



A 3D-printed surgical guide for joint replacement is held by Silver Medallist Dr Susannah Clarke, co-founder of Embody Orthopaedics

Silver Medals

The Academy's Silver Medals are awarded to outstanding individuals in recognition of their personal contributions to UK engineering. The award recognises individuals' success in creating and bringing a particular innovation to market. In 2015, the Silver Medallists were:

- **Dr Susannah Clarke**, co-founder of Embody Orthopaedics, a spin-out from Imperial College London. She is pioneering new medical techniques using 3D-printing technology to revolutionise joint replacements.
- **Dr Don Syme**, principal researcher at Microsoft Research, Cambridge, where he works to improve the tools available to programmers worldwide, helping them create the building blocks of the virtual world more effectively. He created the F# computer programming language.
- **Dr Andy Ward**, founder and Chief Technology Officer at UbiSense, a location intelligence provider that can track individual items in a factory and automate the processes between them.

Fellows can interact, and creating a focal point for excellence in engineering innovation and entrepreneurship.

International activities

The Academy is a delivery partner for the government's Newton Fund, which supports science and innovation partnerships with emerging economies. One of the Academy's flagship Newton Fund activities is the Leaders in Innovation Fellowships programme, which helps entrepreneurial researchers across the globe commercialise innovations that address development challenges. In the past two years, the Academy has supported 320 technology innovators from 12 countries in Latin America, Africa and Asia. The researchers from these partner countries benefit from an intensive period of training and coaching in the UK, masterclasses from Academy Fellows and opportunities to network with their UK peers.

The training ends with a competitive pitching session in front of a judging panel headed up by an Academy Fellow.

The programme has already had a significant impact, both in terms of progressing individual innovations and influencing changes in the partner countries' culture of research entrepreneurship. Work is now underway to expand the list of partner countries and provide better networking opportunities for alumni with each other and with potential funders through regional hubs in Southeast Asia and Latin America.

Under the Newton Fund, the Academy also initiated the Industry Academia Partnership Programme to promote bilateral, inter-sector links that address engineering higher education and research and innovation challenges in partner countries. The Academy hosted scoping workshops in India and South Africa that brought together senior

figures from across government, industry and academia to discuss core issues in the engineering sector. A grant-making programme was subsequently designed and 41 awards made, totalling £1.9 million for collaborations between the UK and Colombia, India, Kazakhstan and Thailand.

The Newton Research Collaboration Programme enables engineering researchers from the UK to work with peers from Newton Fund partner countries for a period of three months to one year. During the year, 42 exchanges were funded across six countries.

The Distinguished Visiting Fellowship scheme provides funding for UK universities to host a world-leading academic from overseas for up to a month and establish partnerships. In the last year, the scheme awarded 23 Distinguished Visiting Fellowships to academics from 10 countries to enable them to visit 15 UK universities.



Africa Prize winner Dr Askwar Hilonga with head judge Malcolm Brinded CBE FREng

Africa Prize for Engineering Innovation

The Africa Prize for Engineering Innovation was launched in March 2014 with the aim of stimulating and rewarding innovation and entrepreneurship in sub-Saharan Africa. The annual prize offers six months of training and mentoring to 12 talented entrepreneurs from across the region, before selecting a winner and runners-up to receive the prizes worth a total of £55,000.

In May 2015, Dr Askwar Hilonga, a chemical engineer from rural Tanzania, was announced as the winner of the inaugural Africa Prize. Dr Hilonga's nanofilters innovation uses nanotechnology to create bespoke water filters for particular contaminants, from heavy materials or minerals such as copper and fluoride, to biological contaminants such as bacteria and viruses, and pollutants such as pesticides.

As a result of winning the Africa Prize, Dr Hilonga was invited to participate in the first Pitch@Palace Africa competition hosted by HRH The Duke of York, Nigerian entrepreneur Aliko Dangote and former

President of Nigeria Olusegun Obasanjo. With a passionate and articulate pitch, Dr Hilonga was selected by the audience as the overall winner.

Since its launch, the Africa Prize has received entries from entrepreneurs in 16 countries across the continent and has been profiled prolifically in international print and broadcast media.

The Africa Prize is generously supported by the Shell Centenary Scholarship Fund, Consolidated Contractors Company, the Foreign & Commonwealth Office, ConocoPhillips and the Mo Ibrahim Foundation.



FEATURED FELLOW

Professor Mary Ryan FREng, Professor of Materials Science and Nanotechnology at Imperial College London, was appointed Shell/RAEng Research Chair in Interfacial Nanoscience of Engineering Material at the university.

Address the engineering skills crisis

UK employers continue to cite a shortfall of engineering skills as a key cause of concern for their future success. The UK produces only 15,000 UK domiciled engineering graduates each year. This is compared to a million graduates a year in China and 500,000 a year in India. Technician shortfalls are also affecting employers, particularly at advanced and higher skill levels.

The factors affecting supply are numerous and complex. In secondary schools, teacher shortages in critical subjects such as physics, mathematics, computing, and design and technology prevent young people from receiving the best education to lead to a career in engineering. Narrow accountability measures for schools focus attention on attainment in a limited set of academic subjects rather than the development of a broad range of creative and problem-solving skills. Careers education and guidance and employer engagement are patchy across the UK.

The further education sector, which develops the technician skills that underpin engineering, suffers from a chronic shortfall in funding and many engineering departments in higher education struggle to break even because of the high costs of provision.

One particular issue that the Academy is now

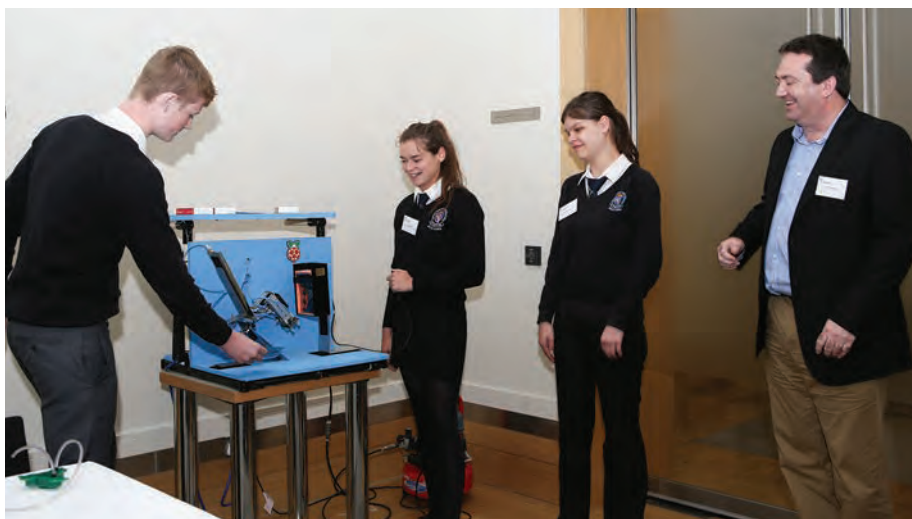
addressing on a national scale is public perceptions and attitudes towards engineering as a career. Supported by seven major UK engineering businesses, the Academy is developing a national campaign to communicate the excitement of engineering in the 21st century and the wide variety of disciplines and career opportunities available.

As the campaign develops, more industry supporters are expected to come on board. Alongside the new messages that will be developed for the campaign, the Academy is leading a policy drive to ensure that structural barriers are addressed, such as specialist teacher shortages and provision of consistent and high-quality careers guidance. There will also be an internal focus on engineering to ensure that it is genuinely attractive to future generations who have different values and expectations from previous generations of engineers.

Activities for schools

The Academy's *Connecting STEM Teachers* programme, which works to enhance the teaching and learning of STEM (science, technology, engineering and mathematics) in schools across the UK, has recruited a further 10 STEM teacher coordinators. The programme has 38 teacher coordinators who are busy supporting their regional networks, which now consist of 635 teachers from 518 schools, with training, teaching and learning resources and funding for collaborative projects between schools. It is estimated that over 96,000 school students have benefited from the programme since it was launched in September 2011.

The Academy's regional STEM support programmes, which provide opportunities



Pupils from Cynffig Comprehensive School demonstrate their system for packaging the Raspberry Pi computer at a STEM conference for the *Connecting STEM Teachers* programme held in July 2015. They are watched by Kevin Edwards, General Manager of the South Wales facility where the computers are made



At a glance

STEM education resources

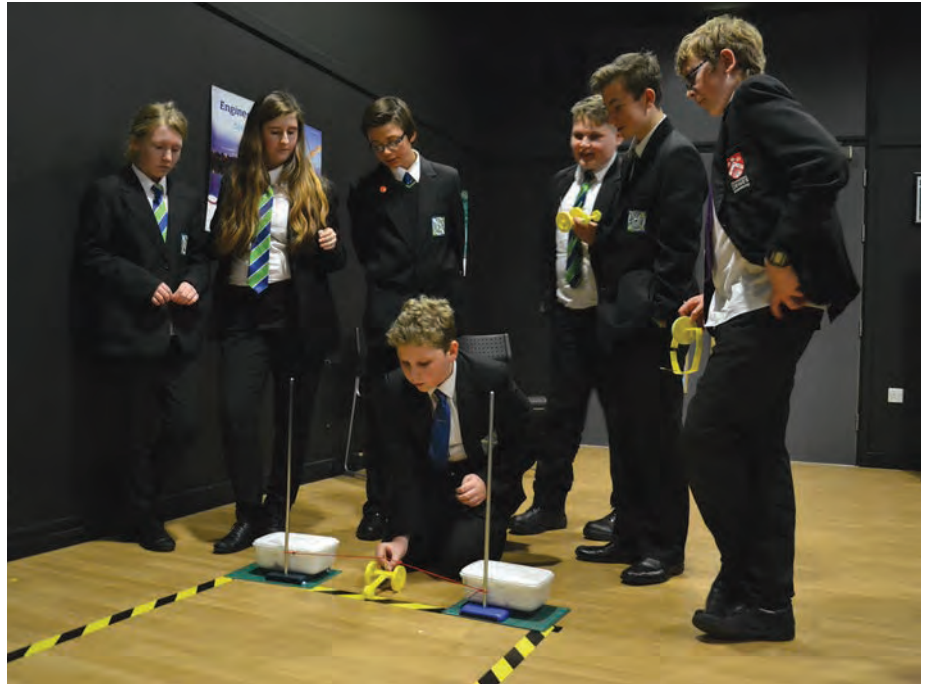
10 resource boxes about various subjects:

- Winter Olympics
- Engineering ideas
- Paralympic sport
- Disaster response
- Deployable structures
- Existence at the extreme
- Hovercraft
- Drones
- Controlling motion
- Computing in Design and Technology

3,000 free resource boxes given to schools.

More than **22,000** learning and teaching resources downloaded.

Over **500** continuing professional development sessions held for teachers.



Students design and race wheelchairs developed for Paralympic athletes as part of the Lowestoft Engineering Project

for STEM engagement to students in disadvantaged areas of the UK, have also been expanded. The Lowestoft Engineering Project was launched in November 2015 and joins the existing programmes in Barrow-in-Furness (2008) and Stoke-on-Trent (2013). These three programmes, which provide funding directly to schools to enhance and enrich their STEM curricula, are cumulatively working with 32 primary schools, 15 secondary schools and six further education colleges. Over 80,000 STEM learning opportunities for local students have been provided, with activities including after-school clubs, STEM challenge days, computing/robotics challenges and visits to local employers. Continuing professional development for teachers has been provided at all levels of education and engagement. Currently, 20 local engineering employers are engaged with these regional programmes.

In the last year, the Academy has expanded the number of its STEM Club activity resources while also taking the opportunity to redesign and relaunch existing ones. The Academy has developed a new resource, *Making Waves*, to support the 2016 BAE Systems Schools Roadshow in addition to developing and launching the latest STEM teaching and learning resource, *Drones: Friend or Foe?* This gives students the opportunity to explore

how drones work and how they can be used for civilian, humanitarian and commercial purposes. Since its launch in September 2015, over 450 resource boxes and associated training materials have been disseminated to schools and the resource has been downloaded nearly 2,000 times online.

To date, the Academy has distributed nearly 3,000 resource boxes to schools and the full suite of resources has been downloaded online over 22,000 times.

In March 2016, the Academy again supported the national Big Bang Fair with a stand based on the Academy's report *Thinking like an engineer: implications for the education system*, and the six engineering habits of mind identified within it. The Academy stand challenged visitors with a series of practical activities linked to the characteristics identified in the report, and had close to 8,000 visitors over the four days.

Further and higher education

The Aerospace MSc Bursary Scheme, which was developed by the Academy, the Royal Aeronautical Society, government and leading aerospace companies, has now met



FEATURED FELLOW

Professor Peter Goodhew FREng, Emeritus Professor at the University of Liverpool, is a member of the Education and Skills Committee and is leading the Academy's support in the development of a new liberal engineering curriculum at the New Model in Technology and Engineering (University of Hereford).

Engineering Talent Project

Through the Engineering Talent Project, which is backed by seven major UK engineering businesses, the Academy is addressing public attitudes towards engineering as a career. The project aims to communicate the excitement of engineering in the 21st century and the wide range of career opportunities it offers.

The Engineering Talent Project is a multi-intervention social marketing programme designed to change perceptions of engineering and address the engineering skills crisis. It is backed by partners from major engineering organisations and has been developed in response to an appeal from industry for the Academy to take the lead in 'marketing the dream of modern engineering'. The last year has seen some significant developments in establishing strategic leadership from the engineering sector, and in achieving starter funding to get the project underway.

The project concentrates on areas where the Academy has experience and demonstrable credentials: engagement to address the barriers to creating a pipeline of future engineering talent; engineering engagement in schools; improving culture and practice across the sector to

ensure that the employment experience in engineering meets the expectations of millennials; and communications to promote engineering and its wide range of specialisms and opportunities. Importantly, employers are central to the project, and will strengthen and authenticate its messages. The findings from a rigorous programme of qualitative research show that engineering, when presented through the right messages and channels, has real potential to appeal to the next generation of untapped talent.



Awardee of the 500th Aerospace MSc bursary, Loweri Nicholls with then president of the Royal Aeronautical Society, Martin Broadhurst OBE

its target of awarding 500 bursaries for new entrants to the UK aerospace industry and for upskilling people already in the sector. The 500th bursary holder is Loweri Nicholls. Her first degree was in mathematics, which led her into a career as a credit risk analyst, but her ambition has been to go into aerospace materials engineering. The MSc course on materials science and engineering that she is studying at the University of Leeds will help her achieve this goal. The course caters specifically for students wanting to convert to materials engineering from other backgrounds.

As part of the Academy's work to enrich and maintain standards in qualifications and curricula in the further education sector, Academy representatives sit on a number of advisory committees for awarding organisations. These include the qualifications awarding body OCR's focus group for its Level 2 Technicals in Engineering qualification and Pearson External Stakeholder Advisory Groups

for its Nationals (Level 3) engineering courses as well as for Higher Nationals (Levels 4 and 5) in construction.

A new scheme for further education colleges has been launched. Visiting Teaching Engineers embeds engineers and technicians into courses so that both industry and academia can create rich and contextualised curriculum content for full-time students.

Visiting Professors

The Academy's Visiting Professors (VP) scheme is a highly valued industry-into-academia initiative to enhance both student learning and the employability of engineering undergraduates at UK universities. The

Academy's VPs play a key role in embedding an industry-focused teaching approach into the academic environment.

In September 2015, 23 new VPs were appointed and many have gone on to develop both existing and new undergraduate courses. Keith Clarke CBE HonFREng, an Academy VP, played a key role in organising Aston University's Carbon Week in November 2015. Over 2,000 undergraduate students from across the university and 200 industry guests participated in this week-long programme of activities. As well as focusing on student employability, the week was designed to improve understanding of the challenges posed by climate change and the requirements of a low-carbon economy.



Keith Clarke CBE HonFREng, Visiting Professor in sustainability, gives a presentation to students on the first day of Aston University's Carbon Week



© Sharron Wallace

Students take part in the Engineering Leadership Advanced Awards selection event

Bursaries and professional development

The Academy's Engineering Leadership Advanced Awards programme identifies and supports outstanding engineering undergraduates with the potential to become future leaders in industry and act as inspiring role models for the next generation of engineers. Over the past year, 35 award holders each received £5,000 to undertake an accelerated personal development programme, along with an annual training weekend and mentorship.

In September 2015, four Petrofac/Royal Academy of Engineering Fellowships were awarded, with recipients each given a £9,000 bursary towards an eligible full-time master's-level course at a UK university. Additional learning and development opportunities are provided by Petrofac, including a company-sourced major project, a mentor and a work placement.

Eight new Panasonic Trust Fellowships were awarded to graduate engineers during the year. This scheme supports and facilitates the professional development and technical upskilling of UK-based engineers by providing funding for the pursuit of full-time master's degree courses in the following fields: environmental technology, energy, sustainable development, natural resources, materials, and the built environment.

The Academy has continuously championed the importance of developing industrial leaders who will drive UK growth in the future. With a grant from the Gatsby Charitable

Foundation, and the personal support of Lord Sainsbury, the Academy has enabled more than 300 exceptional engineering graduates to attend the world's most prestigious business schools over the past 30 years. Nine new awards were made during the year. Following the completion of their MBA, the awardees will be supported by an extensive network of Sainsbury Management Fellowship (SMF) alumni, now managed by the SMF charity. The Academy hosted a reception in January 2016 to celebrate the relationship between the Academy, SMF awardees and the Gatsby Charitable Foundation, which was addressed by Lord Sainsbury of Turville HonFREng FRS, the President, Dame Ann Dowling, and David Falzani, President of the SMF charity. SMF alumni also play a key role in supporting a wide range of Academy

activities including the Engineering Leadership Advanced Awards.

Diversity and inclusion

The first phase of the Academy's diversity programme ended in March 2016. The programme included a number of initiatives, both Academy-led and with various stakeholders. Findings from an evaluation study by EY suggest that it has strongly supported employers, employer-led organisations and professional engineering institutions in increasing and embedding diversity in their organisations.

For over a year, the Academy has collaborated with a number of engineering employers



As part of the Engineering Engagement Programme, engineering students attend a fast-track workshop where they can meet potential employers and learn about companies' recruitment practices

Support and promotion of engineering education

The Academy provides both a physical and an intellectual forum for the engineering profession to discuss key issues.

A high priority for the profession is the creation of an education system that supports the formation of engineers at

all levels. The Academy-hosted alliance, Education for Engineering (E4E), brings together the 35 professional engineering institutions, the Engineering Council and EngineeringUK to discuss important issues and shape a common view on education and skills. Topics have included:

- Apprenticeships: E4E has responded to consultations and select committee inquiries on various aspects, including funding, quality assurance and protecting the title 'apprentice'.
- Engineering qualifications and enabling subjects: new GCSE and A-level content is being introduced, the English Baccalaureate is growing in influence, and the recruitment of trainee design and technology teachers is very low. All these areas have been covered by E4E in responses to government and Parliament.

- Careers guidance: the newly announced Careers & Enterprise Company will be an important part of the education landscape. E4E is working with organisations, such as Tomorrow's Engineers and STEMNET, to ensure that technical expertise is included.

Work to implement the recommendations of the 2013 *Perkins' Review of Engineering Skills* has focused on continuing professional development for teachers, work experience for students, engineering employer engagement in further education, and placements and other employer support for engineering higher education. E4E has worked with organisations such as the Engineering Professors' Council and the National Centre for Universities and Business to share information and practical guidance.

to create an Engineering Engagement Programme (EEP) aimed at attracting undergraduates from diverse backgrounds into employment in engineering. The Academy has hosted some 160 students on a combination of summer school and engineering fast-track workshops. Following positive feedback from both students and employers, the EEP will continue to run as a pilot for the next two years.

In November 2015, the Academy's Diversity Leadership Group (DLG) launched a toolkit developed with and for employers, *Increasing diversity and inclusion in engineering*, that features 17 case studies from 16 organisations to encourage greater diversity and inclusion in the profession. A benchmarking survey report in 2015 revealed that while many UK companies are already engaged in driving better gender balance in engineering, more work is needed in promoting ethnicity, sexual orientation and disability diversity. The launch event was attended by more than 100 stakeholders and publicised substantially on social media.

The Academy continues to work with InterEngineering and Stonewall to help attract, support and retain LGBT engineers in the workplace. In February 2016, the Academy co-sponsored an event at the House of Commons to mark the launch of a report, *Engineering Action: Tackling Homophobia in Engineering*, which is jointly authored by Alec Shelbrooke MP and Dr Mark McBride-Wright, chair and co-founder of InterEngineering. The report shows that over half of LGBT people in engineering are choosing not to disclose their sexuality through fear of homophobia and concerns about the impact on their professional careers of coming out. At the launch event, attendees were able to discuss the problem of homophobia and transphobia



Engineering students take part in a speed networking event at the Engineering Uncovered Summer School, the first phase of the Engineering Engagement Project



Delegates at the launch of the Academy's Diversity Toolkit

in the sector and ways in which engineering institutions could help eradicate it.

In March 2016, the Academy celebrated the women engineers in its Fellowship with

the launch of a page on its website to mark International Women's Day. Featuring profiles of 43 of the Academy's women Fellows, the project was well received and generated extensive media coverage.

Position engineering at the heart of society

The Academy's external affairs activities aim to position engineering at the heart of society by improving public awareness and recognition of the crucial role of engineers and by changing the language used to talk about engineering to better reflect its breadth and appeal.

Communications activities have grown steadily during the year, with an increase in media coverage, audiences engaged with the Academy through social media and readers of *Ingenia* magazine. A particular highlight was Chairman of the Queen Elizabeth Prize for Engineering Foundation and Past President Lord Browne FREng FRS's interview with Senior Fellow HRH The Duke of Edinburgh on BBC Radio 4's *Today* programme in January 2016. The Senior Fellow's comment that "everything not created by God was created by an engineer" was widely reported in national press, including a leader in *The Daily Telegraph* on the subject of how Britain should take pride in its engineering track record.

Past President Lord Browne FREng FRS talks to HRH The Duke of Edinburgh for BBC Radio 4's *Today* programme

Engaging through the media

Media coverage generated by the Academy continued to grow. This year, material produced by the Academy has appeared in print, on TV and radio, and online more than 3,000 times.

Over 250 news stories mentioned the New Year Honours for Fellows, in particular the President, Sir James Dyson FREng and Lord Darzi HonFREng, who were admitted to the Order of Merit. A leader in *The Times* described all three as 'richly deserving'.

Innovation is a central theme of Academy



MacRobert Award winners Artemis Intelligent Power receive their gold medal from HRH The Duke of Edinburgh and the President

Academy awards evening

In July 2015, the President was joined by over 400 guests to celebrate the best in UK engineering at the Academy's annual Awards Dinner. The event was held at the Landmark London and was attended by Fellows and leading engineers and their guests. The keynote address was delivered by His Excellency The Hon. Matthew Barzun, the US Ambassador to the UK.



The evening culminated in the announcement of the UK's most prestigious prize for innovation in engineering, the MacRobert Award. HRH The Duke of Edinburgh presented the prize to the winning team from Artemis Intelligent Power for the innovation of its Digital Displacement hydraulics power system.

A number of prizes were presented throughout the evening including the Silver Medals to three recipients who have made outstanding contributions to UK engineering (see page 11) and the Colin Campbell Mitchell Award, given to University College London's Optical Networks Group

for its pioneering contributions to optical communications technology. The Rooke Award was presented to Dr Hugh Hunt for his outstanding contribution to the public promotion of engineering through a wide and varied range of activities across education, television and radio.

The President's Medal was awarded to Sir Richard Olver FREng for his exceptional contributions to the Academy's work, particularly in engineering education. The Major Project Award was given to a team from Atkins for the delivery of the Highlands & Islands Superfast Broadband project.

communications. Dame Sue Ion DBE FREng introduced the finalists for the 2015 MacRobert Award on the *Today* programme and they received wide coverage including in outlets such as British Airways *Business Life* inflight magazine.

The Academy celebrated International Women's Day 2016 with promotion through social media of profiles of 43 female Fellows (see page 17). Dame Sue Ion was the castaway on BBC Radio 4's *Desert Island Discs* and the President wrote in *New Scientist* on the importance of recruiting more women to the profession.

The Academy policy study, *A critical time for UK energy policy*, received over 70 pieces of media coverage, including in the *Guardian*, the *Independent* and an appearance by David Clarke FREng on Radio 4's *Today* programme.

Dr Rhys Morgan, Director of Engineering and Education, became a presenter on Yesterday Channel's new series *Impossible Engineering*,

now in its second series with over 400,000 viewers.

The Academy's social media communities have also continued to grow, reaching over 13,000 followers on Twitter, more than 900 likes on Facebook and 6,900 followers on LinkedIn.

Public affairs

Following the 2015 general election, the Academy was proactive in meeting new ministers and their advisers, as well as members of both Houses of Parliament. Topics discussed included the comprehensive Spending Review, the engineering skills crisis and the contribution of engineering innovation to UK economic growth. In November 2015, the newly appointed Chair of the Commons Science and Technology Committee, Nicola Blackwood MP, visited the Academy to address the Trustee Board and former members of Council about her vision for her new role. In February 2015, the Academy held a meeting

with government chief scientific advisers to discuss shared goals and continue to build a productive working relationship.

The Academy joined the other national academies in hosting roundtable meetings at the Conservative, Labour and Scottish National Party conferences in September and October 2015. These events focused on the relevance of research and innovation to enhanced UK productivity, and were well attended by ministers, select committee chairs and other parliamentarians.

The Academy provided evidence to a number of select committee inquiries and government consultations. In May 2015, the Academy's Head of Policy, Dr Alan Walker, appeared before the Economy, Energy and Tourism Committee of the Scottish Parliament to discuss energy security. In July, Professor Ric Parker FREng and the presidents of the other national academies appeared in front of the Commons Science and Technology Committee to discuss the importance of



At a glance

Event highlights

May 2015

Cornflour, ketchup and parts for cars – East Midlands Regional lecture hosted by Loughborough University.

June 2015

Summer Soirée and Exhibition – 100 years of engineering excellence, hosted by Babcock International at Rosyth Dockyard in the presence of Royal Fellow HRH The Duke of Kent.

September 2015

Fellows' Day and 39th AGM – a special event for Fellows on the day of the 39th annual general meeting, highlighting the Academy's recent and current work.

October 2015

Innovation in agri-tech – showcasing a selection of some of the most recent advances in agri-tech.

November 2015

Creating underground infrastructure – the role of geotechnical engineering – Hinton Lecture delivered by Professor Lord Mair CBE FREng FRS.

Early development of the Rolls-Royce RB211 Turbofan engine – East Midlands Regional lecture by Philip Charles Ruffles CBE FREng FRS.

December 2015

In conversation with 2015 MacRobert Award Winners: Artemis Intelligent Power – pioneering new Digital Displacement® technology.

January 2016

Engineering forever – New Year Reception lecture given by Philippe Mellier, Chief Executive of De Beers Group.

March 2016

Health and safety: the journey back to common sense and personal responsibility – lecture by Dame Judith Hackitt DBE FREng as part of the *View from the top* series.

continued investment in UK research and innovation. In October 2015, Allan Cook FREng, Academy Vice President, appeared before the Department for Business, Innovation and Skills (BIS) Committee to discuss the relevance of engineering to UK productivity. In January 2016, Professor Parker gave evidence to the Lords Science and Technology Committee on the relationship between EU membership and the effectiveness of science, research and innovation in the UK. In February, the President attended a seminar of the Commons Science and Technology Committee to inform its submission to the March Budget.



Ingenia

The Academy's quarterly magazine *Ingenia* reaches a broad audience including school pupils, Fellows and opinion leaders. It is circulated in hardcopy to around 11,000 recipients, including opinion formers and all secondary schools that teach science in the sixth form, as well as being viewed 145,000 times online. The latest *Ingenia* readership

survey results found that each hard copy of the magazine is typically read by a further three people in addition to the subscriber, and 96% of readers rated the content as either good or very good.

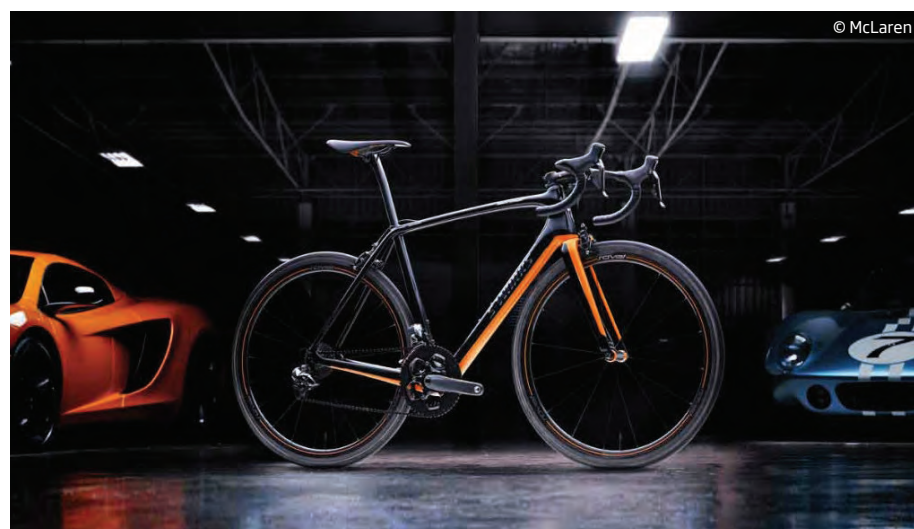
Ingenia publishes articles that cover the full spectrum of engineering and profiles of engineers across all disciplines. Over the past year, its articles have celebrated 50 years of tribology, explained how precision farming can increase the efficiency and yield of crops, and investigated what makes a good roller coaster.

The accompanying series of *Ingenia Live!* events, aimed at younger audiences, has covered a range of topics from the magazine. In November 2015, the second *Ingenia Live!* event explored how advanced engineering and novel materials are being used to make sports equipment faster, lighter and stronger. *Ingenia*'s Editor-in-Chief Dr Scott Steedman CBE FREng chaired the event, and the speakers were Dan Chambers, Co-founder and Director of Draft Wheelchairs Ltd., and Dr Caroline Hargrove, Technical Director of McLaren Applied Technologies.

Ingenious

The *Ingenious* public engagement grant scheme aims to develop engineers' communication and engagement skills by encouraging them to share their engineering stories, passion and expertise with members of the public in innovative ways. Funded by BIS since 2006, the scheme made awards to 23 projects in 2015.

Projects that ran over the last year ranged from location-specific initiatives that increased awareness of an area's engineering heritage to nationwide design competitions. One such project, *Back Then*, explored engineering in Sheffield's past and present through art. It brought together 20 engineers



This McLaren-designed bicycle is an example of how innovative engineering and materials are being used to create faster, lighter and stronger sports equipment, as discussed at *Ingenia Live!*

BIS exhibition: raising awareness of innovation

The announcements of the MacRobert Award finalists and winners have, for several years, been highlights in the Academy's communications calendar and present opportunities to raise awareness of innovation and the social impact of engineering. This year was no exception.

As well as widespread media coverage of the announcements, the MacRobert finalists also featured in a month-long exhibition in the foyer at BIS. The exhibition included a scale model of a wind turbine and an electronically controlled pump that showcased the Digital Displacement technology developed by MacRobert Award winner, Artemis Intelligent Power. Also featured was a working display from healthcare



Minister for Universities and Science, Jo Johnson MP, and the President view the MacRobert Award exhibition at BIS

company Endomag, which is responsible for pioneering the development of an alternative method of breast cancer diagnosis. The third stand demonstrated the properties of Victrex's ACTIV film, which has made smartphone speakers smaller and thinner without compromising reliability or sound quality. ACTIV film is now used in 70% of smartphone speakers worldwide.

Visitors to the exhibition in the BIS foyer over the month of June 2015 included policymakers, representatives from industry and the Minister for Universities and Science Jo Johnson MP. The display emphasised how the Academy and BIS work closely together to promote growth through UK-based innovation.

and five community groups, including a parents' group, a primary school and residents in sheltered housing, to curate an exhibition of photography, painting and sculpture that explored the impact of engineering on the local community and the challenges it might help them address in the future.

Ingenious also funded the UK Space Design Competition, which gave secondary school students the opportunity to take part in a design simulation working in a large industrial team. Students were tasked with designing a space settlement for up to 10,000 inhabitants, taking into account factors such as structural engineering, entertainment and food production.

The *Ingenious* scheme continues to be the lead public engagement scheme in the profession. Results from the most recent long-term tracking survey of engineers who participated in *Ingenious* projects show that, while 46% had no prior public engagement experience, almost 70% had gone on to participate in additional public engagement activities after taking part in the scheme.



A visitor enjoys the *Ingenious*-funded Back Then exhibition, which explored Sheffield's engineering heritage



FEATURED FELLOW

Dame Judith Hackitt DBE FEng, Chair of the EEF, was appointed Chair of the External Affairs Committee and delivered a *View from the top* lecture about her involvement in re-establishing the reputation of the Health and Safety Executive, where she was Chair for eight years.



Dr Robert Langer receives the Queen Elizabeth Prize for Engineering trophy from Her Majesty The Queen at a ceremony at Buckingham Palace

Celebrating engineering – Queen Elizabeth Prize for Engineering

The Queen Elizabeth Prize for Engineering is an international £1 million prize that rewards and celebrates engineers responsible for a groundbreaking innovation that has been of global benefit to humanity.

In February 2015, the judges announced that the 2015 Queen Elizabeth Prize for Engineering (QEPrize) would be awarded to Dr Robert Langer, a chemical engineer who has made revolutionary advances and is a world leader in engineering at the interface with chemistry and medicine.

The award of the second QEPrize generated remarkable international media coverage from outlets including the wider BBC networks, *The Times*, the *Washington Post*, *China Daily* and the *Times of India*. Together, this media activity has brought news of the QEPrize to a global audience of more than 1.25 billion people.

Dr Langer received the QEPrize trophy

from HM The Queen in October 2015 during a ceremony at Buckingham Palace. The ceremony attracted international representation, with ambassadors and high commissioners from countries including the United States, China, Japan, Germany, South Korea, South Africa, Singapore and India in attendance. They were joined by senior business leaders from the QEPrize donor companies, including BG Group, GSK, Jaguar Land Rover, National Grid, Nissan, Sony, Tata Steel, Tata Consultancy Services and Toshiba, and young engineers from the QEPrize Engineering Ambassadors Network.

The day also marked the release of the first QEPrize report, *Create the Future*. The report revealed the changing nature

of perceptions of engineering across 10 key markets, including the USA, Germany, Japan, Turkey, India and Brazil, and provided insights into the differences in these perceptions between countries. The report also featured expert commentary from leaders in the fields of commerce, science, academia, and the full breadth of engineering disciplines.

Engagement with the 13 QEPrize donor companies continued throughout the year. Some 100 guests attended an evening audience with the Chief Executive of Siemens, Juergen Maier, and keynote interviews have taken place with the leaders of BP, Shell and BAE Systems.

Lead the profession

The Academy's engineering policy activities are focused on five strategic priority areas: energy and environment; infrastructure and transport; manufacturing; biomedical engineering and healthcare; and digital systems.

Each of these policy areas is considered to be essential and work has either been completed or is ongoing in all of them. Alongside these areas, work that supports the Academy's overall strategy is also undertaken, as well as a specific role in advising government in policy areas related to engineering. The Academy has close links with BIS, the Government Office for Science (GO Science) and the Department of Energy and Climate Change (DECC).

Infrastructure and transport

This year, two significant reports were published on the infrastructure and transport sectors. The first was the report *Built for living*, published in July. Produced jointly with Arup and the Economic and Social Research

Council with support from the Royal Institute of British Architects (RIBA), University College London and the University of Leeds, this report explored the relationship between the design of the built environment and human behaviour, as well as the implications for design practice, research and policymaking. It followed a series of three workshops, hosted by the Academy, RIBA and Arup, that explored ways in which the design of the built environment can have a significant impact on resource use (in particular, energy, water and waste), health and wellbeing, and performance and productivity.

The report highlighted how design and human behaviour are interlinked and that stakeholders need to collaborate to capitalise on what is already known about both.

An Arup Realtime synthetic environment simulates navigation of a railway station





At a glance

Responses to consultations and inquiries

April 2015

Response to the *Nurse review of research councils*.

July 2015

Responses to the House of Commons Environmental Audit Committee on the environmental risks of fracking and the British Academy's Consultation on Interdisciplinarity.

August 2015

Responses to the House of Commons Energy and Climate Change Committee on priorities for holding government to account and the House of Commons Science and Technology Committee on the science budget.

September 2015

Response to the House of Commons Science and Technology Committee on the big data dilemma, an *Engineering the Future* response to the Business, Innovation and Skills Select Committee on the government's productivity plan, and a joint academies submission to the Migration Advisory Committee's Review of Tier 2.

November 2015

Response to the House of Lords Science and Technology Committee on the relationship between EU membership and UK science.

January 2016

Response to BIS on higher education: teaching excellence, social mobility and student choice.

February 2016

Responses to the House of Commons Business, Innovation and Skills Committee inquiries on access to finance and on the proposed integration of Innovate UK into Research UK. A joint academies letter to government regarding recommended changes to the Tier 2 visa route.

March 2016

Response to Lord Stern's Review of the Research Excellence Framework Submission.

Digital systems

In 2015, the Academy focused on the subject of digital systems, an increasingly vital sector of the economy with impact across all areas of engineering.

Connecting data: driving productivity and innovation was a joint report between the Academy and the Institution of Engineering and Technology, published in November 2015. It explored how the UK can create a 'data-enabled' economy through the use of data analytics (more colloquially 'big data'), supported by data science and advanced data connectivity. It was based on evidence from stakeholder workshops that were run between November 2014 and June 2015 for seven sectors: advanced manufacturing; built environment; energy; transport; health; aerospace and defence; and insurance.

The findings suggested that the area is still largely immature, but has pockets of excellent practice. The UK is strongly placed to develop a leading data-enabled economy, although it will need to address barriers to remain competitive internationally. Recommendations include: the deployment of best engineering practice to new areas such as software development; investment in broadband services equivalent in

A number of ways to improve design outcomes were suggested, including that design should be undertaken from a systems viewpoint. It recommended that user input should be sought from the start of the process, and that a multidisciplinary team including designers, social scientists and engineers should work together using an iterative process, with interdisciplinary feedback. Case studies within the report illustrated the various research methods, tools and techniques that can be used to inform or support this kind of approach to the design of the built environment.

Transport congestion was the subject of the Academy's first 'challenge paper'. This is a new format that allows Academy Fellows with particular expertise to explore challenging issues of interest, and then produce an evidence-based expert view on an issue where consensus on a policy position might prove difficult to achieve.

The resulting paper, *The transport congestion*



performance to EU targets; investigation of methodologies that allow the value of data assets to be formally recognised; the development of appropriate industry standards; and the exploration of mechanisms for creating markets in data. To facilitate this, it will be important to share best practice and nurture the relevant multidisciplinary skills, in order to address the severe shortage of engineers with data science skills and specialist data scientists.

Work continues to build on the findings of this report, particularly in the areas of cyber safety and resilience, and the valuation of data.

challenge, addressed the growing problem of congestion on the UK's road and rail networks. It assessed the technical practicality of various measures to get more out of them, either to buy time before new infrastructure can be delivered or as the most effective means of optimising existing capacity. Led by a number of Fellows who are experienced transport practitioners and academics, it focused on the costs and congestion reduction potential of the different measures and identified 18 'frontrunners' that offer the best value for money.

It recommended that government should develop an integrated strategy for tackling road and rail congestion, and that such a strategy must maximise the impact of any measure by carefully packaging different technologies and policy measures together. It found that, of all the available interventions considered, efficient pricing on the road network offered the single best way of tackling congestion. The paper recognised that this was not currently in favour with policymakers or the public, but that a well-

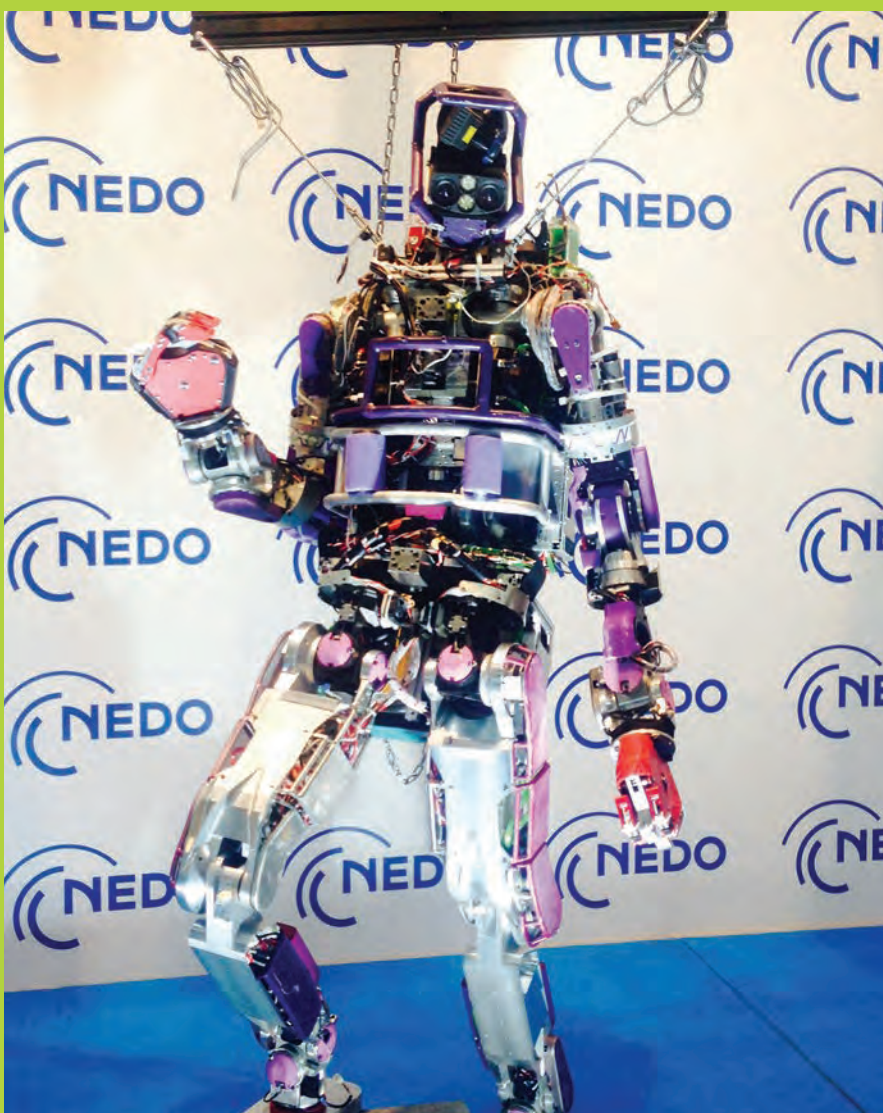
International activities

The Academy has been involved in a wide range of activities across the world, working with national academies, international governments and commissions, and even mixing with global superstars. This activity has seen it influence international and European policy, and contribute to engineering solutions to worldwide challenges.

Last year, the Academy extended its policy reach internationally through a number of missions and events, including an innovation workshop in China on the theme of advanced manufacturing; a robotics mission to Japan jointly organised with UK Trade & Investment; and an inward visit from the Korean National Academy of Engineering on the theme of encouraging technology entrepreneurship that coincided with the Academy's Enterprise Hub open day. In June 2015, the Academy led a UK delegation to a high-level symposium on air quality in Beijing, as part of its ongoing collaboration on the issue with the Chinese government. This has influenced the scope and purpose of Chinese legislation.

Through its membership of the European federation of national engineering academies, Euro-CASE, the Academy also helped facilitate the creation of a new European Science Advice Mechanism. This aims to provide the European Commission with transparent advice that is independent of institutional or political interests, brings together evidence and insights from different disciplines and approaches, and takes into consideration the specificities of EU policymaking. Euro-CASE and four other partner networks of science academies will be integral to this new mechanism.

In September 2015, eight Academy Fellows and awardees spoke at the second Global Grand Challenges Summit, hosted by the Chinese Academy of Engineering in Beijing. This is part of a three-year collaboration between the UK, USA and Chinese national academies on the contribution that engineering can make to meeting common global challenges. Highlights of the event included Enterprise Fellow Jack Cohen discussing his virtual reality innovation on a panel alongside musician and technology enthusiast will.i.am.



Advanced robotics technology on display during the Academy's robotics mission to Japan with UK Trade & Investment



Enterprise Fellow Jack Cohen (second from left) shares a panel that includes musician will.i.am, at the Global Grand Challenges Summit in Beijing

designed system could attract popular support and achieve substantial reduction in levels of congestion.

Both these reports were well received and work continues to develop their main themes.

Manufacturing and industry

Policy work in the area of manufacturing and industry focused on innovation and enterprise. Two events were held focusing on **innovation**: *Innovation in autonomous systems* in June 2015 and *Innovation in agri-tech* in October 2015. Both were well attended and featured presentations from those currently active in bringing innovations to market in the respective fields.

The case for continued investment in the UK research base as a means of fuelling future prosperity was the subject of the *Investing in innovation* report launched in September 2015. This report highlighted the need to focus on UK innovation investment and performance in order to ensure that the most is made of the potential in the research base and that the UK can continue to compete globally. It concluded that a clear and robust commitment to targeted, coherent and stable support – both direct and indirect – is essential if the government is to meet its ambition to tackle the productivity challenge and secure the UK's position as one of the richest economies in the world.



The report *A critical time for UK energy policy* looked at what was needed to secure a sustainable future energy supply for the UK, including low-carbon electricity-generating technologies such as offshore wind power

Energy and environment

In October 2015, the report *A critical time for UK energy policy: what must be done now to deliver the UK's future energy system* was launched. This was the third in a series of studies on energy for the Prime Minister's Council for Science and Technology.

The report assessed the actions needed now to secure a sustainable future energy supply for the UK. By considering what the models suggest as the most likely evolution of the system and how this compares with the expectations of industry stakeholders, the working group laid out what it saw as the main risks to delivering against the energy 'trilemma': cost, security and decarbonisation. Overall, it was found that delivery of the UK's future energy system is under serious threat. Substantial investment is needed, costs are likely to rise and decarbonisation must be realised across multiple interconnected sectors where the full technical solution is not yet obvious. The main recommendations are to:

- undertake local or regional whole-system, large-scale pilot projects to establish real-world examples of how the future system will work
- drive forward new capacity in the three

main low-carbon electricity-generating technologies: nuclear, carbon capture and storage, and offshore wind

- develop policies to accelerate demand reduction, especially in the domestic heat sector
- clarify and stabilise market mechanisms and incentives in order to give industry the confidence to invest.

Healthcare and biomedical engineering

The healthcare and biomedical sectors are significant areas of interest for the Academy. Through the Panel for Biomedical Engineering, a multi-institution committee hosted by the Academy, there is a programme of work that includes a biennial two-day event for early-career researchers to showcase their work with opportunities for mentoring and guidance on scientific and professional opportunities from selected experts. The next event will be at Imperial College London on the subject of *Medical imaging and interventions: engineering a better look at cancer*.

The Academy has begun a major study that will consider how engineering systems thinking can help to deliver greater efficiency



Professor Jim Norton FEng, board member of UK Parliamentary Office of Science and Technology and special adviser to the Culture, Media and Sport Select Committee, is a member of the Engineering Policy Committee and was the lead author of the *Connecting data* report.

FEATURED FELLOW



An Academy study into how engineering systems thinking can help deliver greater efficiency in UK healthcare aims to show how engineering can contribute to addressing the challenges of limited resources and budget within the health and social care sector

within the UK's health and social care system while it faces growing resource challenges and a limited central budget. It is hoped that

this study will show how engineering can contribute to addressing one of the major challenges facing society today.

Engineering the Future

Engineering the Future (EtF) is the name of the overarching programme hosted by the Academy to bring together the professional engineering institutions (PEIs), the Engineering Council, and EngineeringUK on key areas of policy. One strand of this work is Education for Engineering (see page 17), while another is focused on the overall policy environment for engineering.

EtF's work on engineering policy addresses complex areas such as energy, transport, climate change, flooding, big data, and innovation. Wherever possible, the PEIs come together under EtF and agree common positions on these important areas that are of great importance to society.

In the past year, there has been a great deal of focus on the government Spending Review and the potential impact of changes to funding. EtF submitted information to the Treasury ahead of the Spending Review that articulated how engineering contributes to the whole of the UK economy and to each of the government's Spending Review priorities. The government is looking for ways to improve efficiency in areas such as local government and the health service, and engineering can provide both the technical support and the 'habits of mind' necessary to achieve this. The EtF submission made a

strong case for government spending that supports engineering as a key enabler for government priorities.

Following the publication of *The Universe of Engineering: A call to action* in October 2014, the EtF group has taken each of the recommendations and formulated action to address them. Some are covered by other initiatives, such as the Engineering Talent Project (see page 15), while others require PEIs to give serious consideration to their membership offer and how they work with other organisations. This work is being coordinated through EtF, with individual organisations leading on particular recommendations. The Chair of EtF, Sir Terence Morgan CBE FREng, is active in many industry and education groups that are also involved in government initiatives, giving EtF a valuable insight into emerging priorities and issues.

Greatly enhance the Academy's delivery capability

Prince Philip House building plans

In early 2016, the final phase of the refurbishment of Prince Philip House began. Work started on remodelling of the basement and mezzanine to accommodate the Enterprise Hub in a contemporary environment conducive to the mentoring and networking activities of the Academy's enterprise programmes. Wright & Wright, the Academy's architect, produced some exciting designs for a practical space based on the Academy's needs. At the same time, a modern kitchen will be installed to replace the

current facility, which is almost 30 years old. Building work will be completed by the end of November and the new kitchen will be in place by Christmas 2016.

Development

In the last year, the Academy secured £2.8 million in new commitments for education, engagement, enterprise and research programmes. Support came from corporates, charitable foundations and individuals, including Fellows. The continuing



An artist's visualisation shows how the lower ground floor will look after the redevelopment of Prince Philip House



Richard Williams, Vice President of Fellowship Engagement

The Fellowship is the heart of the Academy and a better level of engagement with a greater number of Fellows serves to advance the Academy's aims and strategic objectives.

Professor Richard Williams OBE FREng, Principal and Vice-Chancellor at Heriot-Watt University, became the first Vice President for Fellowship Engagement in September 2014, following a comprehensive review of the Academy's governance structure and procedures.

Professor Williams has since initiated and led a number of Fellowship-focused activities.

An all-Fellows survey was conducted in spring 2015 to garner Fellows' views and suggestions on Fellowship engagement. This identified a number of areas that the Trustee Board will address, including the

imperative for the Academy to ensure its primary role to lead the national debate on engineering policy and the economy even more strongly.

Broadening the regional footprint of Academy activity is a key strand of Fellowship engagement that is also being addressed. The Academy piloted a regional champions model, whereby Fellows around the country would be supported in organising activities in their local area. This has already successfully been introduced in the East Midlands, South West and the North East, with future regional activity taking place in the North and North West of England.

Regular lunches for Fellows are now held all over the UK so that Fellows outside London can participate more easily in supporting, and engaging with, the Academy.

The first Academy Fellows' Day at Prince Philip House in September 2015 attracted great interest from the Fellowship. It enabled Fellows to see the work being undertaken by other Fellows and Academy staff to advance and promote engineering. It also gave them the opportunity to meet the Trustees and staff in a more informal setting, and to network with one another.

generosity of all donors and supporters is greatly appreciated, as is the assistance of the Development Advisory Board, chaired by Ian Barlow.

International programmes received major support during the year: the Anglo American Group Foundation awarded a multi-year grant to expand the Academy's work in sub-Saharan Africa to improve engineering teaching standards and strengthen links between industry and academia; and the UK

Foreign and Commonwealth Office supported enhanced training for the Africa Prize for Engineering Innovation finalists. In the UK, six major engineering employers – Airbus, Babcock International, BAE Systems, GKN, Jaguar Land Rover and National Grid – all provided support for the Engineering Talent Project, which the Academy is coordinating.

Petrofac provided additional support to expand the Academy's *Connecting STEM Teachers* network, which is now active in

some 15% of all UK secondary schools. The Sir John Fisher Foundation supported the Academy's STEM support programme in Barrow-in-Furness for a fourth consecutive year, and a grant from The Ogden Trust helped launch a similar initiative in Lowestoft. These regional support programmes aim to encourage more young people from a diverse range of backgrounds to become engineers. In further education, the Motorola Solutions Foundation made possible a new round of female Visiting Teaching Engineers to help



At a glance

Examples of new funding

Enterprise

The Royal Commission for the Exhibition of 1851 provided funding for three Enterprise Fellowships per annum for engineering graduates.

Research

A Welsh National Research Network supported industrial secondments for engineering academics.

Education

Motorola Solutions Foundation granted funding for additional female Visiting Teaching Engineers in further education colleges.

Awards

The Worshipful Company of Engineers provided funding for five awards to early-career engineers demonstrating excellence.

International

The Anglo American Group Foundation awarded a further multi-year grant to improve engineering higher education in sub-Saharan Africa.

Annual Fund

Gifts from Fellows were allocated to three priority areas: international projects, Enterprise Hub and regional STEM education projects.

provide teaching support and mentoring in sixth forms and colleges, and act as valuable role models for women seeking to enter the engineering profession.

During the year, Schlumberger and Mathys & Squire LLP joined the Enterprise Hub's partnership programme, which along with Fellows' pro-bono support is helping to enhance and expand the Hub's activities.

Generous support from John Taylor FREng and a legacy from the late Geoffrey Argent FREng are helping create the dedicated facilities for the Enterprise Hub on the lower ground floors at Prince Philip House, illustrating the transformative impact major gifts can have on the Academy's development. The Academy has also launched *Build a Better World*, an initiative to develop legacy giving in the Fellowship that, together with lifetime giving, will help the Academy build on progress and achieve its ambitions.

Trading company

RAE Trading Limited (RAET), the Academy's trading subsidiary, provides high-quality catering for the Academy's events and meetings in Prince Philip House. RAET also markets Prince Philip House as an events venue primarily to the corporate sector. The company's success has continued into its third year and it generated revenues of £1.5 million from which it will gift aid more than £400,000 to the Academy. RAET has temporarily ceased trading during the final phase of the development of Prince Philip House but will reopen in January 2017 with the significant benefit of a new kitchen.



© Aerograft

Aerograft, a spin-out company from University College London supported by the Enterprise Hub, has developed a novel bone graft substitute that could transform dentistry, enabling new bone graft substitutes to integrate into chipped or damaged teeth and potentially achieve 95% integration with the surrounding bone in just three months



FEATURED FELLOW

Malcolm Brinded CBE FREng, Chairman of the Shell Foundation, is chair of the Africa Prize for Engineering Innovation and an active member of the International Committee and the Development Advisory Board.

New Fellows 2015

The Academy's Fellows represent the nation's leading engineering researchers, innovators, entrepreneurs, and business and industry leaders. Each year 50 Fellows are elected by peer review from nominations made by existing Fellows. They are distinguished by the title Fellow of the Royal Academy of Engineering and the postnominal FREng. These were the new Fellows announced at the Academy's AGM in September 2015; their titles were correct at the time of their election.

Fellows



Professor Claire Adjiman FREng

Co-Director, Institute of Molecular Science and Engineering; Professor of Chemical Engineering, Imperial College London



Chris Allam FREng

Engineering and Programme Management Director, BAE Systems, Military Air and Information



Timothy Burnhope FREng

Chief Innovation and Growth Officer, JCB Group



Professor David Butler FREng

Professor of Water Engineering, University of Exeter



Professor Darwin Caldwell FREng

Research Director, and Director, Advanced Robotics Department, Italian Institute of Technology



Ivor Catto FREng

Independent consultant



Peter Chapman FREng

Barrister and arbitrator



Professor Anthony Cohn FREng

Professor of Automated Reasoning, University of Leeds



Professor Paul Collier FREng

Head, Beams Department, CERN



Professor Bob Cryan FREng

Vice-Chancellor and CEO, University of Huddersfield



Professor John Daugman FREng

Professor of Computer Vision and Pattern Recognition, University of Cambridge



Professor Rene de Borst FREng

Regius Professor of Civil Engineering and Mechanics, University of Glasgow; Consultant, Dassault Aviation, Paris



Vincent de Rivaz FREng

Chief Executive, EDF Energy



Professor Mohan Edirisinghe FREng

Bonfield Chair of Biomaterials, University College London



Professor Colin Garner FEng

Caterpillar-Royal Academy of Engineering Chair in Applied Thermodynamics, Loughborough University



Richard Goodwin FEng

Managing Director, Goodwin plc



Steve Harridge FEng

Consultant, Tony Gee and Partners LLP



Dr Chris Haynes FEng

Project Assurance Consultant, KazMinerals plc; Non-Executive Director, Woodside Petroleum Ltd, Perth and Non-Executive Director, WorleyParsons Ltd, Sydney



Dr Clive Hickman FEng

Chief Executive, Manufacturing Technology Centre (MTC)



Professor Karen Holford FEng

Pro Vice-Chancellor, Head of College of Physical Sciences and Engineering and Professor of Mechanical Engineering, Cardiff University



Dr Rick Jefferys FEng

Senior Research Director, University of Edinburgh; formerly Director of Strategy and Technology, ConocoPhillips, Alternative Energy



Dr David Knowles FEng

Director, Energy, Atkins



Bernard Looney FEng

Chief Operating Officer, Production, BP plc



Paddy Lowe FEng

Executive Director (Technical), Mercedes Benz Grand Prix Ltd



Jonathan Lyle FEng

Chief Executive, Defence Science and Technology Laboratory (Dstl)



John Mair FEng

Technology Director, Corporate, Subsea7



Colin Matthews FEng

Chairman, Highways England



Professor Barrie Mecrow FEng

Head of School, School of Electrical and Electronic Engineering, Newcastle University



Andy Mitchell FEng

Chief Executive Officer, Thames Tideway Tunnel Ltd



Dr Edward Morton FEng

Chief Technical Officer, Rapiscan Systems Ltd



Professor Robert Parkin FEng

Pro-Vice Chancellor (Research and Knowledge Transfer), University of Bradford



John Reece FEng

Chairman, Reece Group; Trustee, Reece Foundation; Trustee, Springfield House Trust



Professor Stephen Roberts FEng

Professor of Machine Learning, University of Oxford



Professor Daniel Rueckert FEng

Professor of Visual Information Processing, Department of Computing, Imperial College London; Consultant, IXICO; Scientific Adviser, Vision RT



Professor Mary Ryan FEng

Professor of Materials Science and Engineering, Imperial College London



Richard Sadler FEng

Company Director, RLS Fidelis Ltd



Professor Angela Sasse FREng

Professor of Human-Centred Technology and Director of the Science of Cyber Security Research Institute, University College London



Professor Nilay Shah FREng

Professor of Process Systems Engineering, Centre for Process Systems Engineering (CPSE), Department of Chemical Engineering, Imperial College London



Professor Constantinos Stavrinidis FREng

Head, Mechanical Engineering Department, European Space Research and Technology Centre, European Space Agency



Patrick Thomas FREng

Chairman and Chief Executive, Covestro



Professor Mark Tooley FREng

Head of Medical Physics and Bioengineering, Director of Research and Development and Consultant Clinical Scientist, Royal United Hospitals Bath NHS Foundation Trust; Visiting Professor, University of Bath and University of the West of England



Dr John Tubman FREng

Managing Director, Management Services and Defence, UK, Ireland and Continental Europe, AECOM



Professor Florin Udrea FREng

Professor, University of Cambridge; Chief Technical Officer, Cambridge Microelectronics Ltd and Cambridge CMOS Sensors



Professor David White FREng

Shell EMI Chair in Offshore Engineering, University of Western Australia, Perth



Ant Wilson FREng

Director, Sustainability and Advanced Design – Building Engineering, AECOM UK



Professor Michael Wisnom FREng

Professor of Aerospace Structures, University of Bristol; Director, Advanced Composites Centre for Innovation and Science (ACCIS); Director, Rolls-Royce Composites UTC



Professor Hua Zhao FREng

Vice Dean (Research) and Professor of Mechanical Engineering, College of Engineering, Design and Physical Sciences, Brunel University London

International Fellows



Dr Robert Care FREng

Principal, ACT and Strategic Geographies Leader, Arup Australasia



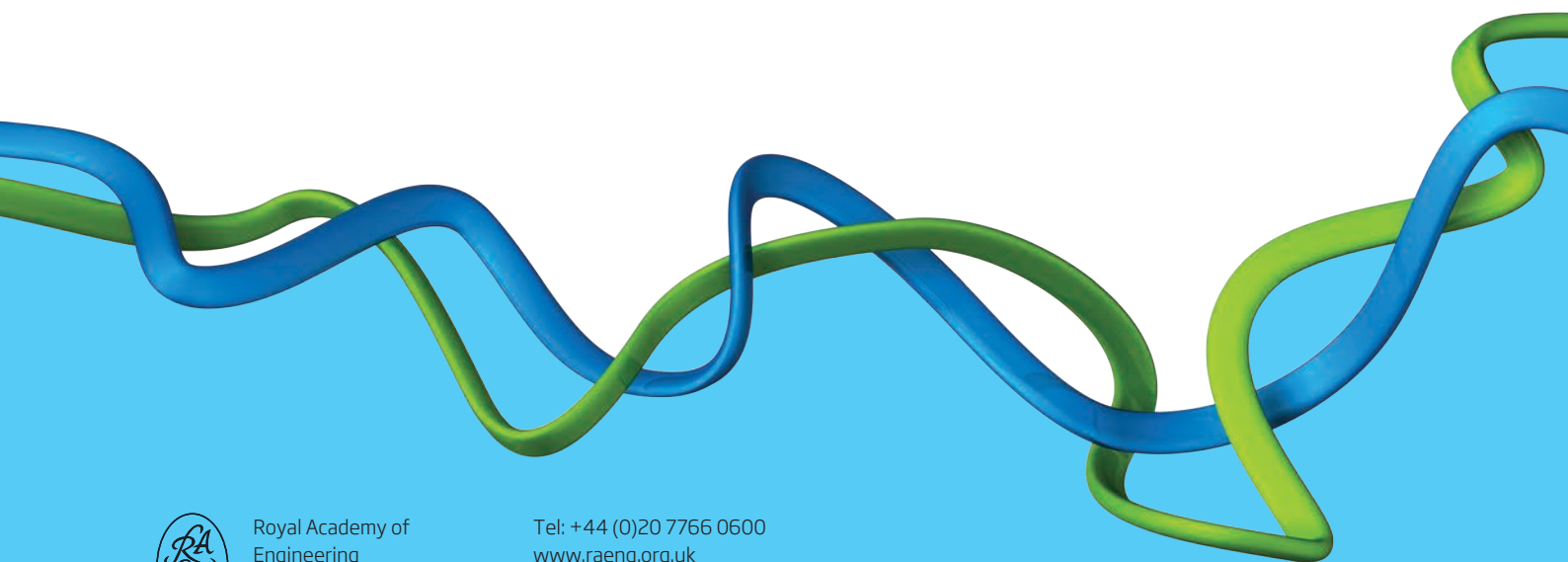
Professor Manfred Morari FREng

Professor of Automatic Control, Department of Information Technology and Electrical Engineering, ETH Zurich



Professor Scott Sloan FREng

Director, ARC Centre of Excellence for Geotechnical Science and Engineering, Newcastle University, Australia



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Annual **Review** Annex
2015/2016



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. Election to the Fellowship is managed by current Fellows of the Academy.

INTERNATIONAL FELLOWS

Elected in 2015 were:

Dr Robert Care

Principal, ACT and Strategic Geographies
Leader, Arup Australasia

Professor Manfred Morari

Professor of Automatic Control,
Department of Information Technology
and Electrical Engineering, ETH Zurich

Professor Scott Sloan

Director, ARC Centre of Excellence for
Geotechnical Science and Engineering,
Newcastle University, Australia

FELLOWS

Elected in 2015 were:

Professor Claire Adjiman

Co-Director, Institute of Molecular
Science and Engineering; Professor
of Chemical Engineering, Imperial
College London

Chris Allam

Engineering and Programme
Management Director, BAE Systems,
Military Air and Information

Timothy Burnhope

Chief Innovation and Growth Officer,
JCB Group

Professor David Butler

Professor of Water Engineering,
University of Exeter

Professor Darwin Caldwell

Research Director and Director,
Advanced Robotics Department, Italian
Institute of Technology

Ivor Catto

Independent consultant

Peter Chapman

Barrister and arbitrator

Professor Anthony Cohn

Professor of Automated Reasoning,
University of Leeds

Professor Paul Collier

Head, Beams Department, CERN

Professor Bob Cryan

Vice-Chancellor and CEO, University of
Huddersfield

Professor John Daugman

Professor of Computer Vision and
Pattern Recognition, University of
Cambridge

Professor Rene de Borst

Regius Professor of Civil Engineering
and Mechanics, University of
Glasgow; Consultant, Dassault
Aviation, Paris

Vincent de Rivaz

Chief Executive, EDF Energy

Professor Mohan Edirisinghe

Bonfield Chair of Biomaterials,
University College London

Professor Colin Garner

Caterpillar-Royal Academy of
Engineering Chair in Applied
Thermodynamics, Loughborough
University

Richard Goodwin

Managing Director, Goodwin plc

Steve Harridge

Consultant, Tony Gee and Partners LLP

Dr Chris Haynes

Project Assurance Consultant,
KazMinerals plc; Non-Executive
Director, Woodside Petroleum Ltd,
Perth and Non-Executive Director,
WorleyParsons Ltd, Sydney

Dr Clive Hickman

Chief Executive, Manufacturing Technology Centre (MTC)

Professor Karen Holford

Pro Vice-Chancellor, Head of College of Physical Sciences and Engineering, and Professor of Mechanical Engineering, Cardiff University

Dr Rick Jefferys

Senior Research Director, University of Edinburgh

Dr David Knowles

Director, Energy, Atkins

Bernard Looney

Chief Operating Officer, Production, BP plc

Paddy Lowe

Executive Director (Technical), Mercedes Benz Grand Prix Ltd

Jonathan Lyle

Chief Executive, Defence Science and Technology Laboratory

John Mair

Technology Director, Corporate, Subsea7

Colin Matthews

Chairman, Highways England

Professor Barrie Mecrow

Head of School, School of Electrical and Electronic Engineering, Newcastle University

Andy Mitchell

Chief Executive Officer, Thames Tideway Tunnel Ltd

Dr Edward Morton

Chief Technical Officer, Rapiscan Systems Ltd

Professor Robert Parkin

Pro-Vice Chancellor (Research and Knowledge Transfer), University of Bradford

John Reece

Chairman, Reece Group; Trustee, Reece Foundation; Trustee, Springfield House Trust

Professor Stephen Roberts

Professor of Machine Learning, University of Oxford

Professor Daniel Rueckert

Professor of Visual Information Processing, Department of Computing, Imperial College London; Consultant, IXICO; Scientific Adviser, Vision RT

Professor Mary Ryan

Professor of Materials Science and Engineering, Imperial College London

Richard Sadler

Company Director, RLS Fidelis Ltd

Professor Angela Sasse

Professor of Human-Centred Technology and Director of the Science of Cyber Security Research Institute, University College London

Professor Nilay Shah

Professor of Process Systems Engineering, Centre for Process Systems Engineering (CPSE), Department of Chemical Engineering, Imperial College London

Professor Constantinos Stavrinidis

Head, Mechanical Engineering Department, European Space Research and Technology Centre, European Space Agency

Patrick Thomas

Chairman and Chief Executive, Covestro

Professor Mark Tooley

Head of Medical Physics and Bioengineering, Director of Research and Development, and Consultant Clinical Scientist, Royal United Hospitals Bath NHS Foundation Trust; Visiting Professor, University of Bath and University of the West of England

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Managing Director, Management Services and Defence, UK, Ireland and Continental Europe, AECOM

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Shell EMI Chair in Offshore Engineering, University of Western Australia, Perth

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Director, Sustainability and Advanced Design - Building Engineering, AECOM UK

Professor Michael Wisnom

Professor of Aerospace Structures, University of Bristol; Director, Advanced Composites Centre for Innovation and Science (ACCIS); Director, Rolls-Royce Composites UTC

Professor Hua Zhao

Vice Dean (Research) and Professor of Mechanical Engineering, College of Engineering, Design and Physical Sciences, Brunel University London

Trustee Board

The Trustee Board comprises 13 Trustees elected by and from the Fellowship and is chaired by the President, Professor Dame Ann Dowling. The Trustee Board has co-opted Mr Ian Ritchie to serve as a Trustee for an additional year and to continue as Chair of the Finance Committee.

OFFICERS AND MEMBERS OF COUNCIL

Chair

Professor Dame Ann Dowling OM DBE FREng FRS, President

Vice Presidents

Allan Cook CBE FREng, Vice President
Committee Coordination

Professor Richard Williams OBE FREng,
Vice President Fellowship Engagement

Members

Professor Helen Atkinson CBE FREng
Professor Sir Michael Gregory CBE FREng
Dr Andrew Harter FREng
Norman Haste OBE FREng
Dr Michael Howse CBE FREng
Professor Elaine Martin OBE FREng
Professor Richard Parker CBE FREng
Ian Ritchie CBE FREng FRSE
Dr Frances Saunders CB FREng
Professor Martyn Thomas CBE FREng
Paul Westbury CBE FREng

Secretariat

Howard Beeston ACIS

Academy Governance Committees

AUDIT AND RISK COMMITTEE

The purpose of the Audit and Risk Committee is to assess and improve risk management and internal processes and controls across the Academy and oversee the external audit on behalf of the Trustee Board.

Chair

Dr Michael Howse CBE FREng

Members

Dr Carolyn Griffiths FREng

Dr Joanna Kennedy OBE FREng

**Professor Gordon Masterton OBE
FREng FRSE**

Dr Michael Purshouse FREng

John Robinson CBE FREng

Secretariat

Howard Beeston ACIS

FINANCE COMMITTEE

The Finance Committee is responsible for and accountable to the Trustee Board for the financial management of the Academy including compliance with the Charities Act 2011 and other relevant legislation, management of Academy budgets, external investment fund managers and compliance with external financial reporting standards.

Chair

Ian Ritchie CBE FREng FRSE

Members

John Baxter CBE FREng FRSE

Allan Cook CBE FREng

Norman Haste OBE FREng

Professor David Lane FREng FRSE

Professor Jim Norton FREng

Secretariat

Howard Beeston ACIS

MEMBERSHIP COMMITTEE

The Membership Committee is the guardian of excellence in determining which candidates may go forward for election to the Fellowship. The Membership Committee consists of a Chair, Chairs of each of the Membership Selection Panels, and the Chair of the International Committee. Each of the 11 Membership Selection Panels looks after a sector of engineering.

Chair:

Dr Frances Saunders CB FREng

Ex officio:

The President

Panel Chairs

Panel 1 (Civil and Environmental)

Professor Colin Bailey FREng

Panel 2 (Materials and Mining)

Professor Jan Cillers FREng

Panel 3 (Chemicals and Process)

Dr David Tomlinson FREng

Panel 4 (Aerospace)

**Air Marshal Sir Simon Bollom KBE CB
FREng**

Panel 5 (Transport and Mechanical)

Professor Stephen Garwood FREng

Panel 6 (Manufacturing and Design)

Professor Roger Benson FREng

Panel 7 (Electrical and Electronic)

Dr Frances Saunders CB FREng

Panel 8 (Energy and Power)

Dr Martin Grant FREng

Panel 9 (Medical and Bioengineering)

**Professor Liz Tanner OBE FREng
FRSE**

**Panel 10 (Computing and
Communications)**

**Professor Alan Bundy CBE FREng
FRS FRSE**

Panel 11 (Special)

Sir Andrew Mathews KCB FREng

Panel Members

Panel 1 (Civil and Environmental)

**Professor Muhammed Basheer
FREng**

Professor Nicholas Buenfeld FREng

Ginny Clarke CBE FREng

Dr Steve Denton FREng

Dr Peter Hansford FREng

Professor Oubay Hassan MBE FREng

Chris Hendy FREng

Professor Doug King FREng

David MacKenzie FREng

Michelle McDowell MBE FREng

Dr Toby Roberts FREng

Professor Peter Robery FREng

Professor Tom Stephenson FREng

Panel 2 (Materials and Mining)

Professor Paul Curtis FREng

**Professor Eileen Harkin-Jones OBE
FREng**

Professor Chris Hall FREng FRSE

Professor Steve Bull FREng

Dr John Groom FREng

**Professor Anthony Kinloch FREng
FRS**

Professor Allan Matthews FREng

**Professor David Owen FREng FLSW
FRS**

Jeff Smith FREng

Dr Alan Turnbull OBE FREng FRS

Dr Paul Woollin FREng

Panel 3 (Chemicals and Process)

Professor Adisa Azapagic FREng

Professor Zanfeng Cui FREng

Professor Mike Hounslow FREng

Phil Tracy FREng

Professor Andrew Livingston FREng

Professor Elaine Martin OBE FREng

**Professor Raffaella Ocone FREng
FRSE**

Nigel Perry MBE FREng

Professor Robin Smith FREng

Panel 4 (Aerospace)

**Professor Sir Richard Brook OBE
FREng**

Dr Roger Digby FREng

Dr Stephen Elston FREng

Dr Richard Greaves FREng

Graham Hopkins FREng

Professor Andrew Keane FREng

Professor Tony Kinghorn FREng

**Professor Constantinos Soutis
FREng**

Panel 5 (Transport and Mechanical)

Kenneth Burrage FREng

Professor David Cebon FREng

Dr Simon Gallimore FREng

**Dr Willem John van Griethuysen
FREng**

Professor Tim Leighton FREng FRS

Dr Michael Purshouse FREng

Professor Paul Shayler FREng

Professor Raymond Snidle FREng

Professor Hugh Spikes FREng

Professor Paul Wrobel FREng

Panel 6 (Manufacturing and Design)

Carol Burke CBE FREng

Professor Stuart Cameron FREng

Professor John Clarkson FREng

Professor Jane Jiang FREng

Professor Patrick Keogh FREng

Professor Lin Li FREng

Panel 7 (Electrical and Electronic)

Professor Roger Appleby FREng

Professor Cliff Burrows OBE FREng

Professor Jonathan Chambers FREng

Professor Roger Goodall FREng

Professor Ian Hunter FREng

Professor Cliff Jones FREng

Professor Andrew Marvin FREng

Professor Mohamed Missous FREng

**Professor Sir Michael Pepper FREng
FRS**

Professor Richard Penty FREng

Professor Harvey Rutt FREng

Dr Nicholas Waltham FREng

Dr Richard Wylde FREng

Panel 8 (Energy and Power)

Professor Nigel Brandon OBE FREng

Janice Crawford FREng

Ed Daniels FREng

David Eyton FREng

**Dr Malcolm Kennedy CBE FREng
FRSE**

Dr Marcus Newborough FREng

Dr Win Rampen FREng

Professor Albert Rodger FREng FRSE

Nicholas Winsor CBE FREng

Panel 9 (Medical and Bioengineering)

**Dr Douglas Anderson OBE FREng
FRSE**

Professor Serena Best FREng

Professor Clive Buckberry FREng

Dr Donal Cronin FREng

Professor Nicholas Medcalf

Professor Guang-Zhong Yang FREng

**Panel 10 (Computing and
Communications)**

Professor Bashir Al-Hashimi FREng

Dr Steve Allpress FREng

Dr Andrew Fitzgibbon FREng

Professor Carole Goble CBE FREng

Nic Holt FREng

Dr David Watson FREng

Dr Richard Whittington FREng

Professor James Woodcock FREng

Panel 11 (Special)

Professor Graham Davies FREng

Professor Richard Godwin FREng

**Commodore Peter Hurford OBE
FREng**

**Professor Gordon Masterton OBE
FREng FRSE**

Professor Ian Wallace FREng

Dr Alan Begg FREng

Committee secretariat

Jo Ryley

NOMINATIONS COMMITTEE

The purpose of the Nominations Committee is to ensure that a sufficient number of Fellows stand as candidates in the annual Trustee election and that the candidates bring to the Trustee Board skills, knowledge, experience and diversity that would yield, among the ordinary members and vice presidents, a balanced Board. The Committee will recommend to the Board candidates for appointment as vice presidents and candidates for appointment as chairs of the Academy's committees. The Committee is also to recommend to the Trustees, and ultimately the Fellowship, the Academy's President from nominations submitted by the Fellowship.

Chair

**Professor Dame Ann Dowling OM
DBE FREng FRS**

Members

**John Baxter CBE FREng FRSE
Professor Dame Wendy Hall DBE
FREng FRS
Dervilla Mitchell CBE FREng
Professor Sir Christopher Snowden
FREng FRS
Paul Westbury CBE FREng
Professor Richard Williams OBE
FREng**

Secretariat

Howard Beeston ACIS

REMUNERATION COMMITTEE

The purpose of the Remuneration Committee is to establish and keep under review the remuneration policy for permanent Academy staff, which will be implemented by the Chief Executive; to consider the recommendation of the Chief Executive for remuneration of the Academy Directors and agree their remuneration; and to set the remuneration of the Chief Executive.

Chair

**Professor Dame Ann Dowling OM
DBE FREng FRS**

Members

**Allan Cook CBE FREng
Professor Sir Michael Gregory CBE
FREng
Ian Ritchie CBE FREng FRSE**

Secretariat

Philip Greenish CBE

Academy Operating Committees

AWARDS COMMITTEE

The role of the Awards Committee is to identify and recommend to the President and Trustee Board appropriate candidates for all of the Academy's relevant prizes and awards (with the exception of National Honours, the International Medal, the Queen Elizabeth Prize for Engineering and the MacRobert Award).

Chair

Nigel Perry MBE FREng

Members

Dr Steve Allpress FREng
Professor Adisa Azapagic FREng
Professor Anthony Bull FREng
Chris Hendy FREng
Professor Tim Ibell FREng
Professor Malcolm Macleod FREng
Professor Raffaella Ocone FREng
FRSE
Dr Jim Ramage FREng
Professor John Watts FREng
Professor Jim Woodcock FREng

Secretariat

Philip Greenish CBE

Committee secretariat

Sylvia Hampartumian

EDUCATION AND SKILLS COMMITTEE

The Education and Skills 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 Helen Atkinson CBE FREng

Members

Chris Allam FREng
Professor Graham Davies FREng
Dr Paul Holbourn FREng
Professor Ian Hutchings FREng
Howard Mathers CBE FREng
Professor Jonathan Seville CBE
FREng
Professor Nick Tyler CBE FREng
Dr Jean Venables CBE FREng
Faith Wainwright MBE FREng

Ex officio

Chris Earnshaw OBE FREng
Professor Peter Goodhew FREng
Dr Stephen Huntington OBE FREng
Professor Jeff Magee FREng
Professor Andrew McNaughton
FREng

Observer

Deborah Seddon, Engineering
Council

Committee secretariat

Dr Rhys Morgan

ENGINEERING POLICY COMMITTEE

The Engineering Policy Committee's role is to advise and be responsible to the Trustee Board 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

Professor John Loughhead OBE
FREng

Members

Dr Peter Bonfield OBE FREng
Tim Chapman FREng
Dr David Clarke FREng
Professor John Clarkson FREng
Professor Brian Collins CB FREng
Lambert Dopping-Hepenstal FREng
Professor Jim Hall FREng
Professor Paul Howarth FREng
Dr Mike Lloyd FREng
Professor Jim Norton FREng
Dr Liane Smith FREng
Paul Taylor FREng
Steve Yianni FREng
Professor Paul Younger DL FREng
FRSE

Ex officio

Professor Serena Best FREng

Committee secretariat

Dr Alan Walker

ENTERPRISE COMMITTEE

The role of the Enterprise Committee is to provide strategic oversight and leadership of the Academy's Enterprise Hub, on behalf of the Trustee Board. The Committee oversees the development and operation of the Enterprise Hub, and supports and promotes its activities, which includes developing appropriate partnerships and funding relationships. It ensures the quality and rigour of the assessment process and selection of awards for the Academy's UK-based enterprise schemes.

Chair

Ian Shott CBE FREng

Members

Professor Norman Apsley OBE FREng

Professor Steven Beaumont OBE FREng

Professor Richard Brook OBE FREng

Michael Carr FREng

Suranga Chandratillake FREng

Anne Glover CBE HonFREng

Sir David Grant CBE FREng

Iain Gray CBE FREng FRSE

Dr Hermann Hauser KBE FREng FRS

Professor Andrew Hopper CBE FREng FRS

John Leggate CBE FREng

Dr Michael Lynch OBE DL FREng FRS

Chris Mairs CBE FREng

Professor Alison Noble OBE FREng

Sir Alan Rudge CBE FREng FRS

Dr John C Taylor OBE FREng

Dr Robert Sansom FREng

Committee secretariat

Ana Avaliani

EXTERNAL AFFAIRS COMMITTEE

The role of the External Affairs Committee is to provide strategic direction for external affairs activities on behalf of the Trustee Board. It oversees all aspects of the Academy's communications, public affairs and engagement activities and events programme, ensuring that they are delivered in line with the strategic plan.

Chair

Dame Judith Hackitt DBE FREng

Members (Fellows)

Janice Crawford FREng

Professor Robin Grimes FREng

Professor Doug King FREng

Professor Gordon Masterton OBE FREng FRSE

Richard Maudslay CBE FREng

Professor Mark Miodownik FREng

Dr Scott Steedman CBE FREng

Professor Saeed Zaheedi OBE FREng

Members (Non-Fellows)

Clive Cookson, *Financial Times*

Jeremy Greaves, Airbus UK

Dr Roger Highfield, Science Museum Group

Committee secretariat

Juniour Blake

INTERNATIONAL COMMITTEE

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

The Committee contributes to other international committees and study groups as appropriate and works to expand relationships with other academies of engineering and technological sciences, taking part in their activities where this is consistent with the Academy's objectives.

The Committee oversees the Academy's Newton Fund activities.

Chair

David Thomlinson FREng

Members

Professor Ian Bogle FREng

Malcolm Brinded CBE FREng

Dr Andrew Chan FREng

Professor Muffy Calder OBE FREng

Dr Alastair Glass FREng

Professor Sir Michael Gregory FREng FRSE

Dr Shirley Jackson FREng

Dr John Lazar CBE FREng

Professor William Lee FREng

Dr Timothy Leverton FREng

Professor John Loughhead OBE FREng

Dr Stephen Myers OBE FREng

Professor John Perkins CBE FREng

Professor Hai-Sui Yu FREng

Committee secretariat

Shane McHugh

RESEARCH AND SECONDMENT SCHEMES COMMITTEE

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

Chair

Professor Ric Parker CBE FREng

Members

Professor Bashir Al-Hashimi FREng

Professor Polina Bayvel FREng FRS

Dr Alan Begg FREng

Professor Peter Cawley FREng FRS

David Eyton FREng

Professor Carole Goble CBE FREng

Professor Michael Hounslow FREng

Professor John McDermid OBE FREng

**Professor Stephen McLaughlin
FREng FRSE**

**Professor Andrew McNaughton
FREng**

**Professor Lionel Tarassenko CBE
FREng**

Dr David Watson FREng

Professor Paul Younger DL FREng

Ex officio

Professor Neil Alford MBE FREng

(Research Fellowships)

Professor William Milne FREng

(Leverhulme Trust Senior Research
Fellowships)

Professor Clive Parini FREng

(Industrial secondments)

Professor Steve Williamson FREng

(Research Chairs)

Committee secretariat

Dr Ian Forristal

Awards

2015 MacRobert Award

The premier award for innovation in UK engineering, with a £50,000 prize, awarded annually to a team of engineers for an exceptional engineering innovation that has been both commercially successful and delivers benefits to society. The MacRobert Award is supported by the Worshipful Company of Engineers.

Awarded to:

Artemis Intelligent Power for its Digital Displacement power system using digitally controlled hydraulics

2015 President's Medal

Awarded to an Academy Fellow who has contributed significantly to the Academy's aims and work through initiative in promoting excellence in engineering.

Awarded to:

Sir Richard Olver FEng

2015 Colin Campbell Mitchell Award

For an engineer or small team of engineers who have made an outstanding contribution to the advancement of any field of UK engineering.

Awarded to:

Optical Networks Group, University College London:

Professor Polina Bayvel FEng FRS

Dr Lidia Galdino

Dr Robert Killey

Dr Robert Maher

Dr Seb Savory

Dr Benn Thomsen

2015 Silver Medals

For an outstanding personal contribution to UK engineering by an early- to mid-career engineer resulting in market exploitation. Up to four medals may be awarded in any one year.

Awarded to:

Dr Susannah Clarke, Founder and Director, Embody Orthopaedic

Dr Don Syme, Principal Researcher, Microsoft Research UK

Dr Andy Ward, Chief Technology Officer, Ubisense

2015 Major Project Award

The award recognises the contribution of a team of up to five UK-based engineers who have delivered a major engineering project that has had a substantial impact on society.

Awarded to:

The Highlands and Islands Superfast Broadband Project, Atkins:

Neil Watt, John Jennow, JD Olliero and Chris Bond

2015 RAEng-ERA Foundation Entrepreneurs Award

Awarded to early-career UK university researchers working in electro-technology, who demonstrate considerable entrepreneurial promise.

Awarded to:

Matthew Murray, University of Leeds

2015 Rooke Award

The prize is awarded to an individual, small team or project based in the UK that has supported the Academy's aims and work through their initiative in promoting engineering to the public.

Awarded to:

Dr Hugh Hunt, Reader in Engineering Dynamics and Vibration, University of Cambridge

2015 Sir Frank Whittle Medal

Awarded to an engineer resident in the UK whose achievements have had a profound impact upon their engineering discipline.

Awarded to:

Professor Peter Clarricoats CBE FEng FRS, Emeritus Research Professor, School of Electronic and Computer Science, Queen Mary, University of London

2015 Sir George Macfarlane Medal

The award recognises the potential of engineers working in the UK who have demonstrated excellence in the early stage of their career.

Awarded to:

**Dr Matthew Cole
Oppenheimer Research Fellow at the Centre for Advanced Photonics and Electronics, University of Cambridge**

2016 RAEng Armourers and Brasiers Company Prize

A biennial prize awarded to an individual for excellence in materials engineering demonstrated by the successful application of novel materials science and technology in practical engineering systems. The prize is supported by the Worshipful Company of Armourers and Brasiers.

Awarded to:

Professor Judith Driscoll, Professor of Materials Science, University of Cambridge

Grants, fellowships and programmes

RESEARCH CHAIRS

The Research Chairs programme provides funding, together with industry and other research organisations, to support strategically important research in UK universities. The Academy provides funding for an initial period of five years.

Name	Co-sponsor	Subject	University
Professor Guglielmo Aglietti	Surrey Satellite Technology	Space engineering	University of Surrey
Professor Robert Akid	BP	Corrosion and materials	University of Manchester
Professor John Andrews	Network Rail	Infrastructure asset management	University of Nottingham
Professor Matthew Angling	Defence Science and Technology Laboratory (Dstl)	Space environment and radio frequency engineering	University of Birmingham
Professor Ashraf Ayoub	Pell Frischmann	Nuclear infrastructure engineering	City University London
Professor Luke Bisby	Arup	Fire and structures	University of Edinburgh
Professor Richard Butler	Rolls-Royce	Experimental studies of next generation gas-turbine combustion system aerothermal processes	University of Loughborough
Dr Jon Carrotte	Rolls-Royce	Next generation gas-turbine combustion system aerothermal processes	University of Loughborough
Professor Jonathan Cooper	Airbus	Integrated design of advanced novel wing architectures	University of Bristol
Professor George Constantinides	Imagination Technologies	Energy-efficient high performance embedded processing in an uncertain world	Imperial College London
Professor Yulong Ding	Highview Power Storage	Cryogenic energy storage	University of Birmingham
Professor Steve Dixon	Elster	Industrial ultrasonic	University of Warwick
Professor Fionn Dunne	Rolls-Royce	Integrative mechanistic design	Imperial College London
Professor Daniel Esser	SELEX Galileo	Laser devices and engineering	Heriot-Watt University
Professor Brian Falzon	Bombardier	Advanced aerospace composites	Queen's University Belfast
Professor Chris Gerada	Cummins Generator Technologies	Electrical machine technology	University of Nottingham
Professor Alistair Gibb	ECI	Management of complex projects	Loughborough University
Professor Kenneth Grattan FEng	George Daniels Trust	Next generation optical and fibre-optic instrumentation	City University London
Professor Hugh Griffiths FEng	Thales UK	Intelligent radar systems	University College London
Professor Susan Grimes	SITA	Environmental waste management	Imperial College London
Professor Eileen Harkin-Jones	Bombardier	Composites engineering	University of Ulster
Professor Ian Hunter	Radio Design Limited	Microwave signal processing	University of Leeds
Professor Neil Hyatt	The Nuclear Decommissioning Authority	Nuclear waste management	University of Sheffield

Name	Co-sponsor	Subject	University
Professor Lorenzo Iannucci	Dstl	Multiscale composite armour design	Imperial College London
Professor Nikil Kapur	GSK	Pharmaceutical processing	University of Leeds
Professor Alan Kemp	Fraunhofer UK	Advanced laser engineering	University of Strathclyde
Professor Jianguo Lin	TATA Steel	Multidisciplinary studies of hot stamping	Imperial College London
Professor John Miles	Arup	Energy transitions	University of Cambridge
Professor James Moore	Bagrit Trust	Medical devices	Imperial College London
Professor Stephen Muggleton FREng	Syngenta	Applications of automated theory-formation using meta-interpretive machine learning	Imperial College London
Professor Andrew Neely	IBM/BAE Systems	Complex engineering systems	University of Cambridge
Professor Kamran Nikbin	EDF Energy	Structural integrity assessment	Imperial College London
Professor mc schraefel	Microsoft Research	Human computer interaction	University of Southampton
Professor Sven Schroeder	Infineum UK	Engineering applications of synchrotron science	University of Leeds
Professor Sridhar Seetharaman	TATA Steel	Low-carbon technologies	University of Warwick
Professor Spencer Sherwin	McLaren Racing	Transient flow simulation for advanced race and road cars	Imperial College London
Professor David Smith	Rolls-Royce/EDF Energy	Structural performance of energy systems	University of Bristol
Professor Iain Todd	GKN Aerospace	Additive manufacture and advanced structural metallics	University of Sheffield
Professor Zi-Qiang Zhu	Siemens Wind Energy	High efficiency and power density wind-power generator systems	University of Sheffield
Professor Andrew Davison	Dyson Technology Ltd	Ultra-efficient vision algorithms for resource-constrained robotics	Imperial College London
Professor Xiangqian (Jane) Jiang FREng	Renishaw	Precision metrology	University of Huddersfield
Professor Bruno Merk	National Nuclear Laboratory	Computational modelling for nuclear engineering	University of Liverpool
Professor Chris Pearce	EDF Energy	Computational mechanics for nuclear power engineering	University of Glasgow
Professor Mary Ryan FREng	Shell	Interfacial nanoscience for engineering systems	Imperial College London
Professor Jennifer Whyte	Laing O'Rourke	Systems integration	Imperial College London

RESEARCH CHAIRS IN EMERGING TECHNOLOGIES

This programme 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 can subsequently be taken forward by industry.

Name	Subject	University
Professor Anne Neville FREng	Bio-inspiration for functional surface design	University of Leeds
Professor Jeremy O'Brien	Photonic quantum ICT	University of Bristol

SENIOR RESEARCH FELLOWSHIPS

This scheme provides funding for senior lecturer/reader-level appointments. Fellowships are funded jointly with industry for a period of five years.

Name	Co-sponsor	Subject	University
Dr Matthew Hall	British Geological Survey	Rock-fluid interactions in carbon capture, storage and alternative hydrocarbons	University of Nottingham
Dr Stephen Neethling	Rio Tinto	Heap and <i>in-situ</i> leaching	Imperial College London
Dr Graham Spinardi	Ove Arup Foundation	Integrating technical and social aspects of fire safety engineering	University of Edinburgh
Dr Andrew Tyas	Dstl	Protection engineering against high explosive blast	University of Sheffield
Dr Thomas Scott	AWE	Performance and detection of actinide materials	University of Bristol

RAENG/EPSRC RESEARCH FELLOWSHIPS

These Fellowships, which are funded jointly with the Engineering and Physical Science Research Council (EPSRC), 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 Tore Butlin	Modelling the vibration of complex structures with localised nonlinearities	University of Cambridge
Dr Filippo Fazi	Electroacoustical inverse problems	University of Southampton
Dr Andrew Marshall	Exploiting emerging interface misfit epitaxy to engineer cheaper, higher performance photodiodes for imaging, communications and gas monitoring	Lancaster University
Dr Davide Mattia	Nanoparticle factory-on-a-chip	University of Bath
Dr Manlio Tassieri	Rheology at the microscale: new tools for bio-analysis	University of Glasgow

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 while their academic and administrative responsibilities are taken over by an early-career academic.

Name	Subject	University
Dr Haofeng Chen	Modelling the fatigue and creep of metal matrix composite	University of Strathclyde
Dr Piotr Dudek	Analog computation with novel nanodevices for machine learning	University of Manchester
Dr Marianne Ellis	Scale-up of immune cell therapies for organ transplants	University of Bath
Dr Stephen Garrett	Understanding transition in boundary-layer flows over rotating geometries	University of Leicester
Dr Paola Lettieri	A life-cycle approach for nuclear waste management and plant decommissioning	University College London
Dr Chenfeng Li	Real-time computational methods for complex high-fidelity surgical simulation	Swansea University
Dr Cyril Lynsdale	Recycling of carbon dioxide in mortar and concrete	University of Sheffield
Dr Dmitry Nerukh	Personal supercomputer for modelling complete virus at all atom resolution	Aston University
Professor Thomas Nowotny	Enabling scientific computing with GPUs with domain specific languages and metacompilers	University of Sussex
Dr Rachel Oliver	Understanding and utilising nitride nanostructures	University of Cambridge
Dr Justin Philips	A non-invasive continuous monitor of intracranial pressure	City University London
Dr David Sanders	Improving mobility and quality of life for children with disabilities	University of Portsmouth
Dr Sebastian Savory	Realising the capacity in fibre-optic networks with uncertainty and nonlinearity	University College London
Dr Aleksandra Vuckovic	Home-based patient-managed neurorehabilitation following spinal cord injury	University of Glasgow

DAPHNE JACKSON TRUST FELLOWSHIPS

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

Name	Subject	University
Dr Margarita Fernandez-Chas	Effect of changes in the spatial properties of the myocardial tissue mechanics on the overall efficiency of the heart	Kings College London
Dr Suhaila Mattar	Embodied CO ₂ of concrete: materials, structural and methodological factors	University of Leeds
Dr Divya Tiwari	LPG sensors for measuring carbon dioxide concentration at carbon capture and storage sites	Cranfield University
Dr Maria Ribera Vicent	Satellite FEM validation with advanced optimisation and virtual vibration testing	University of Surrey

RAENG RESEARCH FELLOWSHIPS

These Fellowships are awarded to 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 Mark Ainslie	Engineering interactions of magnetic and superconducting materials for electrical applications	University of Cambridge
Dr David Armstrong	Micro-engineering advanced alloys for extreme nuclear power environment	University of Oxford
Dr Mahdi Azarpeyvand	Source and propagation modelling for wind turbine and turbomachinery noise	University of Bristol
Dr Emmanouil Benetos	Software inspired by the human ear/looking at the human ear to design novel listening software	Queen Mary, University of London
Dr Martynas Beresna	Ultrafast laser-induced nanostructuring: a pathway to advanced optical-fibre engineering	University of Southampton
Dr Ben Britton	Better understanding of materials to make safer reactors	Imperial College London
Dr Peter Carrington	High efficiency mid-infrared semiconductor materials and devices grown on silicon	Lancaster University
Dr Alasdair Clark	Plasmon enhanced pyroelectrodynamic nanoscale trapping and sensing	University of Glasgow
Dr David Clifton	Machine learning for the intelligent patient record	University of Oxford
Dr Simon Cotton	Next generation body-centric communications: a joint analytical-statistical approach to modelling quasi-cyclostationary anisotropic signal reception	Queen's University Belfast
Dr Alexander Dickinson	Developing the next generation of prosthetic limbs	University of Southampton
Dr Trung Duong	Meeting future wireless capacity via secure and energy-efficient small-cell networks	Queen's University Belfast
Dr Marco Endrizzi	Laboratory-based x-ray dark-field microscopy and microtomography	University College London
Dr Christian Fensch	Auto-tuned programming patterns and the programmability gap	Heriot-Watt University
Dr Amanda Joy Foust	Holographic light shaping for reverse engineering neural circuit learning	Imperial College London
Dr Peter Gammon	Novel interlayer cooling for harsh environment (NICHE) devices and circuitry	University of Warwick
Dr Deborah Gunning	Neural interfaces for studying cortical processes	University of Strathclyde
Dr Tawfique Hasan	Graphlex: fully flexible graphene-based transparent conductors	University of Cambridge
Dr Matthew Himsworth	Atom-chip integration for quantum-enabled devices	University of Southampton
Dr Edmund Kelleher	Next-generation short-pulse lasers for the visible and ultraviolet	Imperial College London
Dr Maiwenn Kersaudy-Kerhoas	Towards better pregnancy monitoring: miniaturised tools for non-invasive prenatal diagnosis in clinics and hospitals	Heriot-Watt University
Dr Edward Laird	Quantum computing devices based on carbon nanomaterials	University of Oxford

Name	Subject	University
Dr Martin Lavery	Increasing data transfer capacity using light's unusual properties	University of Glasgow
Dr Hugh Leather	Optimising the mobile net	University of Edinburgh
Dr Grigorios Loukides	Privacy protection in event-based data sharing and analysis	Cardiff University
Dr Fleur Loveridge	New thermal and geotechnical facility for ground heat exchangers	University of Southampton
Dr Mathieu Lucquiaud	Future-proofing fossil power stations with CO ₂ capture	University of Edinburgh
Dr Luca Magri	Adjoint-based approaches in thermo-acoustics: understanding, modelling and controlling instabilities	University of Cambridge
Dr Christos Masouros	Interference as a source of green signal energy in wireless communications	University College London
Dr Matthias Mauch	Software systems for computer-aided music understanding	Queen Mary, University of London
Dr Ruth Misener	Towards rational chemotherapy strategies: a hybrid computational/experimental approach	Imperial College London
Dr Mehran Moazen	Predicting skull growth in craniosynostosis for improved surgical treatment	University College London
Dr Thomas Okell	Novel imaging techniques to visualise blood flow in the brain	University of Oxford
Dr Pola Goldberg Oppenheimer	Advanced micro-optofluidic portable sensing (AMPS) technology for timely point-of-care diagnostics	University of Birmingham
Dr Francesca Parmigiani	Optical processing of high-spectral efficiency phase-encoded signals for future generation optical networks	University of Southampton
Dr Oliver Payton	Mapping, measuring and manufacturing nanostructures via high-speed atomic force microscopy	University of Bristol
Dr Alberto Peruzzo	Quantum processors for quantum chemical engineering	University of Bristol
Dr David Phillips	Sensing and actuation of nanoscale mechanics in biological systems	University of Glasgow
Dr Soraia Pimenta	Exploiting novel carbon-fibre composites	Imperial College London
Dr Antoniu Pop	Developing a language for the computers of the future	University of Manchester
Dr Paul Shearing	Four-dimensional tomography of electrochemical devices	University College London
Dr Radu Sporea	Novel high performance transistors for use in large area electronics	University of Surrey
Dr Nikos Tzevelekos	Game semantics for program analysis	Queen Mary, University of London
Dr Freddie Withers	Light harvesting hybrid - graphene-based devices (GrapheX)	University of Manchester
Dr Amanda Wright	New horizons in adaptive optics for life science research: adaptive microscopy	University of Nottingham
Dr Weijia Yuan	Advancing renewable energy integration by innovative smes-battery storage systems	University of Bath

RAENG/LLOYD'S REGISTER FOUNDATION RESEARCH FELLOWSHIP

This Fellowship is funded by the Lloyd's Register Foundation, and 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 Mark Batty	Holographic light shaping for reverse engineering neural circuit learning	University of Kent

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 and blast impact loading	University of Cambridge

ENTERPRISE FELLOWSHIPS

Enterprise Fellowships provide funding and support to outstanding entrepreneurial engineering researchers, working at a UK university, to enable them to develop a spin-out business based on their technological idea.

Name	Project title	University
Dr Samuel Chapman	KENOTEQ: 'breathing' bricks that reduce waste in the construction sector	Heriot-Watt University
Dr Damien Coyle	NeuroCONCISE: 'movement-free' communication for the physically impaired	Ulster University
Dr Alexander Enoch	Robotical Ltd: programmable 3D-printed robot	University of Edinburgh
Dr Nicholas Everdell	Gowerlabs: real-time optical imaging of the human brain	University College London
Dr Yunjia Li	Synote: software to automate transcription	University of Southampton
Dr Andrew Marsden	Immaterial Labs: nano-materials for gas storage and separation	University of Cambridge
Dr Silo Meoto	AeroGraft: bone grafting in dentistry	University College London
Dr Oliver Stevens	On-the-spot cancer screening	University of Bristol

BLAVATNIK FAMILY FOUNDATION ENTERPRISE FELLOWSHIP ALUMNI AWARDS

The Blavatnik Family Foundation Alumni Awards celebrate engineering innovation and promote role models for engineering entrepreneurship, by recognising the achievements of the most successful early-stage Hub members in turning innovative technologies into viable businesses. Awardees act as role models for future entrepreneurs.

Name	Project title	University
Dr Toby Basey-Fisher	Eva Diagnostics: blood measurements without the lab	Imperial College London
Dr Daniel Plant	Armourgel Ltd: SMART Clothing - falls and fracture prevention	Imperial College London
Dr Stephen Smith	Medical devices for routine monitoring of Parkinson's disease	University of York

PATHWAYS TO GROWTH

The Pathways to Growth grants support capacity building within engineering and technology SMEs by providing up to £15,000 of funding towards training for their engineering staff. Leaders of high-performing awardee companies may also be invited to join the Academy's Enterprise Hub.

Awardee companies

BBOXX	Keit	OC Robotics
BPE Design and Support	Kiln Flame Systems	Oil and Gas Measurement
Entropea	Lontra	Oxford Space Systems
Eta Projects	Magnomatics	Photocentric
Fianium	Mirico	React Engineering
Hyperdrive Innovation	Mo-Sys	YASA Motors

LAUNCHPAD COMPETITION

The Launchpad Competition aims to find an exceptionally promising engineering entrepreneur or team of entrepreneurs, between the ages of 16 and 25, and enable them to start a business based on their engineering innovation and maximise the chances of its successful growth. The winner(s) of the competition receive the JC Gammon Award - a prize of £15,000 and membership of the Enterprise Hub. Other individuals or teams may be chosen as runners-up. The winner and finalists are invited to become Hub members.

Winner

Name	Start-up company	Project title
James Roberts	MOM Incubators	Preventing premature baby deaths in the developing world

Runners-up

Name	Start-up company	Project title
Amanda Campbell	Comp-A-Tent	Reducing festivals' environmental impact with biodegradable tents
George Edwards	Gas-Sense	Driving energy efficiency with wireless gas monitoring
Sorin Popa	Stent Tek	Improving outcomes for haemodialysis patients

RAENG-ERA FOUNDATION ENTREPRENEURS AWARD

This award identifies, encourages and rewards entrepreneurial engineering researchers working in the field of electro-technology.

Winner

Name	University	Project title
Dr Matthew Murray	University of Leeds	Alpin: advanced anti-counterfeiting with laser plasma implants

Runners-up

Name	University	Project title
Dr George Frodsham	University College London	MediSieve: magnetic haemofiltration to treat malaria
Dr Peiman Hosseini	University of Oxford	Bodle Technologies: phase change materials for disruptive optoelectronics
Bethan Wolfenden and Philipp Boeing	University College London	Bento Lab: personal molecular biology laboratory to boost education and citizen science

DISTINGUISHED VISITING FELLOWSHIPS

The Distinguished Visiting Fellowship scheme provides funding for an engineering department in a UK university to host a senior academic from an overseas academic centre of excellence for up to a month. The scheme promotes sharing of the latest developments and allows the participating organisations to discover common and complementary skills and initiatives that could lead to future collaborations.

Award holder	Distinguished Visitor	Area of collaboration
Dr Ankush Aggarwal, Swansea University	Professor Michael Sacks, University of Texas at Austin, USA	Stratification of patients at high risk of heart valve dysfunction using inverse model - strengthening the collaboration
Gordon Airey, University of Nottingham	Professor Jo Daniel, University of New Hampshire, USA	Impact of recycled materials and changing climate on the design, maintenance and performance of pavement systems
Dr Yun Bai, University College London	Professor Liaping Liu, Southeast University, China	Development of next generation superplasticiser for novel low-carbon concrete
Dr Christopher George Bryan, University of Exeter	Professor Sue Harrison, University of Cape Town, South Africa	A multidisciplinary approach to studying mineral-microbial interactions in low grade ore and waste rock dump bioleaching
Dr João Cabral, Imperial College London	Professor Jane Lipson, Dartmouth College, USA	Predictive engineering of polymer blends and composites with prescribed thermodynamics and transport properties
Dr Robert Cahill, Queen's University Belfast	Dr Mariano Barba Gea, Universidad Politecnica de Madrid, Spain	New design strategies for increasing the switching speed of microwave and mm antennas based on liquid crystals
Professor Jian Fei Chen, Queen's University Belfast	Professor Lawrence Bank, City College of New York, USA	Non-conventional, recyclable, construction materials for infrastructure renewal
Professor Zoran Cvetkovic, King's College, London	Professor Urbashi Mitra, University of Southern California, USA	Exploiting scarcity in future wireless networks

Award holder	Distinguished Visitor	Area of collaboration
Dr Andrea Da Ronch, University of Southampton	Professor Daniella Raveh, Technion-Israel Institute of Technology, Israel	Gust response analysis and buffet of elastic aircraft in transonic flows
Professor Julian Jones, Imperial College London	Professor Melissa Grunlan, Texas A&M University, USA	Shape memory polymer composites for bone tissue healing
Professor Richard Leach, University of Nottingham	Mr J.-Angelo Beraldin, National Research Council, Canada	Micro surface texture requirements for purpose-made physical standards in close range 3D imaging systems
Dr Haijiang Li, Cardiff University	Professor Mirosław Skibniewski, University of Maryland, USA	Enhancing the key understanding for future BIM (building information modelling) and its roadmap development
Dr Christos Masouros, University College London	Professor Constantinos Papadias, Athens Information Technology, Greece	Merging capabilities in analog-digital transmission of next generation wireless networks [MANGO]
Dr Alcaro Mata, Queen Mary, University of London	Professor Donald Inber, Harvard University, USA	'Organs-on-chips': micro-engineering tissues in the lab for biomedical research
Dr Nicole Metje, University of Birmingham	Professor Ian Moore, Queen's University, Canada	Buried infrastructure - how to design, assess and better utilise our hidden assets
Professor Muttukrishnan Rajarajan, City University London	Professor Shyam Shayamasundar, Indian Institute of Technology, Bombay, India	Information flow control for robust cloud computing with end-to-end security and privacy assurances
Sridhar Seetharaman, University of Warwick	Professor Zhand Lifeng, University of Science and Technology Beijing, China	A multiscale approach for fluid flow effect on microstructure and segregation
Ramanand Shenoi, University of Southampton	Professor Yonghwan Kim, Seoul National University, South Korea	Collaborative research and education in maritime engineering: UK - South Korea
Dr Junwang Tang, University College London	Professor Peidong Yang, University of California, USA	Water splitting for H ₂ fuel synthesis by one dimensional photoelectrodes
Dr Shunca Wang, University of Southampton	Professor Feng Zhou, Lanzhou Institute of Chemical Physics, China	Lubrication science learning from nature and beyond
Professor James Charles Woodcock, University of York	Professor Augusto Sampaio, Universidade Federal de Pernambuco, Brazil	Test-generation for mobile and autonomous robot controllers
Dr Haixue Yan, Queen Mary, University of London	Professor Chenglong Jia, Lanzhou University, China	Single-phase room temperature multiferroic materials for multistate spintronic devices
Professor Yonghao Zhang, University of Strathclyde	Professor Zhihui Li, China Aerodynamics Research and Development Center, China	Multiscale modelling of non-equilibrium gas flows

NEWTON RESEARCH COLLABORATION PROGRAMME

The Newton Research Collaboration Programme is part of the UK Newton Fund, which aims to develop science and innovation partnerships to promote the economic development and social welfare of developing countries.

The main focus of the Newton Research Collaboration Programme is to support the aims of the Newton Fund by facilitating international exchanges lasting three months to a year between researchers in the UK and their counterparts in selected Newton Fund partner countries.

Partner country	UK researcher	Project title	Partner country researcher
Brazil	Dr Nathan Gomes, University of Kent	RFID moisture sensor network for landslide monitoring	Dr Luis Vieira Departamento, Acadêmico de Eletrônica
Brazil	Dr Stephen Leslie Smith, University of York	Security for all: using smart technologies to promote security for citizens	Dr Márjory Da Costa-Abreu, Federal University of Rio Grande do Norte
Brazil	Dr Mark Alan Baker, University of Surrey	Development and characterisation of novel Mg-substituted fluorapatite coatings on austenitic stainless steel for medical implant applications	Isolda Costa, Institute of Nuclear and Energy Research
Brazil	Dr Matteo Ceriotti, University of Glasgow	Optimisation of near Earth orbit transfers	Professor Maisa de Oliveira, Terra Instituto Tecnológico de Aeronáutica
Brazil	Dr Andrea da Ronch, University of Southampton	An outflow buffer zone based on the far-field self-similarity of high-Reynolds-number subsonic turbulent jet flows	Professor Carlos Moser, Pontifícia Universidade Católica do Rio Grande do Sul
Brazil	Professor Wuqiang Yang, University of Manchester	Water-cut measurement by a combination of electrical capacitance tomography and RF resonant cavity sensor	Professor Fernando Rangel de Sousa, Universidade Federal de Santa Catarina
Brazil	Dr Ying Weng, Bangor University	Large-scale active learning for visual retrieval	Dr Daniel Pedronette, University of Sao Paulo
Brazil	Dr Tannaz Pak, Teesside University	Pore-scale investigation of three-phase fluid transport in porous rocks - a time-resolved three-dimensional study using X-ray computed micro-tomography technique	Dr Lara Frangiotti Mantovani, Universidade Federal de Santa Catarina
Brazil	Dr Alistair Clark, University of the West of England	Robust optimisation models for humanitarian logistics in disaster relief	Dr Douglas José Alem, Universidade Federal de São Carlos
Brazil	Dr Sina Rezaei Gomari, Teesside University	Introducing a new technique using powder in quantifying wettability in challenging oil reservoirs	Professor Ronaldo Gonçalves dos Santos, Centro Universitario FEI
Brazil	Dr Christopher Bronn, York University of Glasgow	The flexible wing project: advanced tailoring strategies for laminated composite materials	Professor Sérgio Frascino Müller de Almeida, Instituto de Pesquisas Tecnológicas

Partner country	UK researcher	Project title	Partner country researcher
Brazil	Dr Kiran Kumar Ramesh, University of Glasgow	Development of a fast computational tool for highly flexible flight dynamics	Professor Flávio Silvestre, Instituto Tecnológico de Aeronáutica
Malaysia	Dr Alf Martinez-Felipe, University of Aberdeen	New candidates for targeted drug carriers based on palm oil-based glycosides and polymeric complexes. Towards tuneable natural-based controlled release systems.	Dr Nurul Fadhilah Binti Kamalul Aripin, University of Technology MARA
Malaysia	Dr Paul Grassia, University of Strathclyde	Exploiting microbiology and rheology to improve treatment of palm oil mill effluent	Dr Poh Phaik Eong, Monash University Malaysia
Malaysia	Dr Angela Doufexi, University of Bristol	5G architecture and technologies for a visualised smart city	Dr Nor Fadzilah Abdullah, Universiti Kebangsaan Malaysia
Malaysia	Dr Nicholas James Watson, University of Nottingham	Effect of spiral/tangential gas injection on mass transfer and hydrodynamics for bubbly flow reactors	Dr Sanaullah Khairuddin, University Malaysia Sarawak
Malaysia	Professor Siamak Noroozi, Bournemouth University	Design and development of HODS (human operating deflection shape) system for quantitative assessment of body joints	Dr Zhi Chao Ong, University of Malaya
Malaysia	Professor Dorothy Ndedi Monekoso, Leeds Beckett University	Intelligent system to support post-stroke rehabilitation	Dr Chee Seng Chan, University of Malaya
Malaysia	Dr Zhigang Ji, Liverpool John Moores University	Development of accurate circuit reliability simulator for Malaysia's electronics industry	Dr Norhayati Soin, University of Malaya
Mexico	Dr Jhuma Sadhukan, University of Surrey	Economic value generation and social welfare in Mexico by waste biorefining	Dr Amador Honorato Salazar Jose, INIFAP
Mexico	Dr Paolo Rapisarda, University of Southampton	Modelling and control of integrated renewable energy systems, with experimental validation	Dr Hebertt Sira-Ramirez, CINVESTAV-IPN
Mexico	Dr Flor Siperstein, University of Manchester	Biochar: research into the development of materials to mitigate greenhouse gas emissions (BRIDGE)	Dr Alejandro Gil-Villegas, Universidad de Guanajuato
Mexico	Dr Nour Ali, University of Brighton	An autonomic software architecture for knowledge management in medical diagnosis	Dr Angelina Espinoza, Universidad Autonoma Metropolitana
South Africa	Dr Charlotte Rebecca Ray, University of Nottingham	Energy, technology adoption and behaviour change	Dr Gisela Prasad, University of Cape Town
South Africa	Ashraf Osman, University of Durham	Predicting sinkhole collapse using an unsaturated soil mechanics framework	Professor Esve Jacobz, University of Pretoria
South Africa	Dr Barry Gordon Rawn, Brunel University	Non-active power compensators: implementations and implications	Professor Charles Trevor Gaunt, University of Cape Town
South Africa	Dr Jiangfeng Zhang, University of Strathclyde	Modelling and control for electric vehicle charging and battery swapping networks	Dr Henerica Tazvinga, Council for Scientific and Industrial Research South Africa
Turkey	Dr Trung Q Duong, Queen's University Belfast	A cross layer modelling and design for software defined 5G networks in smart cities	Dr Berk Canberk, Istanbul Technical University

Partner country	UK researcher	Project title	Partner country researcher
Turkey	Professor Khellil Sefiane, University of Edinburgh	Multiphase flows and heat transfer in microscale	Professor Ali Kosar, Sabanci University
Turkey	Dr Gyorgy Szekely, University of Manchester	Sustainable extraction of oleuropein antioxidant from olive leaves	Dr Rustem Kecili, Anadolu University
Turkey	Dr Aleksandra Drizo, Heriot-Watt University	Science and innovation partnership in water/energy/food nexus: assessment of novel technology for phosphorus removal, recycling and re-use from domestic wastewaters	Dr Kemal Gunes, TUBITAK Marmara Research Center
Turkey	Professor Nilanjan Chakraborty, Newcastle University	Enhanced heat transfer and mixing by mixed convection of yield stress fluids in cylindrical container with rotating end wall	Dr Osman Turan, Bilecik Şeyh Edebali University
Turkey	Professor Yong Wang, University of Manchester	Resilient and sustainable structural engineering risk assessment of tall residential buildings for structural fire safety	Dr Serdar Selamet, Bogazici University
Vietnam	Professor Martin Cryan University of Bristol	Nanoantennas for fluorescence biosensing applications	Minh Quang Ngo, Vietnam Academy of Science and Technology
Vietnam	Dr Hui Yu, University of Portsmouth	Multimodal data-based mental workload and stress assessment for assistive brain computer interface	Dr Nguyen Duc Thang, Vietnam National University
Vietnam	Dr Liyang Yue, Bangor University	3D printing of functional photonic and terahertz metamaterials	Dr Nguyen Thanh Tung, Vietnam Academy of Science and Technology
Vietnam	Dr Christos Tachtatzis, University of Strathclyde	Automatic rice seed inspection using hyperspectral imaging	Dr Hai Vu, Hanoi University of Science and Technology
Vietnam	Dr Ivana Kochar, University of Strathclyde	Efficient distributed optimisation methods for solving the dynamic optimal power flow problem	Dr Van-Hoan Pham, Can Tho University
Vietnam	Professor Duc Pham, University of Birmingham	UK-Vietnam collaboration in mechanical engineering and advanced materials science	Professor Duc Dinh Nguyen, Vietnam National University
Vietnam	Dr Chun Yang Yin Teesside University	Understanding adsorptive interactions in nanoporous carbons produced from agricultural by-products	Dr Nguyen Ngoc Ha, Hanoi National University of Education
Vietnam	Dr Trung Thanh Nguyen, Liverpool John Moores University	Operational research for green logistics in Vietnam - a UK-Vietnam research collaboration	Professor Lam Thu Bui, Le Quy Don Technical University
Vietnam	Dr Melissa Brazier-Hicks, Newcastle University	Utilising polyprotein technology to engineer yeast to produce high-value chemicals	Dr Nguyen Thi Hong Thuong, Vietnam National University

LEADERS IN INNOVATION FELLOWSHIPS

The Leaders in Innovation Fellowship programme is aimed at researchers from an emerging country who have an innovation that helps address their country's development needs, and offers two weeks of entrepreneurship training and coaching to help them commercialise their innovation. This year, the Academy delivered training to 176 researchers from Brazil, Chile, China, Colombia, Egypt, India, Mexico, the Philippines, South Africa, Thailand, Turkey, and Vietnam.

AFRICA PRIZE FOR ENGINEERING INNOVATION

The Africa Prize for Engineering Innovation aims to stimulate, celebrate and reward innovation and entrepreneurship in sub-Saharan Africa through six months of mentoring and training before a cash prize is awarded to the winner and runners-up.

2014/2015 winner

Dr Askwar Hilonga	Tanzania
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2014/2015 finalists

Samuel Njuguna Wangui	Kenya
Ernst Pretorius	South Africa
Musenga Silwawa	Zambia

2015/2016 shortlist

Edmand Aijuka	Uganda
Professor Emmanuel Bobobee	Ghana
Brian Bosire	Kenya
Kahituo Hien	Burkina Faso
Bukhary Kibonajoro	Tanzania
Dr Mercy Manyuchi	Zimbabwe
Felix Kimaru	Kenya
Taita Ngetich	Kenya
Olufemi Odeleye	Nigeria
Werner Swart	South Africa
Matt Wainwright	South Africa
Arthur Zang	Cameroon

INDUSTRIAL SECONDMENTS SCHEME

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

Name	University	Project title	Host
Dr Rafic Ajaj	University of Southampton	Loads alleviation for transport aircraft using folding wingtips	Airbus Operations Ltd
Dr Richard Bourne	University of Leeds	Self-optimising reactors for pharmaceutical process development	AstraZeneca
Dr Tao Chen	University of Surrey	In-silico modelling of transdermal permeation	Unilever UK
Dr Liana Mirela Cipcigan	Cardiff University	Future balancing services for high levels of embedded electricity generation	National Grid
Dr Andrea Da Ronch	University of Southampton	Industrial aircraft design	Airbus Operations Ltd
Dr Ibrahim Habli	University of York	Evidence-based assurance of health IT safety	Health & Social Care Information Centre
Dr James Robert Hopgood	University of Edinburgh	Novel signal processing algorithms for automated electrophoresis analysis	Agilent Technologies LDA UK Ltd
Dr Megan Jobson	University of Manchester	Operational optimisation of low-temperature separation processes	Process Integration Ltd
Dr Simon Justin Julier	University College London	Scalable and extensible tracking for virtual production	Mo-Sys Engineering Ltd
Dr Hamed Haddad Khodaparast	Swansea University	Efficient stochastic design of composite aircraft structures	Airbus Operations Ltd
Dr Dongfang Liang	University of Cambridge	Integrated dynamic modelling of surface and ground waters	Mott MacDonald Ltd
Dr Christopher Power	University of York	Methods for positive user experiences in big data analytics	International Business Machines Corporation
Dr Gillian Ragsdell	University of Loughborough	Engineering knowledge management: adding value to the energy sector	Energy Technologies Institute
Dr Karen Renaud	University of Glasgow	Engaging with Scotland's SMEs to improve their digital security	Scottish Business Resilience Centre
Dr Antoaneta Serguieva	University College London	Computational intelligence and knowledge engineering approaches to modelling systemic risk	Bank of England
Dr Siraj Ahmed Shaikh	Coventry University	Automotive cybersecurity	MIRA Ltd
Dr Rafael Mauricio Morales Viviescas	University of Leicester	Test of constrained multi-objective control for future helicopter rotor technologies	AgustaWestland

ENGINEERING LEADERSHIP ADVANCED AWARDS

This award funds ambitious engineering undergraduates to undertake an accelerated personal development programme in order to move into a leadership position soon after graduation. The Academy currently funds 105 awardees.

Name	University	Subject
Imran Ahmed	University of Cambridge	General engineering
Ishan Alam	University of Bristol	Engineering design
George Anderson	University of Southampton	Mechanical engineering with aerospace
Christopher Bartolo	Queen's University Belfast	Mechanical engineering
Leigh Baxter	University of Strathclyde	Electrical and mechanical engineering
Serban Berariu	University of Southampton	Civil engineering
Thomas Bewley	University of Bristol	Engineering design
Ciprian Blujdea	University of Southampton	Mechanical engineering with management
Georgina Box	Durham University	General engineering
Jake Brown	University of Sheffield	Mechanical engineering
Francesca Capaldi	University of Strathclyde	Chemical engineering
Jessica Charter	Imperial College London	Civil and environmental engineering
Martina Cheadle	University of Cambridge	Engineering
Yun-Hang Cho	University of Sheffield	Mechanical engineering
Stephen Colbert	Queen's University Belfast	Aerospace engineering
Jennifer Coyle	University of Edinburgh	Chemical engineering
James Crothers	University of Southampton	Mechanical engineering
Michael Daley	University of Cambridge	Engineering
Arnaud Doko	University of Bath	Mechanical engineering
Rebecca Jane Ede	University of Sheffield	Mechanical engineering with French
Leah Edwards	Loughborough University	Mechanical engineering
Timothy Engstrom	Imperial College London	Mechanical engineering
Supun Fernando	University of Surrey	Aerospace engineering
Thomas Findlay	University of Edinburgh	Civil engineering
Bradley Fowler	University of Cambridge	Engineering
James Fraser	University of Bath	Mechanical engineering
Henri French	University of Bristol	Aerospace engineering
Luca Frondoni	Cardiff University	Mechanical engineering
Olga Fuhrmann	University of Edinburgh	Chemical engineering with management
Radovan Gallo	University of Southampton	Aeronautics and astronautics/spacecraft engineering
Ignacio Garcia Leon	University of Bristol	Engineering design
Cherie Gardiner	Queen's University Belfast	Mechanical engineering
Harry Garstka	University of Bristol	Engineering design, aerospace
Andrew Zi-Xiang Gng	Imperial College London	Civil engineering
Alexander Goff	Cardiff University	Mechanical engineering
Adam Gristock	University of Cambridge	Engineering

Name	University	Subject
Oliver Groling	Durham University	General engineering
Siddharth Gupta	University of Cambridge	Engineering
Conor Hamill	Queen's University Belfast	Mechanical engineering
Gideon Hammond	Loughborough University	Chemical engineering with management
Aurelia Hibbert	University of Cambridge	Engineering
Claire Hughes	Queen's University Belfast	Civil engineering
Samuel David Kelly	University of Bristol	Mechanical engineering
Dmitro Khroma	University of Bristol	Engineering design
Ailsa Kiely	University of Sheffield	Materials science and engineering with a modern language (Mandarin)
James Kinch	University of Leeds	Mechanical engineering
Rabia Lakhani	Imperial College London	Chemical engineering
Eric Shut Wai Leung	Imperial College London	Civil engineering
Sarah Linnell	University of Bath	Civil and architectural engineering
Susan Little	University of Strathclyde	Electrical and mechanical engineering
Archie Lodge	University of Cambridge	Engineering
Allan MacLeod	University of Aberdeen	Chemical engineering
Charlotte MacNair	University of Bristol	Engineering design
Dominic Maskell	University of Southampton	Electronic engineering
Javier Maurino-Alperovich	Imperial College London	Aeronautical engineering
John McBride	Queen's University Belfast	Mechanical engineering
Conor McGlacken	University of Bristol	Engineering design
Joel McGrath	Queen's University Belfast	Mechanical engineering
Peter McGrattan	Queen's University Belfast	Mechanical engineering
Kieran McHugh	University of York	Computer science
Connor McShane	Queen's University Belfast	Mechanical engineering
Alan Middup	University of Sheffield	Mechanical engineering
Erin Meredith	Loughborough University	Chemical engineering
Michel Mesquita	University of Surrey	Aerospace engineering
Vladislav Morgen	University of Strathclyde	Electrical and mechanical engineering
Rabbiya Naveed	University of Cambridge	Engineering
Charles Newton	Loughborough University	Mechanical engineering
Karolina-Verzhiniya Nikolova	University of Bath	Aerospace engineering
Ronan O'Connell	University of Glasgow	Biomedical engineering
Katherine Oxley	University of Sheffield	Chemical engineering
Philip George Parr	Queen's University Belfast	Aerospace engineering
Sarah Parsons	Loughborough University	Product design engineering
Shakti Patel	Loughborough University	Aeronautical engineering
Nicole Perrin	Loughborough University	Chemical engineering
Alice Purcell	Queen's University Belfast	Mechanical engineering

Name	University	Subject
Osian Rees	University of Bristol	Engineering design
Lewis Roberts-James	University of Bristol	Mechanical engineering
Edward James Rogers	Loughborough University	Mechanical engineering
Mark Runciman	University of Strathclyde	Electrical and mechanical engineering
Max Schinke	University of Cambridge	Engineering
Cui Seow	University of Bristol	Mechanical engineering
Holly Smith	University of Bristol	Civil engineering
Aaron Smyth	Queen's University Belfast	Mechanical and manufacturing engineering
Laura Steedman	Robert Gordon University	Mechanical engineering
Gareth Stephenson	Queen's University Belfast	Product design engineering
Hugo Stock	Imperial College London	Mechanical engineering
Alexa Strobel	University of Cambridge	Chemical engineering
Monika Szczyrba	University of Sheffield	Civil engineering with a modern language
Kathryn Taheny	University of Edinburgh	Electronics and electrical engineering
Conor Taylor	Queen's University Belfast	Aerospace engineering
Katherine Theobald	University of Southampton	Civil engineering
Angie Theresia	University of Manchester	Mechanical engineering
Aleksi Tukiainen	University of Cambridge	Engineering
Rebecca Vaslet	University of Strathclyde	Electrical and mechanical engineering
Julian Vercruysse	University of Edinburgh	Structural engineering with architecture
Fiona Walport	Imperial College London	Civil engineering
Neale Watson	Queen's University Belfast	Aerospace engineering
Jack Wilkinson	Imperial College London	Civil and environmental engineering
Lucinda Wilkinson	Imperial College London	Civil and environmental engineering
Robert Winn	University of Southampton	Ship science
Cuebong Wong	University of Strathclyde	Electrical and mechanical engineering
Rebecca Wray	Queen's University Belfast	Product design engineering
Jerome Wynne	University of Bristol	Engineering design
Thomas Yard	Imperial College London	Mechanical engineering
Wai-Ming Yap	Imperial College London	Chemical engineering
Mareks Zevalds	University of Bristol	Engineering design

INGENIOUS PUBLIC ENGAGEMENT AWARDS ROUND 10 AWARDS

Ingenious provides funding for projects that enable engineers to enhance their public engagement skills, and raise awareness of the diversity, nature and impact of engineering.

Awardee	Organisation	Project title
Sujatha Nirmali Arambepola	Structurally Found	Structurally Found
Kate Bellingham	Kate Bellingham Ltd	School Gate SET: Primary school parents supporting STEM
Rebecca Cottrell	Tallyn Holdings Limited & Narrow Gauge Railway Museum	Learning from the Past, Engineering the Future
Susan Brumpton	The Making Place	Making Place Engineering Kits
Jon Chouler	University of Bath	Buskineers: Bath engineers perform their research on the street
Steve Cross	Steve Cross	Engineering Showoff: Chaotic cabaret about making the world
Kevin Curran	Ulster University	Securing Tomorrow's World: Best practice in staying secure online
Ravinder Dahiya	University of Glasgow	Electronic Touch
Adrian Harwood	University of Manchester	Knead for Speed: Aero Challenge
Lindsay Keith	Refinery Productions Ltd	Survival Village @ SMASHFestUK: A festival bringing engineering to new audiences
Ramine Tinati	University of Southampton	The Macroscope: A lens for the World Wide Web
David McGoran	Rusty Squid	Heart in your Hands
Shane McCracken	Gallomanor Communications	I'm an Engineer: Online STEM engagement for schools
Andrea Meyrick	Techniquet, Cardiff	Qualified for Life: Focus on Engineering
Larissa Paver	Telegraph Museum, Porthcurno	Hard Wired World: Fibre-Optic Communication and You
Dawn Pavey	Techniquet, Glyndwr	Let's go on an Engineering Adventure in North Wales
Felicity Paynter	Science Museum	Robots Pop-Up Workspace
Laura Rolinson	Arcola Energy	Wales & Humberside Schools Hydrogen Challenge
Siraj Sabihuddin	University of Edinburgh	eTunes: Building your own electro-acoustic guitar workshop series
Cathy Sturrock	Science Oxford	Student Engineering Ambassador Programme
Jake Tompkins	Modus	Foundation for Jobs
Ricardo Torres	University of Liverpool	Particle accelerator engineering workshops for schools
Jess Wade	Imperial College London	Stemettes Hackathon

VISITING PROFESSORS

The Visiting Professor programme places practising engineers into UK universities to enhance the teaching and learning, as well as employability and skills, of undergraduate engineering students. The programme currently supports nearly 80 Visiting Professors at more than 40 universities.

Name	University
Ivor Annetts	University of Leicester
Nicholas Anott	University of Surrey
Dr David Arnold FEng	London South Bank University
Professor Malcolm Bailey	University of Surrey
Richard Baker	University of Leeds
Neil Barron	Royal College of Art
Ron Bell	Liverpool John Moores University
Massimo Bombino	Middlesex University
Dr Rick Bradford	University of Bristol
Dr Andrew Bradley FEng	Loughborough University
Keith Clarke CBE HonFEng	Aston University
Andy Clough	University of Warwick
David Daniels CBE	University of Manchester
Dr Ashish Darbari	University of Southampton
David Drew	University of Nottingham
Professor Colin Eddie FEng	University of Warwick
Penny Endersby	University of Southampton
Dr Shaun Fitzgerald FEng	University of Cambridge
Professor Malcolm Fox	University of Bradford
Pierre French	University of Huddersfield
Stefan Gabriel	University of Huddersfield
Dr David Goddard	University of Manchester
Steve Graham	University of Liverpool
Dr Isobel Hadley	University of Bristol
Dr John Haine	University of Bristol
Dr Erol Hepsaydir	University of Kent
Dr Walter Holweger	University of Southampton
Dr Robin Irons	University of Nottingham
Christina Jackson	University of Birmingham
Paul Jennings	University College London
Chris Lawrence	University of Nottingham
Dr Darren Lee	Lancaster University
Stephen Legg	University of Surrey
Professor Scott Lockyer	Loughborough University
Dr Ivan Lucic	City University London
John Mackey	University of Surrey
Professor Norman MacLeod	University of Leeds
David Maroney	Queen's University Belfast
Brian McFarland	Queen's University Belfast
Dennis McKeag	University of Derby
Chris Newbold	University of Surrey
John Nolan	University of Birmingham
Crispin Oakman	University of Nottingham

Name	University
Dr Scott Owens	Imperial College London
Paul Rawlinson	University of Manchester
Dr Michael Raxworthy	University of Leeds
Dr Mei Juan Ren	University of Manchester
Franck Robert	Coventry University
Ian Robertson	University of Warwick
Professor Peter Robery FEng	University of Birmingham
Philip Sams	Northumbria University
Jonathan Sands OBE	University of Huddersfield
Martin Simpson	University of Salford
Aaron Smith	University of Edinburgh
Keith Towell	University of Southampton
Simon Vaitkevicius	Bournemouth University
Dr Dick Whittington FEng	University of York
Dr Paul Withey	University of Birmingham
Mike Wood	University of Sheffield

SAINSBURY MANAGEMENT FELLOWSHIPS

This scheme aims to enhance the capability of the UK engineering industry by providing grants to young engineers with leadership qualities so that they can undertake an MBA course at a leading international business school. Last year, 20 Fellowships were awarded.

Name	Business school
Nicholas Allen	International Institute for Management Development, Switzerland
Olubusola Yejide Banjo	INSEAD
Andrew Buckley	London Business School
Jorgina Busquets	London Business School
John Collins	INSEAD
Evridiki Giamouzi	London Business School
Christopher Hughes	INSEAD
William Jones	INSEAD
Eirini Koukaki	London Business School
Christopher Mannion	Massachusetts Institute of Technology

Name	Business school
Kwok-Gam Ng	London Business School
Sinead O'Sullivan	Harvard Business School
Philip Price	London Business School
Pierre-Nicolas Queyroux	INSEAD
Nikhil Sachdeva	Harvard Business School
Mohammad Saquib	London Business School
Hersh Shah	International Institute for Management Development, Switzerland
Farid Singh	INSEAD
Charles Sudborough	London Business School
Mengyi Wu	INSEAD

AEROSPACE MSC BURSARY SCHEME

The Royal Academy of Engineering, the Royal Aeronautical Society, the government and leading companies in the aerospace sector have developed an initiative to boost the supply of aeronautical engineering skills to the UK economy.

The main purpose of the scheme is to bring new talent, knowledge and skills into the UK aerospace sector. It is designed for people who would not otherwise be able to finance their MSc studies. It also provides MSc funding to upskill employees already working in the UK aerospace sector.

Last year, the third and final year of the scheme, 210 students were supported in their studies at the following universities:

University of Birmingham, Brunel University London, City University London, Coventry University, Cranfield University, De Montford University, University of Exeter, University of Glasgow, Glyndwr University, University of Hertfordshire, Imperial College London, Kingston University, University of Leeds, University of Leicester, University of Liverpool, Loughborough University, University of Manchester, University of Nottingham, Queen's University Belfast, Queen Mary, University of London, Robert Gordon University, University of Aberdeen, University of Salford, University of Sheffield, Sheffield Hallam University, University of Southampton, Staffordshire University, University of Strathclyde, University of Surrey, Swansea University, University College London, Ulster University, University of South Wales, University of West England, University of Westminster, University of Wolverhampton, University of York.

PETROFAC FELLOWSHIPS

Petrofac Fellowships develop graduate engineers through a combination of an appropriate full-time postgraduate master's level degree, coupled with additional learning and development opportunities provided by Petrofac.

Name	University
Imwenoghomwen Enabulele	University of Aberdeen
Abdi Ismael Mahamed	Cranfield University

Name	University
Mose Makombe	Cranfield University
Irene Rios	University of Aberdeen

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.

Name	University
Jacob Boast	Royal College of Art
Matthew Colson	Imperial College London
Kyle Gray	University of Cambridge

Name	University
Thomas Knight	University of Nottingham
Aimen Sattar	University of Cambridge
Philip Wiltshire	Heriot-Watt University

HERTHA MARKS AYRTON FELLOWSHIP

This award was established by the Panasonic Trust to support members of underrepresented groups to study a full-time master's course in a new technology subject.

Name	University
Danielle Beever	Durham University

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 study a full-time master's course related to water engineering.

Name	University
Rachel Chester	Loughborough University

Queen Elizabeth Prize for Engineering

The Queen Elizabeth Prize for Engineering is a global award that 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.

QUEEN ELIZABETH PRIZE FOR ENGINEERING PANEL OF JUDGES

Name	Job title	
Professor Sir Christopher Snowden FREng FRS	Chair of Judges Vice-Chancellor, University of Southampton	UK
Professor Frances Arnold	Professor of Chemical Engineering, Bioengineering and Biochemistry, Caltech	USA
Professor Brian Cox OBE	Royal Society Research Fellow, University of Manchester	UK
Dr Jean-Lou Chameau	President, King Abdullah University of Science and Technology	Saudi Arabia
Professor Lynn Gladden CBE FREng FRS	Pro Vice Chancellor for Research, Shell Professor of Chemical Engineering, University of Cambridge	UK
Professor John Hennessy	President, Stanford University	USA
Professor Carlos Henrique de Brito Cruz	Science Director, Saõ Paulo Research Foundation	Brazil
Professor Dr hc Reinhard Huettl	President, German National Academy of Science and Engineering	Germany
Professor Calestous Juma HonFREng FRS	Professor of the practice of international development, Director of the Science, Technology and Globalisation Project, Harvard University	Global
Professor Hiroshi Komiyama	President, Engineering Academy Japan	Japan
Dr Dan Mote Jr	President, U.S. National Academy of Engineering; Regents Professor, University of Maryland	USA
Narayana Murthy CBE	Founder, Infosys	India
Professor Choon Fong Shih	Professor, National University of Singapore	Singapore
Professor Dr Dr hc Viola Vogel	Head of Laboratory of Applied Mechanobiology, ETH Zurich	Switzerland
Paul Westbury FREng	Group Technical Director, Laing O'Rourke	UK

QUEEN ELIZABETH PRIZE FOR ENGINEERING FOUNDATION TRUSTEES

The Queen Elizabeth Prize for Engineering is run by a charitable company limited by guarantee and called The Queen Elizabeth Prize Foundation, which manages the prize and its funding.

Chairman

Lord Browne of Madingley FREng FRS

Members

Sir John Beddington CMG HonFREng

Mala Gaonkar

Sir Mark Walport, Chief Scientific Adviser to UK government, is adviser to the board.

Professor Dame Ann Dowling OM DBE FREng FRS

Sir Paul Nurse HonFREng FRS

QEPRIZE DONORS

The Queen Elizabeth Prize for Engineering Foundation extends its gratitude to the corporate donors whose generosity has funded an endowment to enable the continuing development of the QEPrize. Support has been received from the following:

BAE Systems plc	Shell UK Ltd
BG Group plc	Siemens UK
BP plc	Sony
GlaxoSmithKline	Tata Consultancy Services
Jaguar Land Rover	Tata Steel Europe
National Grid plc	Toshiba
Nissan Motor Company Ltd	

QEPRIZE SEARCH GROUP

The role of the Search Group is: profile raising; engaging the global professional engineering community in making nominations for the prize; acting as global ambassadors for the prize; promoting awareness throughout networks; participating in events; discovering emerging areas of accomplishment and innovation; and assisting in the search for nominations.

Name	Job title	
Professor Stephen Williamson FREng	Chair of Search Group Emeritus Professor, University of Surrey	UK
Professor Jan Cilliers FREng	Head of Department and Chair in Mineral Processing, Imperial College London; Director, Rio Tinto Centre for Advance Mineral Recovery	UK
Professor John Clarkson FREng	Professor of Engineering Design, University of Cambridge	UK
Naomi Climer FREng	President, Institution of Engineering and Technology	UK
David Eyton FREng	Head of Technology, BP	UK
Professor Roger Falconer FREng	Professor of Water Management, Cardiff University	UK
Dr Martin Grant FREng	Chief Executive Officer - Energy, WS Atkins	UK
Dame Judith Hackitt DBE FREng	Chair, EEF; Former Chair Health and Safety Executive (until March 2016)	UK
Professor Joe McGeehan CBE FREng	Emeritus Professor of Communications Engineering, University of Bristol	UK
Professor Philip Nelson FREng	Chief Executive, Engineering and Physical Sciences Research Council; Professor of Acoustics, University of Southampton	UK
Professor Alison Noble OBE FREng	Technikos Professor of Biomedical Engineering and Director of Institute of Biomedical Engineering, University of Oxford	UK
Professor Ric Parker CBE FREng	Former Director of Research and Technology, Rolls-Royce (until April 2016)	UK
Professor Richard Penty FREng	Professor of Photonics, University of Cambridge; Master, Sidney Sussex College	UK
Dr Scott Steedman CBE FREng	Director of Standards, BSI; Board Member, Port of London Authority	UK
David Thomlinson FREng	Former Senior Managing Director – Geographic Strategy and Operations, Accenture	UK
Dr Jean Venables CBE FREng	Chair, Crane Environmental; Chair, Nuclear Liabilities Fund	UK

Development and fundraising

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.

Chair

Ian Barlow

Members

Ayman Asfari FREng

Professor Haroon Ahmed FREng (until October 2015)

Malcolm Brinded CBE FREng

Iain Conn FREng

Vivienne Cox CBE (until November 2015)

Andrew Gould

Dr Andrew Harter FREng (from October 2015)

Dr Tony Hayward

Steve Holliday FREng

Fred Kindle (until October 2015)

Dr Mike Lynch OBE DL FREng FRS

David Thomlinson FREng

CONTRIBUTORS TO ACADEMY PROGRAMMES

The Academy extends its gratitude to the Fellows, companies and charitable trusts whose generosity has enabled the continuing growth and development of its programmes and activities in the UK, and its engineering capacity-building work in sub-Saharan Africa. In the financial year, support was received from the following:

Airbus Group	FCO Africa Prosperity Fund	National Grid plc
AECOM	The Sir John Fisher Foundation	NATS Limited
The Anglo American Group Foundation	David Gammon	Network Rail
Anglo Platinum Marketing Ltd	The Garfield Weston Foundation	The Ogden Trust
Atkins plc	The Gatsby Charitable Foundation	The Panasonic Trust
Babcock International plc	GE UK & Ireland	Petrofac Ltd
BAE Systems plc	GKN plc	QinetiQ plc
Stephen Bechtel FREng	The Helsington Foundation	RealVNC Limited
BG Group plc	IBM UK Ltd	Rolls-Royce plc
The Blavatnik Family Foundation	Jaguar Land Rover Limited	Royal Commission for the Exhibition of 1851
BP plc	Johnson Matthey plc	Sir Robin Saxby FREng FRS
Malcolm Brinded CBE FREng	The Leverhulme Trust	Schlumberger Cambridge Research Ltd
The Commercial Education Trust	Lloyd's Register Foundation	Shell Centenary Scholarship Fund
The Comino Foundation	Sir Robert Malpas CBE FREng	Shell International Ltd
ConocoPhillips Nigeria	Lockheed Martin UK Limited	Urenco Limited
Consolidated Contractors Company	Mathys and Squire LLP	Weir Group plc
The Drayson Foundation	Mayneord Phillips Trust	The Wellcome Trust
The Entrepreneurs Fund	The Motorola Solutions Foundation	Welsh National Research Network
The ERA Foundation	Mott MacDonald Group Ltd	The Worshipful Company of Engineers

ROYAL ACADEMY OF ENGINEERING 2015 ANNUAL FUND

In November 2015, the Academy launched its fourth Annual Fund appeal to its Fellowship. The Academy would like to thank the following* and also those Fellows who have made regular gifts for some years:

William Baker FREng	Dr John Lazar FREng	Dr Robert Sansom FREng
David Ball FREng	Professor Robert Mair CBE FREng FRS	Professor Sarah Springman CBE FREng
Peter Carr FREng	Trevor Massey OBE FREng	Professor Roger Wootton FREng
John Evans OBE JP FREng	William McAlonan FREng	Faith Wainwright MBE FREng
Dr Cecil French FREng	Professor John McWhirter FREng FRS	Dr Christoph Wiesner FREng

*a further four Fellows wished their gifts to remain anonymous.

The Academy also wishes to acknowledge a legacy from the late Jeffrey Turnbull CBE FREng.

Bankers

National Westminster Bank plc
Cavell House
2a Charing Cross Road
London WC2H 0NN

Solicitors

Bristows
100 Victoria Embankment
London EC4Y 0DH

Auditors

BDO LLP
55 Baker Street
London W1U 7EU

Investment Advisers

OLIM Limited
Pollen House
10-12 Cork Street
London W1X 1PD

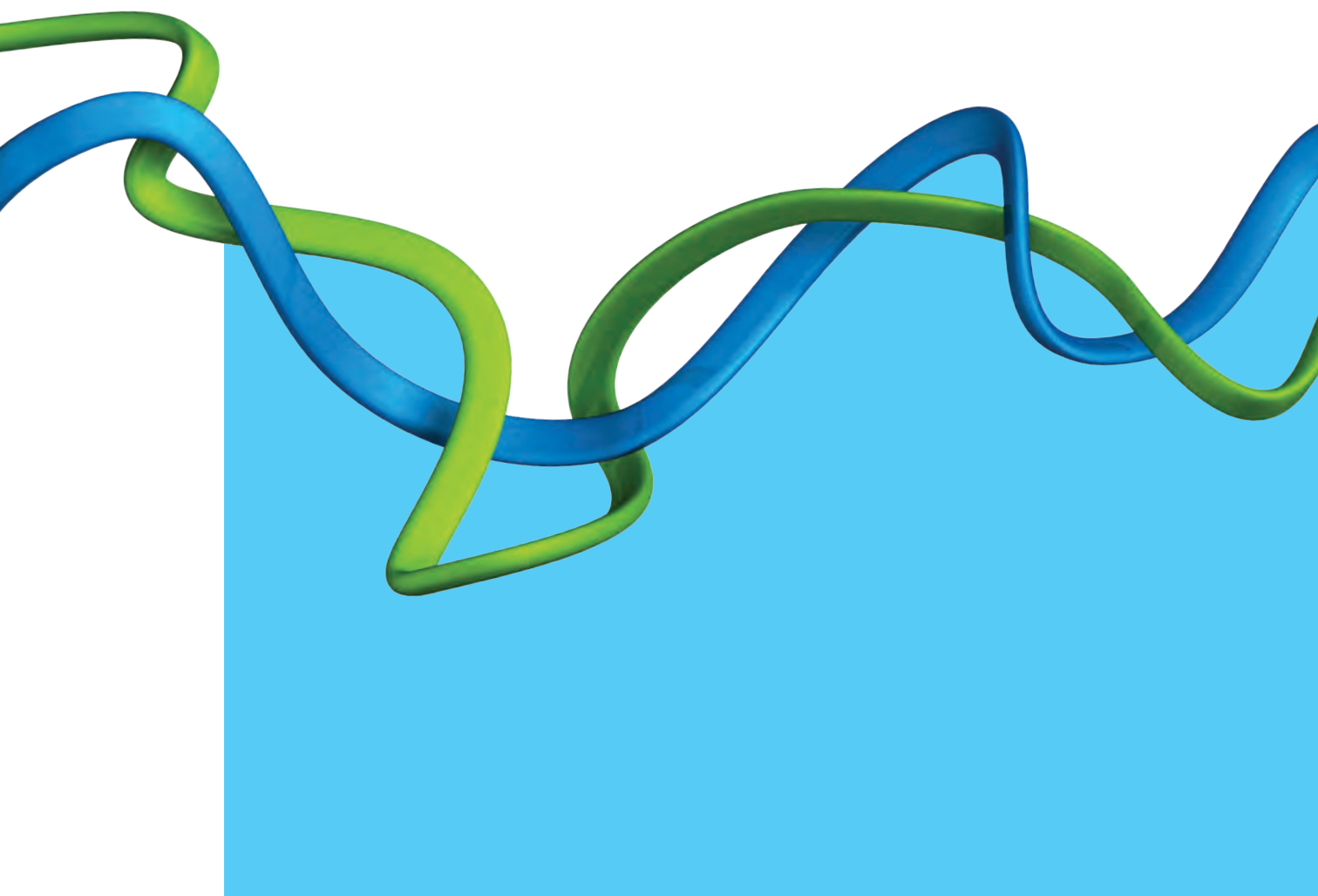


The Royal Academy of Engineering promotes
excellence in the science, art and practice of
engineering.
Registered charity number 293074

Royal Academy of Engineering
Prince Philip House, 3 Carlton House Terrace, London SW1Y 5DG
Tel: 020 7766 0600
www.raeng.org.uk

Financial Report and Accounts

For the year ended 31 March 2016



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Chair of the Finance Committee's statement



RESULTS FOR THE YEAR

The Academy has produced group accounts for the year, having consolidated its accounts with those of its two subsidiaries: the Queen Elizabeth Prize for Engineering Foundation and RAE Trading Limited. For the first time, the group accounts were prepared under the new Statement of Recommended Practice 2015 as defined in the Financial Reporting Standard 102.

Group income for the year was £29.2 million. Group expenditure on charitable activities was £22.0 million. The cost of generating funds across the group was £1.5 million. The carrying value of the group's net assets was £58.5 million.

ROYAL ACADEMY OF ENGINEERING

Total income for the year was £23.4 million. The largest element, core grants from the Department for Business, Innovation and Skills, was £12.4 million.

Income from other grants and contracts remained steady at £7.7 million.

Expenditure on charitable activities was £22.0 million compared to £22.9 million in the previous year. An analysis based upon the principal objective of each activity shows that, of the total charitable expenditure of £23.5 million: 68% on enhancing engineering capacity; 11% on inspiring young people; 13% on promotion of and leadership in engineering; and 8% on leading and shaping engineering policy. Employment costs increased from the previous year by 8% to £4.3 million due to firstly, the Remuneration Committee's decision to adjust staff salaries to the market mid-point and secondly, the cost of complying with pension auto-enrolment legislation; both of these were one-off increases borne within the year.

THE QUEEN ELIZABETH PRIZE FOR ENGINEERING FOUNDATION

Total income for the year was £4.5 million. Expenditure on charitable activities was £638,000. The Queen Elizabeth Prize for Engineering is awarded bi-annually and the next award will be made in 2017. The Foundation pays a management fee to the Academy for services which includes staff employed and office space.

RAE TRADING LIMITED

The commercial activity undertaken by the company during the year was the provision of rooms and catering services within Prince Philip House primarily to corporate customers. Catering services are also provided to the Academy at cost. Revenue for the year was £1.5 million and operating expenditure, including the cost of providing a service to the Academy, was £1.1 million. The net profit for the year of £419,000 was gift-aided to the Academy at the end of the financial year. The company paused trading at the end of year while refurbishment work, including new kitchens, takes place in Prince Philip House. Trading is planned to resume in January 2017.

GROUP ASSET VALUE

The carrying value of the group's net assets was £58.5 million. Investments were valued at £41.0 million, with the Academy holding £24.0 million and the Foundation holding £16.9 million. Tangible fixed assets valued at £12.2 million included the £4.3 million value of the Carlton House Terrace lease and the £7.7 million of leasehold improvements to Prince Philip House. The main liability was a bank loan of £1.1 million, which funded the Academy's property lease. The value of the group's restricted funds increased over the year by £4.2 million mainly due to donations to the Foundation. The Academy's general fund value increased slightly by £55,000.

INVESTMENTS

The value of the Academy's investment portfolio increased over the year by £1.1 million to £24.0 million. The

fund benefited from a donation of £1.7 million, which will be eventually drawn down to part fund the Enterprise Hub capital project. Realised and unrealised investment losses during the year were £563,000. Approximately 94% of the Academy's investment portfolio is held in UK equities and 6% in high-quality fixed-interest stocks. Income to the Academy from dividends and fixed-interest bonds increased by 16% during the year to £945,000 while bank interest decreased to £22,000 from £64,000. Group investment income increased by £231,000 to £1.4 million, of which £444,000 was income from the Foundation's investments, which are managed separately from those of the Academy.

FINANCE COMMITTEE

The Finance Committee meets at least four times during each financial year. Included in the items considered by the Committee during the year were the Academy's investment strategy and the funding of the £7 million Enterprise Hub capital project to complete the refurbishment of Prince Philip House. The Committee is pleased to report that the transfer of the Academy's defined benefit pension scheme was completed during the year and the future financial risk presented by the scheme thereby removed.

This is my last statement as Chair of the Finance Committee as I will stand down at the Academy's AGM on 8 September after four years in post. The Academy has secured a flat government grant in its spending review settlement for the next four years and although we should be mindful of the financial impact of the UK's departure from the EU upon the Academy's finances, which is as yet uncertain, I am confident that the Academy's financial position is strong in all other respects.

**Mr I Ritchie CBE FREng FRSE,
Chair of the Finance Committee**

Report of Trustee Board

Reference and administrative details

NAME AND REGISTERED OFFICE

The Royal Academy of Engineering is a registered charity No. 293074. It is a corporate body governed by Royal Charter. The registered office is Prince Philip House, 3 Carlton House Terrace, London SW1Y 5DG.

PROFESSIONAL ADVISERS

Bankers

National Westminster Bank plc
Charing Cross, London Branch
PO Box 113, Cavell House
2a Charing Cross Road
London WC2H 0NN

Solicitors

Bristows
100 Victoria Embankment
London EC4Y 0DH

Auditor

BDO LLP
55 Baker Street
London W1U 7EU

Investment advisers

OLIM Limited
Pollen House
10-12 Cork Street
London W1X 1PD

Structure, governance and management

TRUSTEE BOARD MEMBERS

The Academy's Trustee Board comprises 13 members elected by and from the Fellowship with the discretion to co-opt up to two additional members. Trustee Board members are the trustees of the Academy as defined under its status as a registered charity. The Trustee Board will meet six times per year and it is responsible for the governance of the Academy. At these meetings the Trustee Board will discuss issues of strategy and policy and also matters referred to it by the governance committees for Finance, Audit and Risk, Membership, Nominations and Remuneration. During the year a review of the structure of the Academy's operating committees was conducted and a review of the terms of reference of each committee will be completed during the forthcoming year.

All Trustee Board members and other Fellows who take part in Academy activities give their time freely; no remuneration was paid in the year beyond the reimbursement of reasonable expenses. The majority of Academy activities are controlled by committees composed of Fellows. The members of the Trustee Board during the year were:

OFFICERS	President	Dame Ann Dowling OM DBE FREng FRS
	Vice Presidents	Mr A Cook CBE FREng Professor R Williams OBE FREng
	Chair Finance Committee	Mr I Ritchie CBE FREng FRSE
TRUSTEE BOARD	Trustee Board members	
	Dame Ann Dowling OM DBE FREng FRS	Professor E Martin OBE FREng (from 21.9.15)
	Professor H Atkinson CBE FREng	Professor R Parker CBE FREng
	Professor B Collins CB FREng (until 21.9.15)	Mr I Ritchie CBE FREng FRSE
	Mr A Cook CBE FREng	Dr J E Roberts CBE FREng (until 21.9.15)
	Professor Sir Michael Gregory CBE FREng	Dr F Saunders CB FREng (from 21.9.15)
	Dr A Harter FREng	Dr M Thomas CBE FREng
	Mr N Haste OBE FREng (from 21.9.15)	Professor Sir William Wakeham FREng (until 21.9.15)
	Dr M Howse CBE FREng	Mr P Westbury CBE FREng (from 21.9.15)
	Professor J Loughhead OBE FREng (until 21.9.15)	Professor R Williams OBE FREng

Election to the Trustee Board

Trustee Board members are elected for a term of three years with the exception of the President who is elected for a term of up to five years. The trustee election is by a ballot of Fellows each year. The Nominations Committee meets annually to draw up a list of candidates willing to stand in the trustee election and, if elected, to serve as either a Vice Presidents or a chair of a governance committee.

Induction and training of Trustee Board members

Following election, trustees are provided with an information pack comprising the Charter, Statutes and Regulations of the Academy, a Charity Commission publication on the responsibilities of charity trustees and the strategic plan. Trustee Board members are encouraged to attend recommended external training courses for charity trustees.

Report of Trustee Board

Internal control

The Finance Committee is mandated by and reports to the Trustee Board on the following issues:

- Setting a budget prior to each financial year for approval by the Trustee Board.
- Appointing and monitoring the performance of independent investment advisers.
- Approving authorised signatories and setting limits on delegated financial authorities.
- Monitoring actual financial performance against budget.
- Reviewing the reserves policy annually.
- Ensuring that accounting rules are followed.

Detailed management accounts are prepared monthly within 10 working days of the month end and submitted quarterly to the Finance Committee. Summarised accounts are submitted at each Trustee Board meeting.

MEMBERS OF THE FINANCE COMMITTEE

Mr I Ritchie CBE FREng FRSE (Chair)
Mr J Baxter CBE FREng FRSE
Mrs C Burke CBE FREng (until 21.9.15)
Mr A Cook CBE FREng

Mr N Haste OBE FREng (from 21.9.15)
Professor D Lane CBE FREng (from 21.9.15)
Professor J Norton FREng

INVESTMENT POWERS

The Academy's constitution stipulates that the Chair of the Finance Committee must be a trustee of the Academy.

RISK ASSESSMENT

The major risks to which the Academy is perceived to be exposed have been identified and mechanisms are in place to mitigate and monitor those risks. As part of this process, the Chief Executive reports to the Audit and Risk Committee twice per year on the status of perceived risks and the actions taken or about to be taken to reduce the risks of greatest concern. A review of the Academy's risk management processes and controls was completed during the year and a new Risk Management Policy is currently being implemented. This work has identified that financial sustainability is a significant risk for the Academy. The impact of the UK's withdrawal from the European Union upon the Academy's income, including from government grants and fundraising activities, is as yet uncertain. The Queen Elizabeth Prize for Engineering Foundation has yet to raise all the funds required to sustain the prize in perpetuity.

SENIOR MANAGEMENT TEAM

Day-to-day management of the Academy is the responsibility of the Chief Executive who with the directors comprise the senior management team, which meets weekly. The remuneration of the Chief Executive and directors is set annually by the Remuneration Committee. The directors are as follows:

Chief Executive	Mr P Greenish CBE
Director, Finance and Corporate Services	Mr H Beeston ACIS
Director, Education Programmes	Dr R Morgan
Director, Policy and Public Affairs	Ms B Parkin
Director, Development	Ms S Philbrick
Director, Strategy and Planning	Dr H Sillem
Director, Queen Elizabeth Prize	Ms K Navaratnam

Objectives and activities for the public benefit

Charitable activities

The Academy has focused its efforts on four areas of activity for the public benefit:

- Promotion of, and leadership in, engineering.
- Leading and shaping engineering policy.
- Enhancing engineering capacity.
- Inspiring young people and nurturing educational skills.

In pursuing its objectives, the Academy aims to position engineering at the centre of society, and to demonstrate the contribution made by engineers and engineering to society in the UK and beyond. The Trustee Board confirms that it has referred to the guidance contained in the Charity Commission's general guidance on public benefit, both when reviewing the Academy's aims and objectives and also in planning future activities.

Activities, achievements and performance

"Promotion of, and leadership in, engineering"

Main public benefits:

- Acting as a leadership body and to promote the value of engineering by harnessing the strengths of the engineering organisations.
- Working with the other national academies on a range of policy issues.
- Engaging the public in debate on engineering and its impact on society.
- Recognising great engineering through prizes and awards.

Main achievements

Engineering the Future (EtF), the overarching programme that is hosted by the Academy to bring together the professional engineering institutions (PEIs), the Engineering Council and EngineeringUK on key areas of policy, such as energy, transport, climate change, flooding, big data and innovation. Following the publication of *The Universe of Engineering: A call to action* in October 2014, the PEIs have taken each of the recommendations and formulated action to address how to make the profession fit for the future.

The MacRobert Award for innovation in UK engineering for 2015 was awarded to a team from Edinburgh-based Artemis Intelligent Power for its Digital Displacement

power system using digitally controlled hydraulics, which has the potential to transform the viability of offshore wind power and low-carbon transportation.

Other awards in 2015 were:

- Sir Frank Whittle Medal – awarded to Professor Peter Clarricoats CBE FREng FRS, Emeritus Research Professor, School of Electronic and Computer Science, Queen Mary, University of London, for his influential achievements spanning more than half a century.
- Sir George Macfarlane Medal – awarded to Dr Matthew Cole for his work in nanoscale materials science.
- Colin Campbell Mitchell Award – awarded to Optical Networks Group at University College London for its contribution to optical networks research and development of next-generation optical communications technologies.
- Silver Medals – awarded to Dr Susannah Clarke, Founder and Director of Embody Orthopaedic; Dr Don Syme, Principal Researcher at Microsoft Research UK; and Dr Andy Ward, Chief Technology Officer at Ubisense.
- Major Project Award – awarded to a team from Atkins for the Highlands and Islands superfast broadband project.
- President's Medal – awarded to Sir Richard Oliver FREng for his championing of engineering education and skills as chair of the Academy's Education for Engineering policy group.
- RAEng Armourers and Brasiers Company Prize – awarded to Professor Judith Driscoll, Professor of Materials Science at the University of Cambridge, for research that has revolutionised the properties of high temperature superconductors.
- Rooke Award – awarded to Dr Hugh Hunt for his outstanding contribution to the public promotion of engineering through a wide and varied range of activities across education, television and radio.

A number of significant events were held throughout the year, including the annual Academy Awards Dinner, the New Year Reception, three meetings in the *Innovation in...* series of events, *Ingenia* live!, and a number of lectures and meetings.

The *Ingenious* public engagement grant scheme awarded funding to 23 projects in 2015. Results from the most recent long-term tracking survey of engineers who participated in *Ingenious* projects show that, while 46% had no prior public engagement experience, almost 70%

Report of Trustee Board

had gone on to participate in additional public engagement activities after taking part in the scheme.

“Leading and shaping engineering policy”

Main public benefits:

- Enhancing the UK’s economic and social development by providing essential engineering expertise and policy advice to government and wider society, providing a unified voice for engineering on policy matters.
- Providing written responses and advice to parliamentary, governmental and other national bodies on a range of engineering topics, including the government’s Spending Review.

Main achievements

The Academy demonstrated the value of government support for innovation to secure the UK’s future growth, especially during a time of severe pressures on public finance and growing global competition. The resulting report, *Investing in Innovation*, received significant coverage in the media, as well as forming the basis for the Academy’s submission to the science budget inquiry by the House of Commons Science and Technology Select Committee.

Major Academy engineering policy reports included: *Built for living: understanding behaviour and the built environment through engineering and design*, produced jointly with Arup and the Economic and Social Research Council with support from the Royal Institute of British Architects (RIBA), University College London and the University of Leeds; *A critical time for UK energy policy: what must be done now to deliver the UK’s future energy system*, which was the third in a series of reports for the Prime Minister’s Council for Science and Technology; *Connecting data: driving productivity and innovation*, a joint report between the Academy and the Institution of Engineering and Technology (IET), which explored how the UK can create a ‘data-enabled’ economy through the use of data analytics; and the Academy’s first ‘challenge paper’ looking at *The transport congestion challenge*.

“Enhancing engineering capacity”

Main public benefits:

- Developing the health and wellbeing of the UK by improving the wealth generation of the UK economy by supporting high-quality engineering research and encouraging entrepreneurs and innovators to develop ideas.
- Facilitating links between industry and universities to translate innovative research into economic success.
- Enhancing the links between UK researchers and other international centres of excellence.

Main achievements

Academy President, Dame Ann Dowling OM DBE FREng FRS, published her *Review of Business-University Research Collaborations*, which offered advice and recommendations on how relationships between UK businesses and the UK’s world-leading university researchers could be better supported.

Achievements in programmes funded by the parliamentary grant included: 50 Research Chairs and Senior Research Fellows were in post during the year; two Research Chairs in Emerging Technologies were in post; 51 Research Fellows (including RAEng/EPSRC Research Fellowships, RAEng Research Fellowships and RAEng/MOD Fellowships) were in post; six new Industrial Secondment Scheme awards were made, with 17 in post; 41 universities had Academy Visiting Professorships in post; 18 companies participated in the Pathways to Growth scheme; 23 Distinguished Visiting Fellowship awards were made; under the Newton Fund, 41 awards were made for collaborations between the UK and Columbia, India, Kazakhstan and Thailand, and 42 exchanges were made across six countries as part of the Newton Research Collaboration Programme; eight engineering Enterprise Fellowships were awarded.

A total of 105 students were in receipt of Engineering Leadership advanced awards; 30 people took part in the Executive Engineers Programme; 20 Sainsbury Management Fellowships were awarded; four Petrofac/RAEng Fellowships were in post; two Sir Angus Patton Bursaries were granted; one Hertha Marks Ayrton Fellowship was in post; and 500 Aerospace MSc bursaries were granted.

The Academy continued to work with a number of related bodies including the National Academies, the Royal Society of Edinburgh, the Engineering Council, EngineeringUK, the 35 UK professional engineering institutions, Gatsby Charitable Foundation, the ERA Foundation, the Lloyd’s Register Foundation, Petrofac, the US National Academy of Engineering, the Chinese Academy of Engineering, the European Council of Academies of Applied Sciences, Technologies and Engineering (Euro-CASE), the international council of engineering and technological sciences academies (CAETS), the Daphne Jackson Trust, the Leverhulme Trust, and Women in Science and Engineering (WISE).

“Inspiring young people and nurturing educational skills”

Main public benefits:

- Meeting the needs of the UK economy and society by encouraging young people to study engineering.
- Promoting diversity and enabling underrepresented groups to take up a career in engineering.

- Enhancing teaching and learning.

The Academy continued to support The Big Bang Fair in 2016, the largest celebration of science, technology, engineering and maths for young people in the UK with an estimated 8,000 visiting the Academy stand over the four days.

The Academy, alongside EngineeringUK, co-leads the Tomorrow's Engineers programme, which reached more than 200,000 young people in 2015.

The Academy published the report *The UK STEM education landscape*, which highlighted the UK's engineering skills gap and teacher shortages in subjects such as physics, mathematics, computing, and design and technology.

The Academy continued to host Education for Engineering (E4E), which provided expert advice on apprenticeships and new content for engineering qualifications and enabling subjects at GCSE and A level.

The Academy's *Connecting STEM Teachers and Engineering Engagement* projects worked with hundreds of teachers to strengthen the quality of engineering education in schools and colleges.

The Visiting Teaching Engineers scheme for further education colleges was launched, to embed engineers and technicians into the curriculum.

The Academy developed the Engineering Talent Project, a multi-intervention social-marketing engagement programme designed to change perceptions of engineering among the next generation.

The Academy's diversity programme provided focused expertise to widen as well as increase participation in engineering. In 2015, the Diversity Leadership Group launched a toolkit developed with and for employers called *Increasing diversity and inclusion in engineering* at an event attended by more than 100 stakeholders.

The Academy has hosted around 160 students at a combination of summer school and engineering fast-track workshops as part of the Engineering Engagement Programme, which aims to attract undergraduates from diverse backgrounds into engineering employment.

Report of Trustee Board

Financial review

Review of transactions for the year

The financial statements are presented in the new format required by the Charity Commission's revised Statement of Recommended Practice (SORP 2015). The Statement of Financial Activities shows the gross income from all sources and the split of activity between restricted and unrestricted funds. Total group income for the year was £29.2 million. Total income decreased by £2.9 million over the previous year.

GOVERNMENT GRANT

The Academy is grateful to the Department for Business, Innovation and Skills for providing government core grant to support activities aimed primarily at promoting engineering research in the UK. Government core grant at £12.4 million was the largest contribution to funds and represented 42% of total group incoming resources. The Department of Business, Innovation and Skills made an additional grant of £3.9 million to the Newton Fund programme.

ENGINEERING EDUCATION PROGRAMMES

The Academy's engineering education programmes aim to improve engineering education from school through to postgraduate education and professional development. The Department for Business, Innovation and Skills and a group of aerospace sector companies donated £1.7 million to the MSc Aerospace Bursary Programme. BG Group made donations totalling £369,000 during the year to develop a network of support for STEM teachers in secondary schools.

DONATIONS AND LEGACIES

During the year, donations totalled £5.8 million, of which £4.0 million was to the Queen Elizabeth Prize for Engineering Foundation and £1.2 million was to the Enterprise Hub capital project.

OTHER INCOME

Other major sources of income during the year were: investments, subscriptions, events and facilities hire income at a total of £3.3 million.

CHARITABLE ACTIVITIES

Expenditure on charitable activities was £22.0 million during the year or 93% of total resources expended. Of this total, £19.1 million represented charitable activities and grants paid under various programmes and £2.9 million represented the costs of operating those programmes.

COST OF GENERATING FUNDS

The cost of generating funds consists of fees paid to investment managers, facilities hire and catering, and the staff costs and expenses associated with fundraising. These costs totalled £1.5 million or 6% of total group resources expended. The Academy is continuing with major fundraising activity aimed at obtaining funds for the enhancement and expansion of the Academy's educational programmes and public engagement activities.

INVESTMENTS

The Academy's investments are held in a general fund portfolio and a designated charity income fund. The Queen Elizabeth Prize for Engineering Foundation's investments are held in a managed investments fund. The general fund portfolio has the objective of generating income to spend on activities in support of the Academy's strategic objectives while preserving the capital value of the fund in real terms. The structure of the Academy's portfolio is currently 94% UK equities and 6% fixed-interest bonds; this allocation is reviewed regularly. During the year, the general fund generated £873,000 of income and incurred an investment loss of £563,000. Over the year, the portfolio delivered a total return of 1.7%, which was ahead of its benchmark (90% UK equities and 10% gilts) return of negative 3.1%.

FIXED ASSETS

Capital expenditure during the year amounted to £1.1 million, which was almost entirely on the leasehold improvements at Prince Philip House.

Academy's reserves policy

The Finance Committee has considered the level of Academy's general reserves as part of the twice-yearly risk assessment review procedure. The Committee has concluded that the required level of reserves is such as would enable the Academy to continue as a going concern in the event of a major reduction in income from existing sources. The Trustee Board, taking into account the recommendation of the Committee, has agreed the following reserves policy:

The Academy should maintain a minimum level of free reserves of £6 million. The Academy's free reserves should not exceed a maximum level of £60 million.

The reserves policy will continue to be monitored and reviewed by the Finance Committee who forward recommendations to the Trustee Board for their consideration should any amendments be required to the policy.

The free reserves of the Academy are made up as follows:

Year ended 31 March	2016 £000	2015 £000
Total funds per group balance sheet	58,465	53,889
Exclude:		
Restricted funds	34,892	30,625
Unrestricted funds tied up in tangible fixed assets	4,508	4,656
Designated and special funds	505	493
Deduct:		
Pension fund charge on assets	-	(32)
Free reserves	18,560	18,147

The Trustees of the Queen Elizabeth Prize for Engineering Foundation consider the level of the Foundation's reserves as part of their risk assessment review process. These reserves are restricted within the group balance sheet. There are no reserves held by RAE Trading Limited as all profit arising is gift aided to the Academy.

The specific uses and needs of the restricted and designated funds held by the Academy are detailed separately in the notes to the accounts referred to above. The Academy's reserves are available and adequate to fulfil the current obligations of the Academy.

Report of Trustee Board

Recipients of Academy grants

The Academy made over 1,000 grants and awards to organisations and individuals in 2015/2016 totalling £15.7 million. The first 50 organisations, in order of the total amount of cash paid to recipients, are listed below.

Amount in £	Visiting Professors and other programmes			Industrial secondments	Total
	Research				
1	Imperial College London	824,535	104,700	-	929,235
2	University of Southampton	574,044	147,933	-	721,977
3	Cranfield University	10,379	605,455	-	615,834
4	University of Bristol	507,860	34,168	-	542,028
5	University of Manchester	241,478	261,839	24,000	527,316
6	University of Cambridge	392,769	114,636	19,498	526,902
7	University College London	446,234	34,316	24,000	504,550
8	University of Oxford	437,353	6,458	-	443,811
9	University of Glasgow	290,004	98,295	24,000	412,299
10	University of Leeds	294,786	9,500	22,497	326,783
11	University of Surrey	269,553	46,827	-	316,380
12	University of Warwick	167,218	142,182	-	309,400
13	Heriot Watt University	288,323	9,600	-	297,923
14	University of Edinburgh	214,049	17,600	21,832	253,481
15	University of Sheffield	128,130	100,946	5,089	234,164
16	University of Strathclyde	151,551	68,562	-	220,113
17	University of Birmingham	183,213	24,868	-	208,081
18	Queen Mary and Westfield College	207,025	-	-	207,025
19	University of Nottingham	164,107	27,306	-	191,413
20	University of Bath	163,858	2,237	-	166,095
21	City University London	106,503	54,952	-	161,455
22	Lancaster University	133,800	4,750	-	138,550
23	Queen's University Belfast	107,588	24,384	-	131,972
24	Ulster University	101,875	18,181	-	120,056
25	Loughborough University	106,131	13,023	-	119,153
26	University of Brighton	-	114,038	-	114,038
27	Cardiff University	86,038	-	24,000	110,038
28	University of York	8,000	59,487	41,318	108,804
29	Universidad Nacional de Colombia	-	101,079	-	101,079
30	Universidad Industrial de Santander	-	99,782	-	99,782
31	SEO London Ltd	-	101,000	-	101,000
32	University of Huddersfield	82,000	1,450	-	83,450
33	University of the West of England, Bristol	5,919	77,282	-	83,201
34	Swansea University	5,621	46,946	23,525	76,092
35	Royal Society	72,479	-	-	72,479
36	National Institute of Technology	-	69,937	-	69,937

Amount in £	Visiting Professors and other programmes			Industrial secondments	Total
	Research				
37 University of Salford	20,000	42,983	-		62,983
38 University of Newcastle	-	60,393	-		60,393
39 University of Leicester	10,000	49,698	-		59,698
40 ClearSky Medical Diagnostics Ltd	-	56,250	-		56,250
41 Kingston University	941	51,625	-		52,566
42 Edinburgh Research and Innovation Ltd	50,000		-		50,000
43 Universidad Cooperativa de Colombia	-	50,000	-		50,000
44 Liverpool John Moores University	9,960	34,322	-		44,282
45 Universidad EIA	-	43,091	-		43,091
46 International Institute of Information Technology, Bangalore	-	43,060	-		43,060
47 University of Winchester	-	42,000	-		42,000
48 University of Liverpool	31,182	10,600	-		41,782
49 The Daphne Jackson Trust	41,041	-	-		41,041
50 The Chartered Institution of Building Services Engineers	-	40,000	-		40,000
Total	6,935,544	3,167,737	229,758		10,333,039

Notes:

1. Research comprises personal Research Chairs, Senior Research Fellowships, Research Fellowships, Distinguished Visiting Fellowships, public Engagement Awards, Newton International Fellowships, Research Exchanges with China and India, and Engineering Enterprise Fellowships.
2. Visiting Professorships and other programmes include Visiting Professorships in areas such as sustainable development and systems design, Visiting Teaching Fellowships and other engagement and education programmes.

Grant-making policy

The grant and award programmes are run by committees or steering groups of Fellows of the Academy. There is a policy of strict impartiality and no Fellow may participate in a grant/award decision if there is a conflict of interest. The role of Academy staff is solely one of administration of programmes.

Remuneration policy

The Academy's policy is to pay staff salaries at the market mid-point. Salaries are reviewed in alternate years following a market benchmarking exercise conducted by an independent consultancy. The next review will be effective as from 1 April 2017.

Report of Trustee Board

Plans for future periods

As set out in its strategic plan, the Academy will focus on the following five strategic objectives.

Strategic challenge 1: *make the UK the leading nation for engineering innovation*

Our aim is to support the development of successful engineering innovation and businesses in the UK in order to create wealth, employment and benefit for the nation.

We will achieve this by:

- marshalling the expertise in our Fellowship and networks to deliver substantial improvement in the environment for the creation of successful, innovative, wealth-creating UK businesses at scale
- growing our investment in research that brings together industry and the best engineering researchers in UK universities
- developing our Enterprise Hub as an engine for a vibrant, well-networked and supportive community for growing innovative businesses, and as an exemplar of support for innovation and entrepreneurship in engineering and technology
- deploying our Fellows and networks to bring a strong engineering influence to bear on EU, national, regional and local industrial policy.

Strategic challenge 2: *address the engineering skills crisis*

Our aim is to meet the UK's needs by inspiring a generation of young people from all backgrounds and equipping them with the high-quality skills they need for a rewarding career in engineering.

We will achieve this by:

- working with partners to recruit many more women and other underrepresented groups to engineering
- influencing positive structural change and innovation in education, training, recruitment and retention of engineers and technicians
- working with partners to transform the effectiveness of engagement activities that bring an understanding of and aspiration for engineering to young people
- helping teachers to embed engineering in schools and colleges through programmes that support teaching and learning, and bring real-world engineering into all stages of the formation of engineers

- promoting the importance of environmental, economic and social sustainability in engineering practice and education
- recognising and nurturing future engineering leaders.

Strategic challenge 3: *position engineering at the heart of society*

Our aim is to improve public awareness and recognition of the crucial role of engineers everywhere.

We will achieve this by:

- leading a broadly based campaign to create a cultural shift in how engineers are perceived across the whole of society
- convening the most influential people for debate and discussion to find and shape engineering solutions, and provide a clear and consistent voice for engineering
- advising UK and EU governments in all areas of policy that have an engineering dimension to delivery
- engaging with the public and other professions and sharing the value of engineering
- increasing the media profile and impact of the Academy and engineering
- developing our network of engineers into powerful advocates for the profession
- recognising, celebrating and promoting excellence through awards and prizes
- supporting the Queen Elizabeth Prize for Engineering in raising its profile to the level of a Nobel Prize.

Strategic challenge 4: *lead the profession*

Our aim is to harness the expertise, energy and capacity of the profession to provide strategic direction for engineering and collaborate on solutions to the engineering grand challenges.

We will achieve this by:

- establishing a shared vision and articulating clear and consistent messages on behalf of the profession
- working with professional bodies to ensure that engineers are equipped to meet the demands of a future in which technology will have an increasing impact
- leading a programme, with industry, academia and professional institutions, to create a more inclusive culture and to transform the diversity of the engineering workforce such that it reflects UK society

- working with professional bodies to ensure that they are equipped to meet the changing needs of society and the profession they serve
- supporting public policy through the expertise available across the profession
- harnessing international partnerships to promote better policy solutions to global grand challenges and build engineering capacity in developing nations
- raising wider debate and discussion on engineering and its impact on society so that the profession understands public points of view.

Strategic challenge 5: *greatly enhance the Academy's delivery capability*

Our aim is to ensure that the Academy has the Fellows, staff, partners, funding and influence to deliver a substantially greater contribution to the nation.

We will achieve this by:

- electing an engaged Fellowship of outstanding engineers who reflect the full diversity of society and the profession
- making the Academy an organisation that the best people want to work for
- increasing the numbers of our partners and supporters
- raising more funding support from government and third parties, in particular from the private sector
- engaging more influential young people including alumni of Academy programmes
- continually improving our communications
- working to embed our values in staff, Fellows and partners, including embedding diversity within the Academy and its programmes
- ensuring that our programmes complement those of other funders and draw on the unique capabilities of the Academy
- providing high-quality business tools and services to enable staff and Fellows to deliver their work effectively and efficiently
- routinely evaluating our work and measuring our progress
- completing the refurbishment of Prince Philip House by investing £7 million in the Enterprise Hub capital project.

Professor Dame Ann Dowling OM DBE FREng FRS, President

Statement of Trustee Board's responsibilities

The Trustee Board, as charity trustees, are responsible for preparing the Report of Trustee Board and the financial statements in accordance with applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted Accounting Practice).

Charity law requires the trustees to prepare financial statements for each financial year that give a true and fair view of the state of affairs of the group and parent charity and of the incoming resources and application of resources of the group for the year. In preparing those financial statements the trustees are required to:

- select suitable accounting policies and then apply them consistently
- observe the methods and principles in the Charities SORP
- make judgements and accounting estimates that are reasonable and prudent
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the charity will continue in business.

The trustees are responsible for keeping accounting records that are sufficient to show and explain the charity's transactions and disclose with reasonable accuracy at any time the financial position of the group and parent charity and enable them to ensure that the financial statements comply with the Charities Act 2011 and regulations made thereunder. They are also responsible for safeguarding the assets of the group and parent charity and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

The trustees are responsible for the maintenance and integrity of the financial information included on the charity's website. Legislation in the United Kingdom governing the preparation and dissemination of the financial statements and other information included in annual reports may differ from legislation in other jurisdictions.

Signed under delegated authority on behalf of Trustee Board on 29 July 2016.

Mr I Ritchie CBE FREng FRSE, Chair of Finance Committee

Auditor's report

Independent auditor's report to the Trustee Board of the Royal Academy of Engineering

We have audited the financial statements of the Royal Academy of Engineering for the year ended 31 March 2016, which comprise the Group Statement of Financial Activities, the Group and Parent Charity Balance Sheets, the Group Cash Flow Statement and the related notes. The financial reporting framework that has been applied in their preparation is applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted Accounting Practice).

This report is made solely to the charity's trustees, as a body, in accordance with the Charities Act 2011. Our audit work has been undertaken so that we might state to the charity's trustees those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the charity and the charity's trustees as a body, for our audit work, for this report, or for the opinions we have formed.

RESPECTIVE RESPONSIBILITIES OF TRUSTEES AND AUDITOR

As explained more fully in the Statement of Trustee Board's responsibilities, the trustees are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view.

We have been appointed as auditors under section 144 of the Charities Act 2011 and report in accordance with regulations made under section 154 of that Act. Our responsibility is to audit and express an opinion on the financial statements in accordance with applicable law and International Standards on Auditing (UK and Ireland). Those standards require us to comply with the Financial Reporting Council's (FRC's) Ethical Standards for Auditors.

SCOPE OF THE AUDIT OF THE FINANCIAL STATEMENTS

A description of the scope of an audit of financial statements is provided on the Financial Reporting Council's website at www.frc.org.uk/auditscopeukprivate

OPINION ON FINANCIAL STATEMENTS

In our opinion the financial statements:

- give a true and fair view of the state of the group's and the parent charity's affairs as at 31 March 2016, and

of the group's incoming resources and application of resources for the year then ended

- have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice; and
- have been prepared in accordance with the requirements of the Charities Act 2011.

OPINION ON OTHER MATTER AS REQUIRED BY BIS GRANT LETTER

In our opinion, in all material aspects, the grant payments received from the Department for Business, Innovation and Skills (BIS) have been applied for the purposes set out in the Grant Letter and in accordance with the terms and conditions of the agreement.

MATTERS ON WHICH WE ARE REQUIRED TO REPORT BY EXCEPTION

We have nothing to report in respect of the following matters where the Charities Act 2011 requires us to report to you if, in our opinion:

- the information given in the Report of the Trustee Board is inconsistent in any material respect with the financial statements
- sufficient accounting records have not been kept
- the parent charity financial statements are not in agreement with the accounting records and returns
- we have not received all the information and explanations we require for our audit.

BDO LLP

Statutory Auditor

London

United Kingdom

Date: 29 July 2016

BDO LLP is eligible to act as an auditor in terms of section 1212 of the Companies Act 2006.

BDO LLP is a limited liability partnership registered in England and Wales (with registered number OC305127).

Consolidated statement of financial activities

Year ended 31 March 2016	Notes	Unrestricted funds	Restricted funds	Total 31 March 2016	Total 31 March 2015
		£	£	£	£
Income from:					
Charitable activities	2, 3, 4	-	20,144,797	20,144,797	20,822,323
Donations and legacies	5	173,382	5,604,308	5,777,690	8,087,772
Other trading activities	6a	1,914,862	-	1,914,862	2,054,300
Investments	6	894,835	515,963	1,410,798	1,179,670
Total income		2,983,079	26,265,068	29,248,147	32,144,065
Expenditure on:					
Raising funds		1,337,134	143,679	1,480,813	1,494,441
Charitable activities	7	821,284	21,151,708	21,972,992	22,907,381
Other	8	88,759	7,191	95,950	43,868
Total expenditure		2,247,177	21,302,578	23,549,755	24,445,690
(Net losses)/gains on investment assets	11	(563,163)	(558,949)	(1,122,112)	1,031,338
Net income /(expenditure)		172,739	4,403,541	4,576,280	8,729,712
Transfer between funds	16	135,666	(135,666)	-	-
Other recognised gains /(losses)					
Actuarial losses on defined benefit pension scheme	9b	-	-	-	(1,865,000)
Net movement in funds		308,405	4,267,875	4,576,280	6,864,712
Fund balances brought forward 1 April		23,264,153	30,624,780	53,888,933	47,024,221
Fund balances carried forward 31 March	16, 17	23,572,559	34,892,655	58,465,214	53,888,933

All the above results are derived from continuing activities. There are no gains and losses other than those stated above.

Balance sheets

At 31 March 2016		Group		Charity	
	Notes	2016 £	2015 £	2016 £	2015 £
Tangible fixed assets	10	12,176,284	11,462,331	12,176,284	11,462,331
Investments	11	40,959,431	37,585,637	24,027,935	22,945,864
Total fixed assets		53,135,715	49,047,968	36,204,219	34,408,195
Current assets:					
Debtors	12	6,341,676	7,870,869	5,592,107	7,745,819
Stock	13	2,703	3,199	2,703	3,199
Cash at bank		6,067,191	3,819,723	2,233,966	643,924
Short term deposits		1,606,200	3,512,752	1,506,321	2,984,623
		14,017,770	15,206,543	9,335,097	11,377,565
Liabilities					
Creditors (amounts falling due within one year)	14a	(7,711,874)	(9,242,249)	(7,453,276)	(9,035,288)
Net current assets		6,305,896	5,964,294	1,881,821	2,342,277
Total assets less current liabilities		59,441,611	55,012,262	38,086,040	36,750,472
Creditors (amounts falling due beyond one year)	14b	(976,397)	(1,091,352)	(976,397)	(1,091,352)
Net assets excluding pension asset		58,465,214	53,920,910	37,109,643	35,659,120
Defined benefit pension scheme (liability)/asset	9b	-	(31,977)	-	(31,977)
Total net assets		58,465,214	53,888,933	37,109,643	35,627,143
The funds of the charity:					
Restricted income funds	16	34,892,655	30,624,780	13,551,788	12,301,142
Unrestricted funds					
Special funds	16	205,351	205,351	205,351	205,351
Designated fund	16	299,586	287,423	299,586	287,423
General fund	16	23,067,622	22,803,356	23,052,918	22,865,204
Pension reserve	16	-	(31,977)	-	(31,977)
Total unrestricted funds		23,572,559	23,264,153	23,557,855	23,326,001
Total charitable funds		58,465,214	53,888,933	37,109,643	35,627,143

These financial statements were approved and authorised for issue by the President and Chair of Finance Committee under delegated authority from the Trustee Board.

Signed on behalf of the Trustee Board on 29 July 2016

**Professor Dame Ann Dowling OM DBE FEng FRS,
President**

**Mr I Ritchie CBE FEng FRSE,
Chair of Finance Committee**

Consolidated statement of cash flows

Year ended 31 March 2016

	2016 £	2015 £
Cash flows from operating activities:		
Net cash provided by operating activities	4,675,517	307,287
Cash flows from investing activities:		
Dividends, interest and rents from investments	1,410,798	1,179,670
Purchase of property, plants and equipment	(1,126,758)	(359,134)
Proceeds from the sale of investments	4,258,173	2,850,863
Purchase of investments	(8,754,080)	(5,214,801)
Net cash provided by investing activities	(4,211,867)	(1,543,402)
Cash flows from financing activities:		
Repayments of borrowing	(122,733)	(121,414)
Cash inflows from new borrowing	-	-
Net cash used in financing activities	(122,733)	(121,414)
Change in cash and cash equivalents in the reporting period	340,917	(1,357,529)
Cash and cash equivalents at 1 April	7,332,474	8,690,004
Cash and cash equivalents at 31 March	7,673,391	7,332,475

Reconciliation of net income/(expenditure) to net cash flow from operating activities

Net income for the reporting periods (as per the statement of financial activities)	4,576,280	6,864,712
Net losses/(gains) on investments	1,122,112	(1,031,338)
Adjustments for:		
FRS102 operating pension adjustment	-	(35,000)
Payment to pension fund	-	(1,406,023)
Depreciation charges	412,804	433,399
Dividends, interest and rents from investments	(1,410,798)	(1,179,670)
(Increase)/decrease in stocks	497	7,270
(Increased)/decrease in debtors	1,529,193	(3,082,623)
(Decrease) in creditors	(1,554,571)	(2,128,440)
Net cash provided by operating activities	4,675,517	307,287

Analysis of cash and cash equivalents

Cash in hand	6,067,191	3,819,723
Notice deposits	1,606,200	3,512,752
Total cash and cash equivalents	7,673,391	7,332,475

Notes to the accounts

For the year ended 31 March 2016

Note 1 – Accounting policies

(a) Basis of preparation of the accounts

The annual report, incorporating the financial statements for the year ended 31 March 2016, has been prepared in accordance with the Academy's Royal Charter, and in compliance Accounting and Reporting by Charities: Statement of Recommended practice applicable to charities preparing their accounts in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS102) (effective 1 January 2015) – (Charities SORP (FRS102)), the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS102). The Academy meets the definition of public benefit entity under FRS102. These financial statements are the first financial statements prepared under FRS102.

(b) Reconciliation with previous Generally Accepted Accounting Practice

In preparing the accounts, the trustees have considered whether in applying the accounting policies required by FRS102 and the Charities SORP FRS102. No restatement of comparative items was required.

(c) Historical cost convention

The financial statements have been prepared under the historical cost convention, as modified for the inclusion of investment assets at market value. Following the transition under FRS102 a liabilities of £821,278 as at 31 March 2015 have been reclassified into restricted funds.

(d) Consolidation

The financial statements consolidate the results of the Academy and its own wholly

owned subsidiaries, RAE Trading Limited and The Queen Elizabeth Prize for Engineering Foundation, on a line-by-line basis. Transactions and balances between the Academy and its subsidiaries have been eliminated from the consolidated financial statements. Balances between the Academy and the subsidiaries are disclosed in the notes of the Academy's balance sheet. A separate statement of Financial Activities and Income and Expenditure Account for the Academy has not been presented because the Academy has taken advantage of the exemption afforded by section 408 of the Companies Act 2006.

(e) Income

The specific bases for accounting for income are described below. In general terms, income is accounted for on a receivable basis, gross of related expenditure. Income is only recognised where there is evidence of entitlement, where it is probable that income will be received, and there is reasonable certainty of the amount.

- Grants receivable are recognised when entitlement to the grant is confirmed, and also include returned grants that are accounted for on receipt.
- Gifts and donations and legacies are included in full in the statement of financial activities when receivable.
- For legacies, entitlements is taken as the earlier of the date on which either: the Academy is aware that probate has been granted, the estate has been finalised and notification has been made by the executor(s) to the Academy that a distribution will be made; or when a distribution is received

from the estate. Receipt of a legacy, in whole or in part, is only considered probable when the amount can be measured reliably and the Academy has been notified to the executor's intention to make a distribution.

- Income from sales of goods or contracts for services is recognised when the goods and services are delivered.
- Investment income is included in the Statement of Financial Activities in the year in which it is receivable.
- Other incoming resources consist of subscriptions, including income tax recoverable.

(f) Donated services and facilities

Donated professional services and donated facilities are recognised as income when the Academy has control over the item, any condition associated with the donated item has been met, the receipt of economic benefit from the use by the Academy of the item is probable and that economic benefit can be measured reliably. On receipt, donated professional services and donated facilities are recognised on the basis of the value of the gift to the Academy which is the amount the Academy would have been willing to pay to obtain services or facilities of equivalent economic benefit on the open market; a corresponding amount is then recognised in expenditure in the period of receipt.

(g) Expenditure

Expenditure is recognised on an accruals basis, gross of any related income. Costs are allocated to activities as described below. Indirect costs are apportioned to activities on a basis consistent with the use of the resources.

- Costs of raising funds comprise direct costs and expense of staff involved with fundraising, fees paid to investment fund managers, and trading costs.
- Charitable activities – grants. Grants payable are charged in the year in which the commitments to pay the grants are made.
- Charitable activities – other. Other charitable expenditure includes all direct expenditure, including staff costs, which is directly attributable to activities. Indirect costs are allocated to each charitable activity based on the number of staff directly supporting the activity.

(h) Support costs

Support costs are those functions that assist the work of the Academy and mainly comprise of staff costs and overheads. These costs have been allocated between costs of raising funds and expenditure on charitable activities.

(i) Operating leases

Rental costs under operating leases are charged to the Statement of Financial Activities, as the charges are incurred, over the lease periods.

(j) Tangible fixed assets

Depreciation is provided on all tangible fixed assets at rates calculated to write off the cost of each asset over its expected useful life, as follows:

Office fixtures and fittings – *over five years*

Computer equipment – *over three years*

Leasehold cost – *over term of lease*

Carlton House Terrace – *over the term of lease*

(k) Investments

Listed investments are included in the financial statements at market value at the balance

sheet date. Gains/losses on disposal of investments and revaluation of investments are recognised in the year of gain or loss and are allocated to the funds to which the investments relate. Investments in subsidiaries are included in the financial statements at cost

(l) Pensions

The Academy operates a defined contribution pension scheme. The assets of the scheme are held separately from those of the Academy in independently administered funds. The pensions cost charge represents contributions payable to the scheme in the year. The Academy has no liability under the scheme other than the payment of those contributions.

(m) Funds

General funds are those that are available for use at the Council's discretion in the furtherance of the Academy's objectives. Designated funds are unrestricted funds set aside for unrestricted purposes and which would otherwise form part of general funds. Details of the nature and purpose of each designated fund are set out in note 16. Restricted funds are funds that are subject to restrictions imposed by donors and are applied in accordance with these restrictions. Details of the nature and purpose of each restricted fund are set out in note 16.

(n) Debtors

Trade and other debtors are recognised at the settlement amount due after any trade discount offered. Prepayments are valued at the amount prepaid net of any trade discounts due.

(o) Stock

Stock is included at the lower of cost or net realisable value.

(p) Cash and cash equivalents at bank

Cash and cash equivalents at bank includes cash and short term highly liquid investments.

(q) Creditors and provisions

Creditors and provisions are recognised where the Academy has a present obligation resulting from a past event that will probably result in the transfer of funds to a third party and the amount due to settle the obligation can be measured or estimated reliably. Creditors and provisions are normally recognised at their settlement amount after allowing for any trade discounts due.

(r) Financial instruments

The Academy only has financial assets and financial liabilities of a kind that qualify as basic financial instruments. Basic financial instruments are initially recognised at transaction value and subsequently measured at their settlement value with the exception of bank loans which are subsequently measured at amortised cost using the effective interest method.

(s) Corporation taxation

The Academy is exempt from tax on income and gains falling within section 505 of the Taxes Act 1988 or section 252 of the Taxation of Chargeable Gains Act 1992 to the extent that these are applied to its charitable objectives.

Notes to the accounts

Year ended 31 March 2016		Unrestricted funds	Restricted funds	Totals 31 March 2016	Totals 31 March 2015
	Notes	£	£	£	£
Note 2 - Grants					
Government grant	3	-	12,399,875	12,399,875	13,100,543
Included in prior year grant income is £13,100,543 in respect of restricted funds and nil in respect of unrestricted funds					
Note 3 - Government grant					
Grant was expended on:					
External projects		-	9,693,295	9,693,295	10,569,443
Cost of managing external projects		-	2,706,580	2,706,580	2,531,100
		-	12,399,875	12,399,875	13,100,543
Note 4 - Other grants and contracts					
RAEng/EPSRC Research Fellowships		-	211,009	211,009	645,299
Visiting Professors		-	-	-	76,385
Leverhulme Fellowships		-	328,633	328,633	335,958
Africa-UK Engineering Development Partnership		-	-	-	153,000
RSDF Elster		-	-	-	307,909
Connecting Teachers		-	368,607	368,607	243,000
Petrofac Fellowships		-	30,000	30,000	90,000
Engineering Leadership Scheme		-	68,645	68,645	75,000
MOD Fellowships		-	52,738	52,738	105,475
Engineering Engagement Project		-	-	-	15,800
Technology Enhancement Programme		-	-	-	80,739
Engineering FE		-	163,511	163,511	88,700
Visiting Teaching Fellows		-	-	-	-
Sainsbury Management Fellowships		-	300,000	300,000	384,453
Executive Engineers Programme		-	-	-	15,247
Elite Engineering Programme		-	-	-	60,588
MSc Aerospace Bursary Programme		-	1,722,688	1,722,688	1,872,304
Skills Project		-	-	-	40,477
Barrow Engineering Programme		-	20,340	20,340	20,340
KS2 STEM Resources and CPD Programme		-	75,000	75,000	111,617
Stoke Engineering Programme		-	40,500	40,500	42,677
That Could be Me Programme		-	-	-	450,000
Enterprise Hub		-	64,550	64,550	337,500
Africa Prize for Engineering Innovation		-	313,666	313,666	77,000
Engineering for Education		-	-	-	58,119
MacRobert Award		-	26,000	26,000	20,000
Industrial Secondment		-	65,347	65,347	-
Lowestoft Engineering Programme		-	6,400	6,400	-
Enriching Engineering Education Programme		-	30,667	30,667	-
Education Studies and Support		-	20,000	20,000	-

Year ended 31 March 2016		Unrestricted funds	Restricted funds	Totals 31 March 2016	Totals 31 March 2015
	Notes	£	£	£	£
Newton Fund		-	3,822,872	3,822,872	1,907,419
Policy		-	-	-	42,498
Other awards and contracts		-	13,750	13,750	64,276
		-	7,744,922	7,744,922	7,721,780
Total charitable activities		-	20,144,797	20,144,797	20,822,323

Included in prior year other grants and contract income is £7,721,780 in respect of restricted funds and nil in respect of unrestricted funds

Note 5 - Donations and legacies

Development appeal	4,311	-	4,311	87,954
Annual appeal	61,011	-	61,011	37,749
Enterprise Hub capital project	-	1,186,900	1,186,900	2,400,000
Engineering Talent Project	-	375,000	375,000	200,000
Queen Elizabeth Prize for Engineering	-	4,042,408	4,042,408	5,330,075
Other	108,060	-	108,060	31,994
	173,381	5,604,308	5,777,690	8,087,772

Included in prior year other grants and contract income is £7,721,780 in respect of restricted funds and nil in respect of unrestricted funds

Note 6 - Investment income

Dividends and income from equity investments and fixed interest bonds	873,322	506,455	1,379,777	1,104,388
Interest on bank deposits	21,513	9,508	31,021	75,282
	894,835	515,963	1,410,798	1,179,670

Included in prior year investment income is £816,629 in respect of unrestricted funds and £363,041 in respect of restricted funds

Note 6a - Other income

Sponsorship and events	277,390	-	277,390	372,971
Subscription income	275,605	-	275,605	267,367
Advertising income and merchandising	50,278	-	50,278	50,892
Conferencing business	1,311,589	-	1,311,589	1,363,070
	1,914,862	-	1,914,862	2,054,300

Included in prior year other income is £2,054,300 in respect of unrestricted funds and nil in respect of restricted funds

Notes to the accounts

	Promotion of, and leadership in, engineering	Leading and shaping engineering policy	Enhancing engineering capacity	Inspiring young people and nurturing educational skills	Queen Elizabeth Prize for Engineering Foundation	Total 31 March 2016	Total 31 March 2015
	£		£	£	£	£	£
Note 7 - Charitable activities							
Unrestricted							
Charitable activities	68,435	-	-	-	-	68,435	385,271
Charitable grants	54,349	-	-	-	-	54,349	102,100
Direct salaries	335,784	-	-	-	-	335,784	371,400
Support costs	362,716	-	-	-	-	362,716	350,069
	821,284	-	-	-	-	821,284	1,208,840
Restricted							
Charitable activities	237,399	258,655	660,351	134,880	267,587	1,558,872	3,798,764
Charitable grants	433,900	337,800	12,196,000	1,742,600	-	14,710,300	13,785,877
Direct salaries	351,100	520,200	889,200	283,000	249,652	2,293,152	2,167,506
Support costs	434,760	652,993	1,116,189	264,387	121,055	2,589,384	1,946,394
	1,457,159	1,769,648	14,861,740	2,424,867	638,294	21,151,708	21,698,541
Total charitable activities	2,278,443	1,769,648	14,861,740	2,424,867	638,294	21,972,992	22,907,381
Total support costs of £2,952,100 are made up of indirect staff costs totalling £1,373,736 and accommodation costs and overheads totalling £1,578,364.							
2015 Total charitable activities	2,691,077	1,580,191	13,770,707	3,187,611	1,677,795		22,907,381

	2016 £	2015 £
Note 8 - Other costs		
Auditor's fees:		
- Audit	40,742	34,427
- Other services	30,218	2,788
Legal and professional fees	24,990	6,653
	95,950	43,868

Note 9 - Staff and pensions costs

(a) Staff costs analysis		
Gross salaries	3,162,129	2,988,431
Employer's National Insurance	349,518	327,673
Benefits in kind	23,198	17,281
Pension charge	286,140	232,825
Other staff costs (including recruitment, temporary staff, seconded staff)	431,441	357,008
	4,252,426	3,923,218

Average number of staff in the year by activity:	Number	Number
- Engineering and education	7	7
- Programmes and fellowship	31	24
- Policy and external affairs	11	15
- Executive, development, finance and administration	16	18
- Queen Elizabeth Prize for Engineering Foundation	3	4
	68	68

No remuneration is paid to the President or members of the Trustee Board of the Academy. Travelling expenses to attend Trustee Board meetings were reimbursed to eight board members in 2015/16 amounting to £19,434 (2014/15 £10,489 - seven members).

	2016	2015
The emoluments of higher paid staff within the following scales were:	Number	Number
£60,001 - £70,000	-	2
£70,001 - £80,000	1	2
£80,001 - £90,000	1	-
£90,001 - £120,000	2	2
£120,001 - £150,000	1	1
£180,000 - £190,000	1*	1

Emoluments include salary, bonuses and benefits in kind but exclude pension scheme contributions.

The senior management team comprises of a chief executive and six directors who manage the day-to-day operations of the charity. Their aggregate remuneration in the year was £874,933 (2014-15 £851,711).

Note: There were resignations and appointments among higher paid staff during the year.

**The member of staff within this payment scale did not benefit from pension scheme contributions.*

Notes to the accounts

Note 9(b) - Pensions

During the year, the Academy completed the transfer of its defined benefit pension scheme, which had been closed to new members in 2000 and closed to future accrual in 2007, to Aviva.

The Academy operates a defined contribution pension scheme for staff that joined after 1 January 2000 that is compliant with auto-enrolment legislation. The assets of the scheme are held separately from those of the Academy in independently administered funds. The Academy has no liability under the scheme other than the payment of contributions.

Note 10	Computer systems and equipment	Office fixtures and fittings	Leasehold	Carlton House Terrace improvement	Assets under construction	Total
	£	£	£	£		£
Tangible fixed assets (group and charity)						
Cost						
At 1 April 2015	514,218	175,577	5,310,000	7,291,672	-	13,291,467
Additions	78,635	4,692	-	-	1,043,431	1,126,758
At 31 March 2015	592,853	180,269	5,310,000	7,291,672	1,043,431	14,418,225
Depreciation						
At 1 April 2015	360,392	112,470	870,391	485,882	-	1,829,135
Charge for year	90,226	24,447	117,360	180,772	-	412,804
At 31 March 2015	450,618	136,916	987,751	666,654	-	2,241,939
Net book value						
At 31 March 2016	142,234	43,352	4,322,249	6,625,018	1,043,431	12,176,284
At 31 March 2015	153,825	63,107	4,439,609	6,805,790	-	11,462,331

All assets are used for charitable purposes.

Medal collections

- The Whittle Medals Collection are on loan from the family of Sir Frank Whittle, who patented the jet propulsion engine in 1930. The medals relate to his achievements in engineering and celebrate his successes.
- The Warner Medals Collection was a personal gift by Professor Sir Frederick Warner after his death in 2010. The medals relate to his achievements in engineering and celebrate his successes.

The Trustees consider that it is not practicable to obtain a valuation, but are satisfied that the value of the medals collections is not material.

Note 11 - Investments (group and charity)

Investments held in the general fund portfolio represent those held by the Royal Academy of Engineering with the objective of generating income for the Academy's charitable object while preserving the capital value of the portfolio.

Investments held in the restricted fund portfolio represent those held by the Queen Elizabeth Prize for Engineering Foundation with the objective of generating income for the Foundation's charitable object.

	2016 General fund (Charity)	2016 Designated income funds (Charity)	2016 Total funds (Charity)	2016 Restricted fund (Subsidiary)	2016 Total Portfolio (Group)	2015 Total Portfolio (Group)
Market value at 1 April	21,242,270	1,703,493	22,945,763	14,639,873	37,585,636	34,190,361
Add acquisitions at cost	3,939,371	-	3,939,371	4,814,709	8,754,080	5,214,801
Less: sales proceeds	(2,286,802)	-	(2,286,802)	(1,971,371)	(4,258,173)	(2,850,863)
Net investment (losses)/gains for the year	(563,163)	(7,334)	(570,497)	(551,615)	(1,122,112)	1,031,338
Market value at 31 March	22,331,676	1,696,159	24,027,835	16,931,596	40,959,431	37,585,637

All investments consist of securities listed on the London Stock Exchange of which fixed interest bonds amount to approximately £3.72 million in value.

Two stock holdings represented 5% or more of the general portfolio: Dechra pharmaceuticals £1,519,560 and Univer plc £1,110,090 as at 31st March 2016.

The restricted income funds consists of funds invested in a charity common investment fund to support the MacRobert and the Colin Campbell-Mitchell Awards.

	UK Equities £	UK Bonds £	2016 Total £	2015 Total £
Market value at 1 April	32,394,336	5,191,301	37,585,637	34,190,361
Market value at 31 March	37,236,913	3,722,518	40,959,431	37,585,637
Cost at 31 March 2014	27,107,355	3,648,556	30,755,911	25,806,203

Notes to the accounts

	Group		Charity	
	2016	2015	2016	2015
	£	£	£	£
Note 12 - Debtors				
Grants and sponsorship receivable	4,443,096	4,505,659	4,443,096	4,505,659
Prepayments	103,288	183,705	103,288	183,705
Gift Aid recoverable	-	5,651	-	5,651
Other debtors	1,795,292	3,175,854	573,850	2,582,553
Amounts due from subsidiary undertakings	-	-	471,873	468,251
	6,341,676	7,870,869	5,592,107	7,745,819
Note 13 - Stocks (Group and Charity)				
Publications, Academy ties, presentation plates and medals	2,703	3,199	2,703	3,199
Note 14a - Creditors (amounts falling due within one year)				
Committed grants and prizes	4,972,950	5,752,021	4,972,950	5,752,021
Deferred income	801,390	435,457	801,390	435,457
Subscriptions in advance	137,944	144,315	137,944	144,315
Other creditors	1,676,669	2,789,456	1,402,091	2,582,495
Amounts due to subsidiary undertakings	-	-	15,980	-
Social security and other costs	2,813	2,791	2,813	2,791
Bank loan	120,108	118,209	120,108	118,209
	7,711,874	9,242,249	7,453,276	9,035,288
Note 14b - Creditors (amounts falling beyond one year)				
Bank loan*				
- Due one to two years	122,042	120,108	122,042	120,108
- Due within two to five years	378,038	384,123	378,038	384,123
- Due after five years	476,317	587,121	476,317	587,121
	976,397	1,091,352	976,397	1,091,352
*The Academy has an unsecured loan of £2 million with NatWest, repayable over 20 years, with an interest rate of 1.1% over the bank's base rate being applied.				
Note 15 - Future commitments				
Total minimum commitments under operating leases				
Maturing between one and five years (equipment)	13,627	15,294	13,627	15,294
	13,627	15,294	13,627	15,294

Note 16 - Statement of changes in reserves

(a) Restricted funds

The Academy's restricted funds consist of the monies received under grants, corporate donations and contracts to support specific schemes as follows:

- **Department of Business, Innovation and Skills (BIS)** provides a government grant to fund programmes in the areas of engineering research and promoting the public understanding of engineering.
- **Gatsby Charitable Foundation** supports Sainsbury Management Fellowships.
- **RAEng/EPSRC Research Fellowships** are administered by the Academy and funded jointly by the Academy and the Engineering and Physical Sciences Research Council.
- **Leverhulme Trust** supports senior research fellowships of one-year duration.
- **ExxonMobil** provides funds for Engineering Teaching Fellowships, which support able young university engineering lecturers.
- **Engineering Leadership Scheme** assists undergraduate engineering students to realise their full potential and achieve their career goals.
- **Connecting STEM Teachers programme** is building a national network of support for STEM leaders in secondary schools and is supported by BG Group and Petrofac.
- **Petrofac Fellowships** support master's-level education of engineers wishing to pursue a technically specialist role in the oil and gas industry.
- **MOD Fellowships** are administered by the Academy as a joint scheme but fully funded by the Ministry of Defence through the Defence Science and Technology Laboratory.
- **Further Education Fund** is made up of various donations that are used to support the development of new and the extension of existing programmes in further education.
- **Higher Education Funding Council for England** funds the **National Higher Education STEM Programme**, the engineering component of which is led by the Academy as well as Engineering Gateways and UTC Programmes. All three programmes were centred around higher education STEM education activities.
- **Engineering Further Education Programme** develops and disseminates engineering subject-specific professional courses to support further education lecturers and is supported by BP, Shell and other donors.
- **Technician Secondment Scheme** supports technicians to gain experience for Engineering Technician Registration that they do not get in their current company.
- **Education for Engineering** provides information and advice for government on education and skills policy.
- **MSc Aerospace Bursary Programme** for students studying for MSc degrees in aerospace engineering is funded by BIS and delivered in collaboration with the Royal Aeronautical Society.
- **Carlton House Terrace Fund** will be used to develop 3 Carlton House Terrace into a national forum of engineering excellence.
- **Ms Morag Campbell Nelder Legacy** is to be used to fund an award for an individual or group of outstanding engineers.
- **Barrow Engineering Programme** is a regional programme to enhance and enrich STEM teaching and learning in a network of primary schools, secondary schools and further education colleges.
- **KS2 STEM Resources and CPD Programme** is funded by BAE Systems and supports the development and dissemination of contextualised resource boxes for use in primary and secondary schools.
- **Stoke Engineering Programme** is a regional programme to enhance and enrich STEM teaching and learning in a network of secondary schools and further education colleges.
- **The Enterprise Hub** harnesses the expertise, insight and networks of Academy Fellows, who include some of the UK's most successful entrepreneurs and business leaders, to support the country's most promising engineering entrepreneurs.
- **Africa Prize for Engineering Innovation** aims to stimulate, celebrate and reward innovation and entrepreneurship in sub-Saharan Africa.
- **External Education Fund** is made up of various donations that are used to support the development of new programmes and the extension of existing programmes.

Notes to the accounts

- **Newton Fund** schemes promote research and innovation intended to have a direct and long-term impact on the economic development and social welfare of countries participating with the UK in the Newton Fund.
- **Enterprise Fellowship Alumni** awards aim to celebrate the achievements in engineering entrepreneurship of previous Enterprise Fellows with a personal cash prize.
- **The Enterprise Hub capital project** funding will be used to create a base for the Academy's enterprise activities and contribute to the development of the lower ground floors of Prince Philip House.
- **Engineering Talent Project** is the working title of a major project designed to address the engineering skills gap over the next ten years. The project involves detailed analysis of the engineering skills landscape and the development of a strategy to ensure that the UK has the engineers and technicians.
- **The Made Here Now** project involves the development of a website that aims to stimulate the growth in UK manufacturing by communicating the breath of UK manufacturing.
- Other awards and contracts are donations and contracts by a number of companies for specific programmes each year.
- **The Sir Angus Paton Bequest Fund** is used to provide a bursary for a postgraduate student to undertake a full-time MSc course in a subject related to environmental engineering.
- **The Hinton Bequest Fund** is used to contribute towards the cost of the annual Hinton Lecture.

(b) Designated funds

- **The Building Maintenance Fund** is used for major items of building repair and redecoration.
- **The Building Development Fund** will be used to develop 3 Carlton House Terrace into a national forum of engineering excellence. These funds have been transferred to the Carlton House Terrace Fund.
- **The Education Support Fund** is a gift from the Gatsby Charitable Foundation to support education and engagement activities.
- Other designated funds represent general funds earmarked for specific activities such as awards and engagement activities.

	Balance at 1 April 2015	Incoming resources	Resources expended	Transfers between funds	Net investment losses	Balance at 31 March 2016
	£	£	£	£	£	£
Restricted funds						
Government grant	-	12,399,875	(12,399,875)	-	-	-
Sainsbury Management Fellowships	-	300,000	(300,000)	-	-	-
RAEng/EPSRC Research Fellowships	-	211,009	(211,009)	-	-	-
Leverhulme Fellowships	30,157	328,633	(358,791)	-	-	-
ExxonMobil Fellowships	75,495	-	-	-	-	75,495
Engineering Leadership Scheme	295,462	68,645	(68,645)	-	-	295,462
Connecting Teachers	228,428	368,607	(388,607)	-	-	208,428
MOD Fellowships	-	52,738	(52,738)	-	-	-
Further Education Funds	345,514	-	-	-	-	345,514
Petrofac Fellowships	53,253	30,000	(83,253)	-	-	-
Engineering Further Education Programme	-	163,511	(163,511)	-	-	-
MSc Aerospace Programme	-	1,722,688	(1,722,688)	-	-	-
Barrow Engineering Programme	3,814	20,340	(20,340)	-	-	3,814
KS2 STEM and CPD Resources Programme	106,526	75,000	(115,500)	-	-	66,026
Enterprise Hub	245,529	102,448	(20,348)	-	-	327,629
Enterprise Fellowships Alumni Awards	70,000	-	(70,000)	-	-	-

	Balance at 1 April 2015	Incoming resources	Resources expended	Transfers between funds	Net investment losses	Balance at 31 March 2016
	£	£	£	£	£	£
Africa Prize for Engineering Innovation	74,331	313,666	(332,066)	-	-	55,931
Carlton House Terrace Fund	6,424,033	-	-	-	-	6,424,033
Ms Morag Campbell-Nelder	424,537	17,346	(6,903)	-	(1,778)	433,202
Newton Fund	-	3,822,872	(3,822,872)	-	-	-
Enterprise Hub capital project	2,400,000	1,186,900	-	-	-	3,586,900
Engineering Talent Project	92,203	375,000	(112,066)	-	-	355,137
Made Here Now	10,152	2,602	(13,088)	334	-	-
Industrial Secondment Scheme	-	65,347	(65,347)	-	-	-
Lowestoft Engineering Programme	-	6,400	(6,400)	-	-	-
Enriching Engineering Education Programme	-	30,667	(30,667)	-	-	-
Education Studies and Support	-	20,000	(20,000)	-	-	-
Sir Angus Paton Bequest Fund	64,648	-	(9,000)	-	-	55,648
Hinton Bequest Fund	15,658	-	(7,258)	-	-	8,400
MacRobert Award Fund	1,276,463	80,206	(103,440)	-	(5,556)	1,247,673
MacFarlane Award Fund	20,481	-	(2,443)	-	-	18,038
Other awards and contracts	44,458	13,750	(13,750)	-	-	44,458
Queen Elizabeth Prize for Engineering	18,323,638	4,486,818	(781,973)	(136,000)	(551,615)	21,340,868
Total restricted funds	30,624,780	26,265,068	(21,302,578)	(135,666)	(558,949)	34,892,655
Designated funds						
Special funds						
- Building Maintenance Fund	205,351	-	-	-	-	205,351
Total special funds	205,351	-	-	-	-	205,351
Education Support Designated Fund	39,917	-	(13,900)	-	-	26,017
Parliamentary Affairs Designated Fund	5,216	-	(5,216)	-	-	-
External Education Designated Fund	105,648	40,500	(41,026)	-	-	105,122
Ingenia Designated Fund	6,400	49,112	(49,112)	-	-	6,400
Forum Partnerships Programme Designated Fund	130,242	32,000	(195)	-	-	162,047
Total designated and special funds	492,774	121,612	(109,449)	-	-	504,937
General fund	22,803,356	2,861,467	(2,177,038)	135,666	(563,163)	23,067,622
Pension fund surplus	(31,977)	-	31,977	-	-	-
Total funds	53,888,934	29,248,147	(23,557,088)	-	(1,122,112)	58,465,214

The general fund surplus of £684,429 is the difference between incoming resources of £2,861,467 and resources expended of £2,177,038

All other funds, other than the Queen Elizabeth Prize for Engineering, are funds of the parent charity.

Notes to the accounts

Note 17 - Analysis of net assets between funds

	Tangible fixed assets	Investments	Current assets	Liabilities	Total net assets
	£	£	£	£	£
Restricted funds	7,668,450	16,931,596	10,420,332	(127,723)	34,892,655
Special and designated funds	-	1,696,159	504,937	(1,696,159)	504,937
General funds	4,507,834	22,331,676	3,092,501	(6,864,389)	23,067,622
Total funds	12,176,284	40,959,431	14,017,770	(8,688,271)	58,465,214

Note 18 - Capital commitments

As at 31 March 2016, the Academy had capital commitments of £5,947,879 (2014-15 £1,227,770) in respect of building works at Carlton House Terrace.

Note 19 - Subsidiary activities

The Academy has one wholly owned subsidiary, RAE Trading Limited (registered company number 08038360) and a charitable subsidiary company, the Queen Elizabeth Prize for Engineering Foundation (registered charity number 1147743, registered company number 8077332). RAE Trading Limited was formed in April 2012 and manages a conferencing business at Prince Philip House; all available trading profits are gift-aided to the charity. The Queen Elizabeth Prize for Engineering Foundation was formed in May 2012 and advances the education of the public in the subject of engineering by awarding biennially a high-profile and internationally recognised prize for engineering. All activities have been consolidated on a line-by-line basis in the statement of financial activities and these results have been adjusted to eliminate income and expenditure relating to conferencing activities to the Academy and the Queen Elizabeth Prize for Engineering, and management fees payable to the Academy.

At 31 March 2016	RAE Trading Ltd		Queen Elizabeth Prize for Engineering Foundation	
	2016 £	2015 £	2016 £	2015 £
Total incoming resources	1,517,260	1,535,793	4,486,818	5,693,116
Total resources expended	(1,098,015)	(1,067,718)	(917,973)	(1,956,288)
	419,245	468,075	3,568,845	3,736,828
Total investment (losses)/gains	-	-	(551,615)	1,255,716
Net funds before gift aid	419,245	468,075	3,017,230	4,992,544
Gift aid to Royal Academy of Engineering	(419,245)	(468,075)	-	-
Retained net funds for the year	-	-	3,017,230	4,992,544
The aggregate of the assets, liabilities and funds was:				
Assets	580,905	751,530	21,468,591	18,386,530
Liabilities	(580,805)	(751,430)	(127,723)	(62,892)
Funds	100	100	21,340,868	18,323,638

The parent charity's results for the year are disclosed as follows:

	Academy	
	2016 £	2015 £
Gross income	23,888,962	23,656,054
Retained net funds for the year	728,465	(397,751)

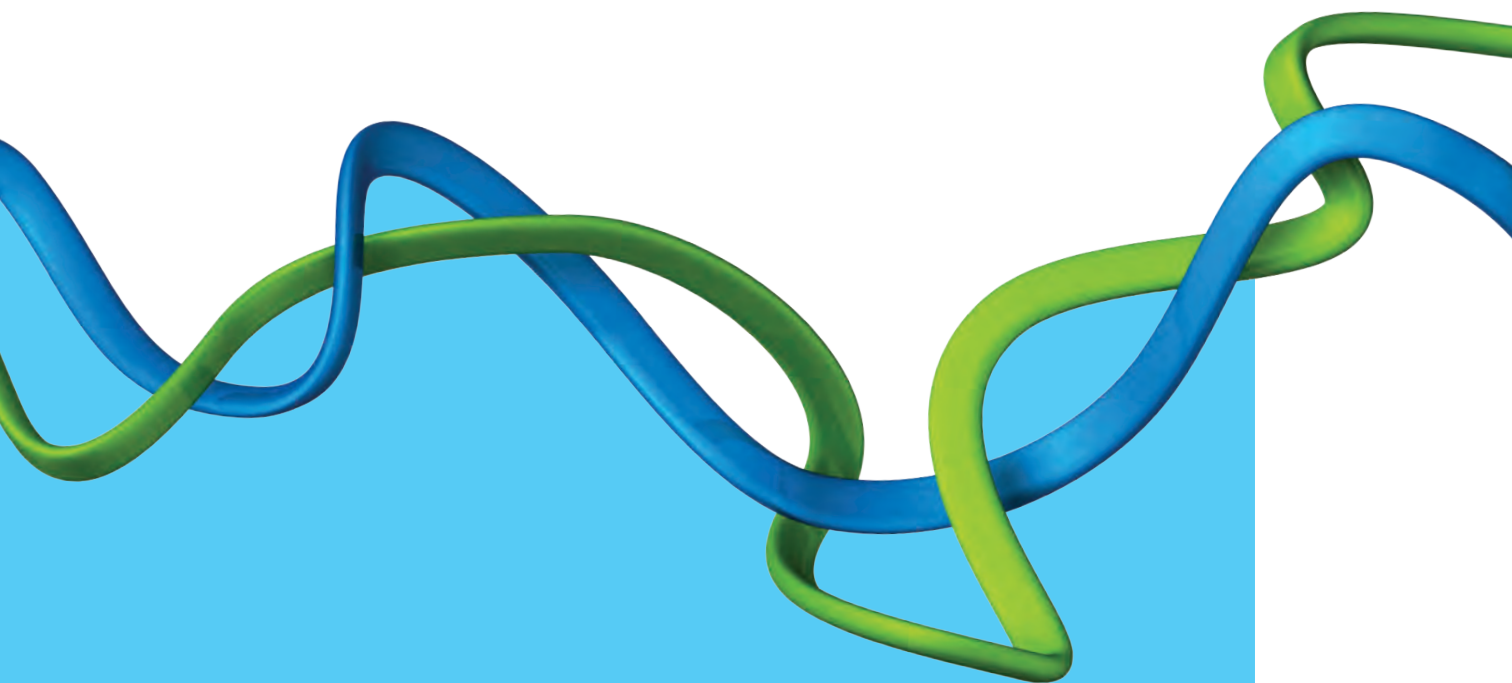
Note 20 - Related party transactions

The Academy has the following transactions within its subsidiaries during the year:

	Sales	Salary recharges	Management charges	Debtors	Creditors
	£	£	£	£	£
Queen Elizabeth Prize for Engineering Foundation	-	282,236	136,000	-	15,980
RAE Trading Limited	205,671	-	150,000	471,873	-

The Academy in the year made a payment of £192,541 into its defined benefit contribution pension fund.

All transactions in respect of trustees is provided for in Note 9.



The Royal Academy of Engineering promotes excellence in the science, art and practice of engineering.

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