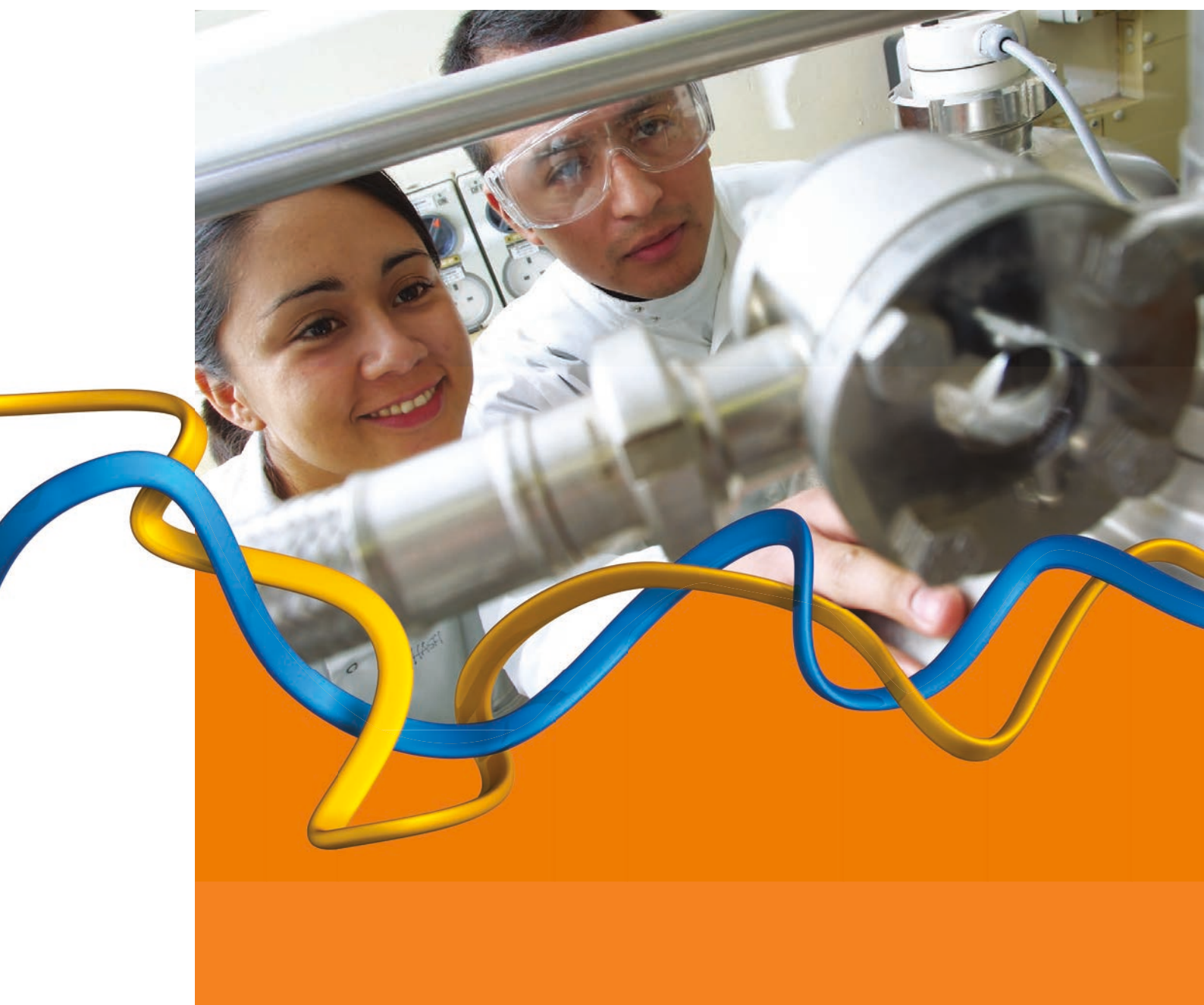


AnnualReview

2016/2017





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.

Position engineering at the heart of society

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

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.

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.

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 the University of Birmingham

Contents

Dame Ann Dowling OM DBE FREng FRS, President	2
Philip Greenish CBE, Chief Executive	3
Highlights of the year	4
Make the UK the leading nation for engineering innovation	6
Address the engineering skills crisis	10
Position engineering at the heart of society	14
Lead the profession	19
Greatly enhance the Academy's delivery capability	22
Trustee board	25
New Fellows 2016	26
Awards	29

Forewords



It is the Fellowship, with its broad range of expertise, that gives credibility and authority to our activities.

Dame Ann Dowling OM DBE FREng FRS President

In June 2016, the Academy celebrated 40 years since our founder Fellows were brought together for the first time by HRH Prince Philip The Duke of Edinburgh to create the Fellowship of Engineering. Since then, as our Senior Fellow, Prince Philip has given his time to the Academy tirelessly and generously and, as he steps back from public duties, we remain deeply grateful for all his encouragement and support.

The 40th anniversary gave us a good opportunity to take stock, assess our progress and look ahead to the next phase of our development. One theme became very evident: everything the Academy achieves is rooted in the leadership and enthusiastic participation of our Fellows. It is the Fellowship, with its broad range of expertise, that gives credibility and authority to our activities. Whether helping identify the next cohort of new Fellows, mentoring budding entrepreneurs, framing our policy advice to government, guiding our communications with the public through the media, supporting our vibrant research programmes, or steering our schools outreach – Fellows are the core of everything we do. I am very grateful to our Fellows who so generously give their time.

Over the year, two critical and significant developments in policy called for a profession-wide response. Following the results of the EU referendum, the Academy led a collaborative study that was published in the name of the 38 organisations that make up the engineering profession. Together, we undertook a very broad consultation right across the UK that provided the evidence for our report, *Engineering a future outside the EU*, which I handed personally to the Secretary of State for Exiting the EU. The report, which sets out the issues that are of concern to the engineering community, has been very well received in the profession and across government, and we have had a steady stream of meetings with key ministers and officials to discuss the points that it conveys.

Later in the year, the government published a Green Paper on industrial strategy, another issue of great importance across the engineering profession. We again joined forces to respond to the consultation, with workshops and a survey with some 1,200 individual responses providing the evidence for our submission. Again, the fact that the profession has spoken with a single voice on such a significant topic has been well received by ministers and we have had a number of meetings and workshops to follow up on our recommendations.

Not surprisingly, a critical issue highlighted in both reports is the shortage of people with engineering skills. The causes of this are long running and complex, and the Academy has identified seven factors that we are addressing in different ways under the banner of the *Engineering Talent Project*. Key among these is the need to address the perception of, and attitudes towards, engineering careers. There are many excellent programmes aimed at bringing engineering into the classroom but these are not having an effect at the scale needed, and the connections with schools are complicated – the Academy's *UK STEM Education Landscape* study identified that there are over 600 organisations involved in STEM education. So many options can make it difficult for schools to find out what is on offer and limits the opportunity to transfer best practice. To address this, the Royal Academy of Engineering and EngineeringUK are exploring how we might best work together to simplify and streamline our outreach to schools, for example through common messaging, a central education portal, and a focus on what teachers and students want. No one underestimates the challenge that this might present but, if the engineering profession works collaboratively once again, the increase in impact could have been significant.



Our education and skills and research programmes are greatly valued by schools, colleges and universities and continue to attract new support from engineering businesses and other partners.

Philip Greenish CBE Chief Executive

In her foreword, the President refers to two important reports to government in what has been a seminal year for the UK. Both were led by the Academy with the support of the larger engineering institutions, but presented in the name of all 38 bodies in the professional engineering community.

This reflects the growing need for our profession to speak with a coherent voice if we are to achieve real impact with policymakers on matters of strategic importance. This was also a key recommendation made by John Uff CBE QC FREng in his independent review of UK professional engineering, commissioned early in the year by the three largest engineering institutions.

The Academy has convened the profession and provided policy leadership for several years but the events of the last year and our response to them have provided added impetus to place this on a more strategic and systematic footing. This is critical if we are to contribute effectively to addressing

the issues that might constrain the UK's ability to compete successfully on a global stage as we leave the EU.

Collaboration underpins all that the Academy does and is integral to the profession. The Trustee Board has been actively considering how the Academy can step up to the next level of effectiveness, impact and influence across all of the Academy's activities. We have already made considerable headway in expanding our global reach through our role in major new international programmes such as the Newton Fund and the Global Challenges Research Fund, all of which are delivered through partnerships. Our education and skills and research programmes are greatly valued by schools, colleges and universities and continue to attract new support from engineering businesses and other partners.

Throughout its relatively short life, the Academy has worked to secure its permanence. While it is the difference we make through our activities across the UK and beyond that matters, we need a well located and effective base from which we can plan and deliver our programmes. This year, we have secured a new 125-year lease on

Prince Philip House and have completed the final phase of its refurbishment with the opening of the Taylor Centre. This provides us with a secure, high-quality home for the foreseeable future, which is close to Whitehall, Westminster and many principal partner organisations. Fellows have contributed significantly to this project over the years for which the President and I are most grateful. You will read within this report of the wide range of work that the Academy delivers within and from Prince Philip House.

The Academy has stepped up to many new challenges this year while consolidating its position. We look forward to working with our partners to increase the influence and impact of our profession in the challenging times to come.

Highlights of the year

MAKE THE UK THE LEADING NATION FOR ENGINEERING

INNOVATION

43 EARLY-STAGE HUB MEMBERS
HAVE RAISED MORE THAN **£30 MILLION**
OF EXTERNAL FUNDING TO DATE

44 ACTIVE RESEARCH FELLOWSHIPS
ACROSS **20** DIFFERENT UNIVERSITIES

181 LEADERS IN INNOVATION
FELLOWSHIPS AWARDED IN **14** COUNTRIES

ADDRESS THE ENGINEERING

SKILLS CRISIS

67,000 PUPILS HAVE BENEFITED
FROM EDUCATION PROGRAMMES

28 NEW VISITING PROFESSORS
APPOINTED, BRINGING THE
TOTAL IN POST TO **68**

35 ENGINEERING LEADERS'
SCHOLARSHIPS AWARDED

POSITION ENGINEERING AT THE HEART OF



SOCIETY

250 MEDIA MENTIONS
A MONTH ON AVERAGE

11,300 COPIES OF INGENIA
SENT OUT QUARTERLY

265,000 VISITS PER MONTH
TO THE ACADEMY WEBSITE

LEAD THE



PROFESSION

35 MILLION PEOPLE EXPOSED
TO THE ENGINEERING A FUTURE
OUTSIDE THE EU REPORT

450 ATTENDEES FROM **40** COUNTRIES
AT THE ENGINEERING A BETTER
WORLD CAETS CONFERENCE

6,799 RESPONDENTS TO THE
INCLUSIVE CULTURES PROJECT SURVEY

Make the UK the leading nation for engineering innovation

“From supporting researchers through their careers to helping to promote excellence in the profession, the Academy wants to make sure that brilliant innovators and entrepreneurs receive the support they need to translate their ideas into commercial success through products that can change lives.”

Ian Shott CBE FREng, Chair, Enterprise Committee

Enterprise Hub

In February 2017, the Enterprise Hub's new physical home, the Taylor Centre, was opened, providing a base for the Hub's community of talented innovators, mentors and investors. 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 high-tech companies and provides bespoke support and mentoring from the Academy's Fellowship.

Just after the opening, the fourth cohort of Enterprise Fellows and the second cohort of

Enterprise Fellows supported by the Royal Commission for the Exhibition of 1851 were announced. The 12 Fellows will benefit from a comprehensive support package that includes seed funding, mentoring, and marketing and PR support. The Hub portfolio is diverse, supporting a wide spectrum of engineering and technology startups on their entrepreneurial journey, from antibacterial coatings for steel and 'smart glasses' for blind and partially sighted individuals, to energy-absorbing smart materials.

The Hub is becoming an increasingly global community. The Academy is now working with over 400 early-stage entrepreneurs from emerging economies around the world, including alumni of the Africa Prize for Engineering Innovation. They are being supported by the Shell Centenary Scholarship Fund, Newton Fund, and Global Challenges Research Fund (GCRF), which provides government funding to support cutting-edge research that addresses the challenges faced by developing countries.

The Academy's Launchpad Competition continues to encourage budding entrepreneurs between the ages of 16 and 25 to start a new business based on their engineering innovation idea. The 2016 winner, Michael Tougher, developed 'Dots', a novel musical technology that allows people to create music by positioning stackable buttons on a mat. Each button acts as a note and can be combined into entire chords.



An attendee at the Taylor Centre launch event tries out Enterprise Hub member Mo-Sys Engineering's virtual reality technology © Rob Lacey

Taylor Centre

The new Taylor Centre within Prince Philip House provides Enterprise Hub members with a place to meet, work and grow their businesses.

The opening of the Taylor Centre in February 2017 is the next step in the Academy's progress towards transforming Prince Philip House, the Royal Academy of Engineering's home since 2007, into a national forum for engineering.

Based in the lower ground floor of Prince Philip House, the dedicated centre offers state-of-the-art IT, audio-visual and

conferencing facilities, hot-desking space and a number of different-sized meeting rooms.

The Taylor Centre provides a place where members can work, meet investors, attend events and receive training. By providing a physical space, together with funding and mentoring support, the Academy is leading the way in expanding the country's capacity for engineering innovation.

Plans for the new centre began with an enabling donation from renowned inventor and entrepreneur Dr John C Taylor OBE FREng, who has also lent his name to the Hub's new home. The redevelopment was also made possible with generous support from the late Geoffrey Argent FREng and The Wolfson Foundation, with equipment kindly donated by Toshiba UK.



The Enterprise Hub's new physical home, the Taylor Centre, offers Hub members a state-of-the-art space to work and network

The technology aims to empower people to create their own music without having to master complex musical instruments. Michael is now working with a number of Hub mentors to bring his product to market.

The Enterprise Hub Annual Showcase is the most significant event in the Hub's calendar. It provides Hub members with an opportunity to pitch their ventures to an audience with the aim of securing investments, clients or collaborations. The theme for the 2016 showcase was *Challenges of scaling up*. Gerard Grech, CEO of TechCity UK, delivered the keynote speech on the importance of building the capabilities of the next generation of technology entrepreneurs. Lesley Eccles, Founder and Marketing Director of fantasy sports marketplace FanDuel, led discussions that focused on breaking the growth barrier, drawing on her experiences of starting FanDuel and developing it into a world-class company.

The *Pathways to Growth* scheme, which previously supported training programmes to improve the skills of engineering entrepreneurs and engineers within startups, spin-outs and other small engineering organisations, has been refocused to meet the increasing challenges of scaling up. The new SME Leaders programme now aims to support the development of leadership skills through training courses, masterclasses and workshops, and mentorship.

Research

The Academy's research programmes contribute to engineering innovation by supporting excellent researchers throughout their careers.

The Research Fellowship scheme provides outstanding early-career researchers with five years' funding and mentorship from Academy Fellows to help awardees establish themselves as future research leaders. The scheme is highly competitive and 13 new appointments were made during the year. One of these Research Fellowships was supported by the Lloyd's Register Foundation and five were supported by the GCRF. The research objectives of the GCRF Research Fellows are focused on promoting the economic development and welfare of developing countries. The Academy's 44 active Research Fellowships are distributed across 20 different universities and a quarter have been awarded to women.

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 five-year university-industrial partnerships have led to real impact, including acoustic damping systems for leaner, greener aero-gas-turbine combustion and improved survivability of protection structures. The scheme currently supports more than 45 partnerships covering

a wide range of engineering disciplines and technology areas, from hip-replacement technology to machine learning. In the last year, four Senior Research Fellows have been promoted to professors and nine new awards were made; eight of these were with industrial partners that were new to the programme.

Another scheme bringing industry and academia together is the Academy's Industrial Fellowships scheme. It supports early- to mid-career academics wishing to undertake a collaborative research project in an industrial environment, which can help improve the quality and industrial relevance of their teaching and promote research collaboration. Eleven new Fellowships were awarded over the past year.

Launched in November 2016, Frontiers of Engineering for Development (FoE) is another of the Academy's GCRF programmes. FoE symposia are interdisciplinary, international events that attract diverse attendees from throughout engineering, including government, industry and academia. The events are held twice a year and bring together early- to mid-career engineers to network, engage and collaborate to tackle global grand challenges. At the end of each symposium, participants are offered the opportunity to apply for £20,000 seed funding to help kick-start a collaborative project inspired by the event. The first event took place in Cambridge in November 2016, resulting in 15 seed fund awards, and the second took place



At a glance

Research Chairs and Senior Research Fellows appointed in 2016-17

Professor Michalis Zervas, University of Southampton, SPI Lasers

Developing fibre-optic lasers of the future.

Dr Xibo Yuan, University of Bristol, Safran Electrical & Power UK

Reducing fuel consumption with more electric aircraft (MEA).

Dr Sophie Williams, University of Leeds, DePuy Synthes

Optimising reliability and performance of artificial hips.

Professor Stephen Roberts FEng, University of Oxford, MAN Group

Machine learning and data analysis techniques for large-scale, real-world applications.

Professor Omar Matar, Imperial College London, Petronas

From oil to toothpaste – multiphase fluid dynamics to help industry go with the flow.

Professor Hongbiao Dong, University of Leicester, TWI Ltd

Cracking the complexities of metal processing.

Professor Christoph Bruecker, City, University of London, BAE Systems

Developing aerodynamic skin inspired by nature.

Professor Robert Bowman, Queen's University Belfast, Seagate Technology

Developing new materials enabling advanced data storage for next-generation hard drives.

Professor Serafim Bakalis, University of Birmingham, Procter & Gamble

Modelling the real use of cleaning products to enable the development of sustainable goods.



The Frontiers of Engineering for Development symposia allow international development and engineering professionals from across the world to network and share ideas © Rob Lacey

in Edinburgh in February 2017, resulting in nine seed fund awards.

The Leverhulme Trust Senior Research Fellowships scheme, funded by the Leverhulme Trust, enables mid-career academics with a proven track record in research to be relieved of their day-to-day responsibilities in order to concentrate on research full time. Each Fellowship pays for a replacement academic to cover their teaching and administrative workloads for up to one year. In the last year, seven Leverhulme Trust Senior Research Fellowships were awarded.

This year, the Academy, the Royal Society and the British Academy, with support from the Leverhulme Trust, launched a new initiative: the APEX Awards (Academies Partnership in supporting Excellence in cross-disciplinary (X) research). The programme aims to demonstrate how researchers from different disciplines sharing a common vision can come together to generate creative and innovative solutions that benefit wider society, with a particular emphasis on the boundary between science and engineering and the social sciences and humanities. Each award will be up to £100,000 and can be held for a duration of 12 to 24 months. The award will primarily fund staff costs.

The Academy is partnering with the Government Office for Science to deliver a new UK Intelligence Community Postdoctoral Research Fellowship programme to promote unclassified basic research in areas of interest to the intelligence, security and defence communities. Applications were invited to address topics ranging from quantum and optical sensors to calculus of privacy, with successful candidates announced at the end of June 2017.

Some Academy-funded researchers had the opportunity to showcase their work at the annual STEM for Britain national poster

competition, open to early-career researchers in science, technology, engineering and maths (STEM). At the March 2017 event, 60 engineering applicants from across the UK presented their research posters. 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.

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 (LIF) programme, which helps entrepreneurial researchers across the globe to commercialise innovations that address international development challenges. In March 2017, the third year of the LIF programme drew to a successful close after welcoming 181 Fellows from 14 Newton Fund partner countries to the UK, including the first attendees from Indonesia and Malaysia. At the Academy, they received an intensive course of training and coaching, masterclasses from Academy Fellows and opportunities to network with peers. The alumni from the second year of the programme reported raising over \$6.5 million in funding following training from their coaches.

The Industry-Academia Partnership Programme is another Newton Fund scheme. This year, the programme funded a total of 46 bilateral collaborations with six countries. The China programme was particularly well subscribed and represents an important outcome of the Dowling Review Symposium, which was held in Beijing in July 2016 and encouraged both countries to share lessons on business-university collaboration.

Research Fellowships

Royal Academy of Engineering Research Fellowships are designed to promote excellence in any field of engineering.

The scheme provides support for high-quality engineers over a five-year period and encourages them to develop successful, independent academic research careers. The Fellowships can have a long-term impact on the Research Fellow's career and can be of great relevance to industry.

One such Fellowship was held by **Dr Paul Shearing** at University College London until December 2016. His research focused on tackling challenges in electrochemical energy conversion and storage, particularly improving the design of lithium-ion batteries, and he was promoted to Reader during the Fellowship. Dr Shearing has published more than 90 papers on his work in electrochemical storage and raised additional funding of over £9 million from Research Councils



Dr Paul Shearing

UK and industry. He won the Institution of Chemical Engineers' Young Chemical Engineer of the Year in Academia in 2014 and a RAEng Engineers Trust Young Engineer of the Year award in 2016. Dr Shearing believes that the resources, support and academic freedom afforded by the Research Fellowship were pivotal to these achievements.

Dr Peter Gammon completed his Research Fellowship at the University of Warwick in March 2017. His work focused on developing new electronic devices that can work in harsh environments, such as aerospace and electric vehicles. He developed novel silicon-on-



Dr Peter Gammon

silicon-carbide (Si/SiC) wafers that exploit the advantages of these semiconductor materials, which include higher voltages, currents and temperatures. The Si/SiC concept and the methodology for developing these wafers were developed within the time of Dr Gammon's Fellowship and have led to an optimised and subsequently patented device layout. Dr Gammon has since been awarded an Innovate UK grant and is involved in industrial projects with Thales Alenia Space and the UK Space Agency. He believes that his career developed at such a pace thanks "to the academic freedom and security that the Research Fellowship guarantees".

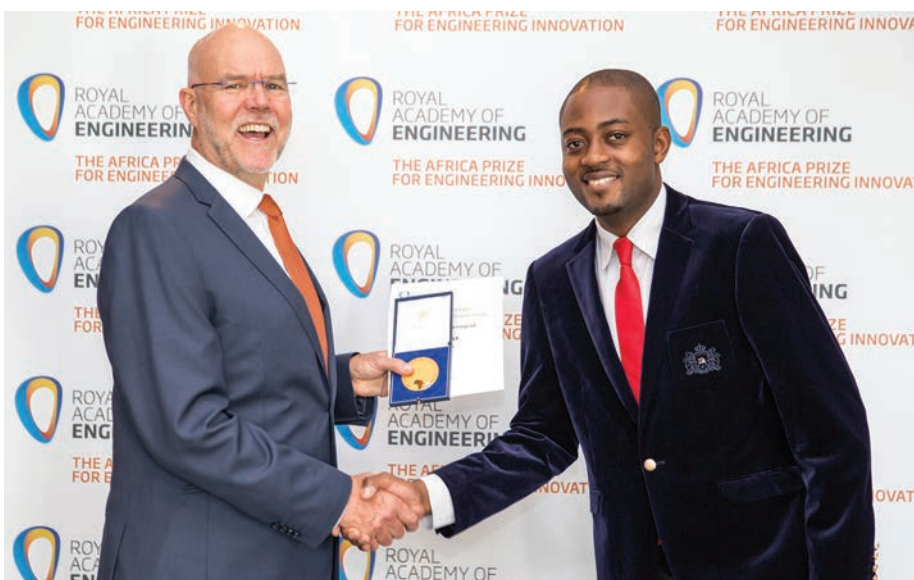
After a pilot phase that ran from 2013 to 2015, the Higher Education Partnerships in sub-Saharan Africa programme was able to scale up significantly, supported by funding from the Anglo American Group Foundation and the GCRF. The programme provides funding to nine hub universities in sub-Saharan Africa, which support a network of 62 additional spoke universities in 16 countries across the region. The hub universities undertake work placements with local industry partners, and in turn, share their experiences with the spoke universities through a series of workshops that they organise and fund. By forming and strengthening relationships between academia and industry, the programme aims to ensure that the higher education system in sub-Saharan Africa produces engineers with the skills and knowledge required to meet the needs of industry and to tackle local challenges.

In 2016, the second Africa Prize for Engineering Innovation was awarded to Arthur Zang, an innovator from Cameroon, for his heart-monitoring device, the Cardio-Pad. The small tablet device allows any medical professional to perform heart diagnostics at any location, which can then be sent to a cardiologist and interpreted in less than 20 minutes. Zang's innovation earned him a prize

of £25,000, and three other finalists from Kenya, South Africa and Uganda each received £10,000 to support their businesses in the fields of health technology and energy access.

In early 2017, 16 entrepreneurs from eight countries in sub-Saharan Africa who have been shortlisted for the third Africa Prize

attended a week of training in Kigali, Rwanda. The training allowed them to practise their pitches and meet inspiring local Rwandan innovators. An exciting partnership with HRH The Duke of York's Pitch@Palace series also resulted in all of those on the shortlist pitching their innovations at St James's Palace in London in March 2017.



Africa Prize winner Arthur Zang receives the award for his Cardio-Pad device from lead judge Malcolm Brinded CBE FREng

Address the engineering skills crisis

“ The UK requires a highly skilled workforce of creative engineers and technicians. From learning resources for school pupils to grants and bursaries for engineering students, the Academy is ensuring that young people are aware of the opportunities to pursue engineering at each stage of their education. ”

Professor Helen Atkinson CBE FREng, Chair, Education Committee



Visitors to the Academy's stand at the Big Bang Fair enjoy a demonstration of Marty the Robot, a programmable 3D-printed robot developed by Enterprise Hub member Dr Alexander Enoch of Robotical

Activities for schools

The Academy's *Connecting STEM Teachers* programme, which works to enhance the teaching and learning of STEM in schools across the UK, has expanded over the year and now has 45 teacher coordinators who support regional networks. The networks consist of 1,007 teachers from 504 schools across the UK, who receive training, free teaching and learning resources, and funding for collaborative projects between schools. It is estimated that over 150,000 school students have benefited from the programme since it was launched in September 2011.

The Academy's regional STEM support programmes, which provide opportunities for STEM engagement to students in disadvantaged areas of the UK, are now active in Lowestoft, Barrow-in-Furness and Stoke-on-Trent. These three programmes, which provide funding directly to schools to allow them to enhance and enrich their STEM curricula, are cumulatively working with 32 primary schools, 15 secondary schools and six post-16 colleges. To date, over 106,000 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. To build links with local organisations, the Lowestoft project provided fully funded internships in the local energy industry for five 16 to 18 year old students over the summer in 2016. Following this pilot, the scheme is being expanded to provide placements for 25 students in 2017.

In the last year, the Academy has developed a new *Cyber security* resource to support the schools' roadshow, launched in February 2017 by BAE Systems, the RAF and the Royal Navy. The resource explores online safety and shows how engineers have applied their knowledge to improve the security of the internet. The resource will be an integral part of the roadshow, which is expected to travel to more than 400 schools across the UK. The Academy also developed and launched *Existence at the extreme*, its latest STEM teaching and learning resource. This resource gives students the opportunity to learn how engineering has provided solutions to allow people to live in extreme environments such as deserts, the Arctic and monsoon regions. Since its launch in September 2016, more than 525 resource boxes and associated training materials have been disseminated to schools.

To date, the Academy has distributed nearly 3,700 resource boxes to schools and the full suite of resources has been downloaded online more than 25,000 times.

Engineering education reports

Over the past year, the Academy has published two reports about the status of STEM education in the UK, from primary and secondary level to higher education and opportunities for graduates.

Published in May 2016 for the Lloyd's Register Foundation, *The UK STEM education landscape* report provided a detailed picture of the engineering and STEM education landscape: the issues that need to be addressed, the organisations involved and an analysis of gaps in provision. It highlighted the fact that many young people do not study STEM subjects beyond GCSE, despite over 10 years of activity from more than 600 organisations encouraging them to do so. The STEM community has been working hard for many years to improve the number of young people with the qualifications and interest to consider progressing into engineering occupations. The analysis in this report was undertaken to inform the wider community, so that it can make strategic decisions about focusing support in areas that will have the most impact on the engineering skills shortage.

Published in November 2016, *Employment outcomes of engineering graduates: key factors and diversity characteristics* investigated the employment destinations of recent engineering graduates from UK higher education institutions. The report presented a detailed analysis of the factors affecting engineering graduate employment and, for the first time, provided data on long-term graduate employment outcomes. The results showed the importance of engineering skills to the economy, with overall employment outcomes from engineering being very strong, compared to the overall graduate cohort. However, the results also highlighted stark differences in employment outcomes between engineering graduates of white and ethnic minority origin, finding that 71% of white engineering graduates find full-time jobs after six months compared with just 51% of Black, Asian and minority ethnic (BAME) students. The report concluded that further investigation into the impact of ethnicity and academic attainment on early employment prospects for engineering graduates is needed, with the Academy encouraging engineering employers to work to address these issues.



The employment outcomes of engineering graduates: key factors and diversity characteristics report found that engineering graduates are highly employable but that ethnicity is still a barrier © University of Birmingham



Attendees at the Visiting Professors' conference collaborate on a project held at one of the workshops © Rob Lacey

The Academy supported the national Big Bang Fair again this year, with a stand that showcased some of the work done by Enterprise Hub members and the Academy's Research Fellowships. This included Marty the Robot, a programmable 3D-printed robot developed for schools to help students learn to code by Enterprise Hub member Dr Alexander Enoch's company Robotical, and demonstrations of the uses of graphene. It is estimated that close to 10,000 people visited the Academy's stand over the four days of the fair.

Education for Engineering

The Academy-hosted alliance, Education for Engineering (E4E), brings together the 35 professional engineering institutions (PEIs), the Engineering Council and EngineeringUK to provide a single, coherent voice to government and the devolved assemblies on education and skills matters.

This year, much of the activity has centred on the skills implications of exiting the EU and coordinating the engineering profession's response to the skills elements of the government's industrial strategy Green Paper.

Another area of focus has been the creation of the new Institute for Apprenticeships. E4E has

been presenting the profession's view on the functions and responsibilities of the institute. The engineering profession already makes a substantial contribution, not least through the Trailblazer Apprenticeship Standards development process, and is continuing its discussion with the institute on a range of issues around apprenticeship standards.

The institute will also take on responsibility for technical education, specifically the new post-16 routes proposed in Lord Sainsbury's skills review. The engineering community supported the Department for Education in the development of the T-levels by mapping the occupations for engineering and manufacturing, construction and the built environment, and digital.

Further and higher education

The Academy's Higher Education Employer Engagement Programme provides opportunities for undergraduates from underrepresented groups to improve their chances of gaining engineering employment after graduation. It provides them with a range of support activities such as interview techniques, CV writing, mentoring and networking events with employers.

The programme has moved into its second year and staged three events, in London, Derby and Leicester, which promoted a career in engineering to students from underrepresented groups. Working in collaboration with 13 employer partners, the project has engaged more than 300 students, 56 of whom have successfully secured graduate or placement positions in engineering companies.

In late 2016, the Academy launched *Higher Education Focus*, an interactive website that collates information and provides a hub for those teaching, studying, working or interested in engineering in higher education. The website includes links to relevant books, journals, online resources and reports; information about schemes for industry, undergraduates, postgraduates and academic staff; information about the Engineering Education Research Network; details of upcoming events; and weekly news updates.

For the past 18 months, the Academy has been tackling the challenge of developing a robust process for measuring teaching quality. A new university teaching measurement framework has been created for the evaluation of teaching achievement during faculty appointment and promotions procedures. The framework can be used across any discipline, not just engineering,

Transforming attitudes to engineering

The Engineering Talent Project (ETP) aims to communicate the excitement of engineering and breadth of opportunities it offers.

ETP, the Academy's programme to address the engineering skills crisis and public attitudes towards engineering as a career, has made considerable progress over the past year. The project has attracted the support of seven major engineering businesses and a comprehensive research study has provided greater understanding of the young people whom the Academy hopes to reach, and their perceptions of an engineering career.

One of the Academy's main areas of focus has been on developing a suite of creative materials for a communications campaign that will challenge the typical view of engineering and inspire young people to find out more. A variety of ideas have undergone qualitative testing with the target audience, which has provided further insight into the perceptual shift required to engage them. The next steps for the project include the development of a more detailed media plan of where the adverts will appear, the adverts themselves, and commencement of a wider round of consultation and testing of the branding, messaging, storyboard and script.

The other elements of the project focus on increased engagement with schools through EngineeringUK's Tomorrow's Engineers programme; a policy and public affairs programme to address structural barriers, such as teacher shortages in key subjects and poor careers guidance in schools; and a concerted effort to improve workplace cultures so that employers are attractive to the current and next generation of engineers.

as appointment and academic progression is mainly set at institution level. The framework is also intended to be used for academics in both 'teaching and research' and 'teaching-only' posts.

For the past year, the framework has been piloted and evaluated by a consortium of 16 leading universities from across the world. The Academy has hosted expert workshops to gain feedback on the current template and a finalised version is due to be published in late 2017.

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.

This year, 28 new VPs were appointed, bringing the total on the scheme to 68 VPs across 37 different universities. The Academy hosted the annual VP conference in November 2016 on the theme of *How they do it elsewhere*. For the first time, the conference brought together VPs with academics from the Academy's international programmes, enabling them to network, take part in workshops and panel discussions, and share approaches from the UK and overseas.

Bursaries and professional development

The Academy's Engineering Leaders Scholarship programme (formerly the Engineering Leadership Advanced Awards) 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.

The Academy has a long history of developing industrial leaders who will drive future UK growth. The Sainsbury Management Fellowships (SMF) scheme, funded by the Gatsby Charitable Foundation with the personal support of Lord Sainsbury and the Engineers in Business Fellowship (the charity arm of the SMF programme), enables engineers who have high career potential to undertake a full-time MBA programme at a leading internationally renowned business school. Nine new awards were made during the year. Following the completion of their MBA, the awardees are supported by an extensive network of SMF alumni, managed by the charity.

Alumni also play a key role in supporting a wide range of Academy activities, including the Engineering Leaders Scholarships and the Enterprise Hub.

At a glance

Education programme highlights

Over the past year:

Nearly **1,000** free resource boxes have been given out to schools.

The *Connecting STEM Teachers* programme has worked with more than **1,000** teachers from over **500** schools.

The Engineering Leaders Scholarships scheme has supported **35** undergraduates.

The Academy has supported **68** Visiting Professors at **37** UK universities.

Nine Sainsbury Management Fellowships have been awarded.

More than **300** students have been part of the Higher Education Employer Engagement Pilot Project.

Position engineering at the heart of society

“ The Academy’s Fellowship is a hugely valuable resource, enabling us to ensure that the voice of engineering is heard and heeded in the public domain. The Academy has become a key contributor to the development of national policy, and the work we do to raise the public profile of our profession – both in the UK and internationally – has enjoyed great success, although there is so much more to be done. ”

Professor John Loughhead OBE FREng, Chair, Engineering Policy Committee

Policy

This year, a key theme for the Academy’s policy work has been digital systems and data. Following on from the publication of the *Connecting Data* report in September 2015, the Academy held workshops that considered aspects of cyber security and resilience and how to use data to create wealth. The first of these workshops investigated how digital control systems and the Internet of Things can be developed to incorporate higher safety standards, something that is vital as more and more critical systems are being connected. The second workshop explored how data generates value and where innovations have led to new ways of prompting wealth creation, for both individual companies and the UK economy as a whole. To mark the one-year anniversary of the publication of the report, a panel discussion, *Creating value from data through statistics and engineering*, was held jointly with the Royal Statistical Society.

As part of the Engineering and Physical Sciences Research Council’s first Robotics Week in June 2016, the Academy hosted a debate on the ethics of autonomous systems: *Robots: faithful friend or existential threat?* The discussion covered the technical, economic, social and legal aspects of the development of artificial intelligence, focusing on the sufficiency of existing legislation

against cybersecurity attacks and the ethical frameworks that should guide developments in artificial intelligence. It has since been developed into a study that will consider how regulations in autonomous systems might impact on UK businesses.

On the subject of energy, the Academy published *Living without electricity*, a report that was put together with Lancaster University and the Institution of Engineering and Technology. The report detailed the loss of virtually all modern infrastructure in Lancaster for four days in December 2015, caused by unprecedented flooding in north Lancashire and Cumbria. Professor Roger Kemp MBE FREng, a Professorial Fellow at Lancaster University, used this local crisis as an opportunity to observe how modern society copes without a regular supply of electricity. He first wrote a blog post, which was followed by a workshop and publication of the report. Stories about the report’s findings were featured in the *Guardian* and the *Sunday Times* and the subject has been aired at a number of meetings of emergency responders and planners around the country.

Better delivery of health and social care was addressed through a year-long project that brought together engineers and some 50 people involved in service improvement in the NHS. A series of workshops examined how systems-thinking methods drawn from

engineering could help to transform the quality of health and care in the UK and reduce costs. The shared learning from this work has been distilled into a ‘primer’, a document that will enable this engaged community to explore and promulgate the approach in their NHS and academic institutions.

The Academy’s Panel for Biomedical Engineering held a three-day conference, hosted by Imperial College London, on medical imaging and interventions for cancer for early-career researchers and their mentors in September. The conference was designed to support the career development of postdoctoral researchers by giving them the opportunity to showcase their work, improve networking skills and receive guidance from leading experts.

The Academy was commissioned by the Department for Transport and the Department of Energy and Climate Change (now the Department for Business, Energy and Industrial Strategy) to put together a report on the sustainability of liquid biofuels that will provide evidence to support policy developments in this area. Work on the study progressed throughout the year under a working group of Academy Fellows and experts, supported by Academy staff, and the final report will be published in summer 2017.

Academy awards evening



The MacRobert Award 2016 winning team from Blatchford receives the gold medal from HRH The Princess Royal and the President

In June 2016, the President was joined by over 400 guests to celebrate the best in UK engineering at the Academy's annual Awards Dinner, held at the Pavilion at the Tower of London.

The evening saw the announcement of the MacRobert Award, the UK's longest-running and most prestigious prize for innovation in engineering. HRH The Princess Royal and the President presented the prize to the winning team from Blatchford for the development of its Linx limb system, a prosthetic with smart robotics that constantly monitor and adapt to movement, making walking and other movement more natural for lower-leg amputees.

Apple's Chief Design Officer Sir Jonathan Ive KBE HonFREng was guest of honour at the event and presented MacRobert Award finalists Jaguar Land Rover and Siemens Magnet Technology, as well as Blatchford, with a certificate.

A number of other prizes were presented throughout the evening. Professor Danielle George MBE, from the University of Manchester, received the Rooke Award for her contribution to the public promotion of engineering, including the

Royal Institution Christmas Lectures that she presented on engineering. The Major Project Award was presented to a team from BAE Systems' AI (Applied Intelligence) Labs for its Intermediate Frequency Modem System, which was a key component of the technology used by the Rosetta spacecraft to study the comet 67P/Churyumov-Gerasimenko. The Prince Philip Medal, the Academy's highest individual accolade, went to Dr Jonathan Ingram for his groundbreaking work on BIM (building information modelling).

The Silver Medals, which are awarded to outstanding individuals in recognition of their personal contributions to UK engineering, were presented to:

Dr Damian Gardiner, a research scientist and Business Development Manager at Johnson Matthey, which acquired his University of Cambridge startup company, ilumink Limited, in 2015. Dr Gardiner developed a unique method of printing 'liquid crystal' material onto any surface using an ink-jet printer, a secure, economical and practical way of security-tagging products such as cosmetics, perfumes, drugs and banknotes.

Dr Demis Hassabis, Co-founder and CEO of Google's DeepMind subsidiary, which has made a number of pioneering breakthroughs in artificial intelligence (AI). Founded in 2010 and acquired by Google in 2014, DeepMind's

AlphaGo project successfully beat the world's number one Go player, long seen as a grand challenge of AI research, in a contest in Seoul in 2016. It was watched online by 280 million viewers.

Professor Tong Sun, Director of the Photonics and Instrumentation Research Centre at City, University of London. She was the first female professor to be appointed at the university's School of Engineering (as it then was) in its 100-year history and is an international leader in the use of optical fibre sensors to monitor sensitive equipment, particularly in extreme conditions.

Established with the generous support of the Worshipful Company of Engineers, the RAEng Engineers Trust Young Engineers of the Year awards are given to UK engineers in full-time higher education, research or industrial employment, who have demonstrated excellence in the early stage of their career. The five awards were presented to Dr Sithamparanathan Sabesan from the University of Cambridge, Dr T Ben Britton from Imperial College London, John Collins from Arup, Orla Murphy from Jaguar Land Rover and Dr Paul Shearing from University College London. Dr Sabesan also won the Sir George Macfarlane Medal for demonstrating excellence in the early stage of his career.

At a glance

Event highlights

April 2016

Fellows' visit to British Airways Engineering.

May 2016

Self-driving cars – a safe bet? – East Midlands regional lecture by Professor Tim Gordon, Head of School of Engineering, University of Lincoln.

September 2016

Research Forum – exhibiting the work of the Academy's funded researchers.

October 2016

Breaking the code – held as part of the *Ingenia* live! series with presentations from Professor Dino Distefano from Facebook, Dr Marily Nika from Google, and Dr Danny Tarlow from Microsoft Cambridge.

Space missions – the what, how and why – regional lecture by Professor Matt Perkins FREng.

November 2016

In conversation with MacRobert 2016 Award winners: Blatchford – the development of the world's most advanced prosthetic limb.

Hinton lecture – Engineering the future of data – Professor Sir Nigel Shadbolt FREng, Professor of Computer Science at the University of Oxford and Principal of Jesus College, explored how advances in computing are transforming the world we live in.

January 2017

Fellows' Day – a special event for Fellows, highlighting the Academy's recent and current work.

March 2017

Delivering the nation's flagships – joint annual lecture with the Royal Society of Edinburgh given by Archie Bethel CBE FREng FRSE, Chief Executive of Babcock International Group plc.

Engineering the future – lecture by Warren East CBE FREng as part of the *View from the top* series.

Engaging through the media

The Academy's communications activities have grown steadily throughout the year, with an increase in media coverage and audiences engaged with the Academy through social media and public engagement.

Academy activities continue to be promoted through a wide range of traditional and social media. Highlights this year include the President appearing on *Desert Island Discs* on BBC Radio 4 during the week when she was formally appointed to the Order of Merit by Her Majesty The Queen. Several other Fellows were profiled in the media this year, including Dame Judith Hackitt DBE FREng in the *Financial Times*' At Home feature and Dr Dame Sue Ion DBE FREng FRS, who also appeared on *Desert Island Discs*.

Over the course of the year, the Academy was mentioned in national and regional print and online media more than 3,000 times – an average of 250 mentions a month – and has contributed to 43 TV broadcasts and 113 radio broadcasts. These ranged from the Enterprise Hub Showcase being featured on the Sky News' technology show *Swipe* to Optos founder Dr Douglas Anderson FREng being interviewed for the *Daily Express*, 10 years on from winning the MacRobert Award.

Engineering a future outside the EU, the profession-wide report coordinated by the Academy following the EU referendum (see page 19), reached an estimated audience of up to 35 million people when it was published, through coverage including articles in the *Daily Telegraph* and *Financial Times*. Deputy CEO Dr Hayaatun Sillem was interviewed

about the report on BBC World News and BBC Radio 4's *Today* programme.

The Academy's work has also been publicised in connection with cultural events this year. The 20th Century Fox film *Hidden Figures* offered an excellent opportunity to promote the Academy's diversity and inclusion work. The film is based on the true story of a group of African American women who worked for NASA as 'human computers' in the 1950s and 1960s. Head of Diversity Bola Fatimilehin was interviewed by both the *Daily Telegraph* and the *Guardian*, and she and Surrey Satellite Technology's Anita Bernie spoke on Radio 4's *Today* programme about the importance of diverse teams in engineering.

Public affairs

The outcome of the referendum on the UK's membership of the EU and the appointment of Prime Minister Theresa May and her government team provided the backdrop to much of the Academy's external relations activity during the last year. The Academy took advantage of opportunities to engage widely across government following publication of the joint professional report, *Engineering a future outside the EU*, which resulted in the profession having considerable interaction at the highest level with those departments preparing the UK's position for the negotiations.

The Academy has long called for industrial strategy to be a central priority of government. As such, the creation of the Department for Business, Energy and Industrial Strategy was very welcome news,



Speakers at the first UK schools screening of *Hidden Figures*, organised by the Manchester United Foundation: (l-r) Elspeth Finch (Chair of the Royal Academy of Engineering Innovators Network), Anita Bernie (Director of Spacecraft Platforms at Surrey Satellite Technology), Ginny Buckley (broadcaster and motoring journalist), Hazel Macnamara (Audit Partner at PwC), Professor Karen Holford FREng (Deputy Vice Chancellor at Cardiff University) and Rachel Riley (mathematician and presenter of Channel 4's *Countdown*)

and the Academy quickly built on its existing relationship with the new Secretary of State, Greg Clark MP, actively working with him on a number of issues including the engineering skills shortage.

Public engagement

The *Ingenious* public engagement grant scheme supports projects across the UK that engage people with engineering in creative ways, and gives the engineers involved opportunities to develop their communication and engagement skills. Now in its 10th year, the scheme has funded more than 189 projects, reached over 2.5 million members of the public, and worked with more than 5,000 engineers.

Projects that ran over the last year included the eTunes: build your own electro-acoustic

guitar workshop series, where participants worked together with engineers to learn basic acoustic, circuit design and electromagnetic theory. The project culminated in a gallery exhibition and video documentary at Edinburgh College of Art, and participants took part in busking sessions at a local shopping centre.

Ingenious also funded Survival Village, an initiative organised by SMASHfest, which promotes STEM through art and design. The festival took place in Deptford, London, and was designed to increase diversity and widen participation in STEM subjects within one of London's most disadvantaged boroughs. Using a disaster scenario that focused on the aftermath of a volcanic eruption, participants explored engineering solutions to loss of shelter, power and clean water. Survival Village will also visit other underserved areas of London through a series of mini-festivals and workshops.

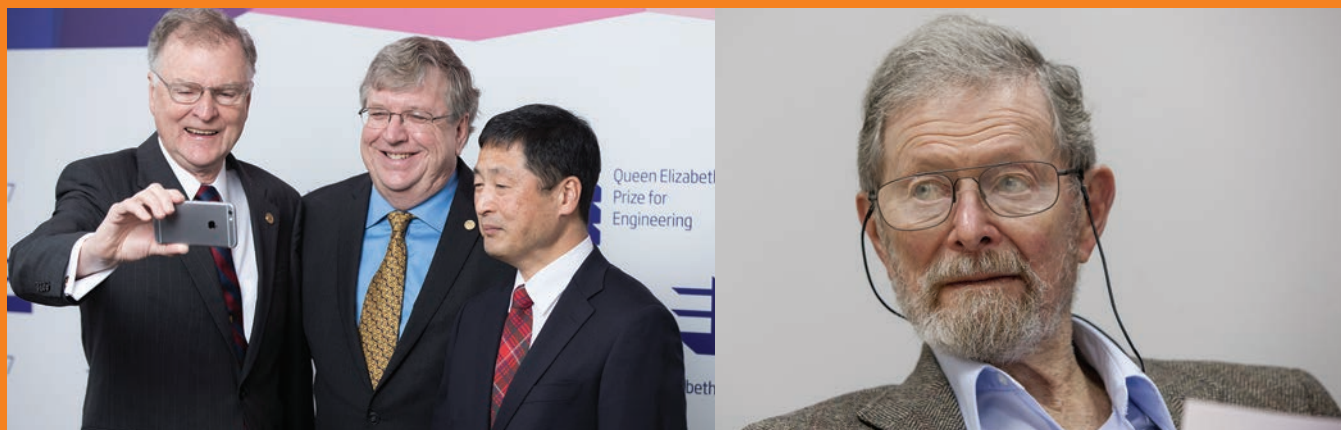
The Academy also participated in public engagement activity at science festivals. In September 2016, the Academy hosted a stand at *New Scientist Live*, based on the theme *Superhuman vs. Superhero*, for which Disney/Marvel permitted the Academy to use imagery of its popular superhero characters. Visitors to the stand were able to get hands-on with the latest brain- and body-enhancing technology, such as state-of-the-art prosthetics, a mind-controlled game, a working *Iron Man*-inspired helmet and glove, and a demonstration of smart materials.

The same theme was explored at Cheltenham Science Festival through an Academy-hosted panel discussion with Professor Mark Miodownik FREng that explored the latest engineering developments and asked how much human enhancement is too much.



Visitors to the Academy's stand at *New Scientist Live* view a demonstration of an *Iron Man*-inspired helmet and glove designed by Matt Dickinson, a lecturer in computer-aided engineering at Lancaster University who received an *Ingenious* grant in 2014

Celebrating engineering – the Queen Elizabeth Prize for Engineering



Queen Elizabeth Prize for Engineering winners (l-r) Dr Michael Tompsett, Professor Eric Fossum, Professor Nobukazu Teranishi and Dr George Smith

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.

On 1 February 2017, Lord Browne of Madingley FREng FRS, Chairman of the Queen Elizabeth Prize for Engineering Foundation, announced the winners of the 2017 Queen Elizabeth Prize for Engineering. The winners were four engineers from across the world, Professor Eric Fossum (USA), Dr George Smith (USA), Professor Nobukazu Teranishi (Japan) and Dr Michael Tompsett (UK), who together were responsible for the creation of digital imaging sensors, technology that has

transformed medicine, science, personal communication and entertainment on a global scale.

The announcement took place at Prince Philip House in the presence of HRH The Princess Royal. It received global coverage, reaching an international audience of around 1.3 billion people across a range of media. These included BBC channels, Sky News, *Financial Times*, *The Times*, *Daily Telegraph* and *Daily Mail*; *Time* and *Forbes* in the USA; NHK and Fuji TV in Japan; and Phoenix TV in China.

On the day, 15-year-old Samuel Bentley from Wales was also named as the winner of the international *Create the Trophy* competition. Samuel's trophy design, inspired by Snowdon, was chosen from thousands of entries from 14 to 24 year olds in 32 countries around the world.

Entries to the competition were made via a bespoke design app, launched in 2016 and free to download, which allowed entrants to easily create and submit their 3D designs. Samuel's winning design will be 3D printed by BAE Systems and presented to the 2017 Queen Elizabeth Prize for Engineering winners at a ceremony at Buckingham Palace in late 2017.

Alongside the biennial award, the prize is committed to encouraging young people to pursue careers in engineering. The Queen Elizabeth Prize for Engineering Global Engineering Ambassadors Network is an international community of young engineers from business and academia that plays a vital role in expanding the worldwide recognition of the prize. The ambassadors are role models and connect with peers around the world to promote engineering excellence and inspire the next generation, embodying the objectives of the prize.



Create the Trophy winner Samuel Bentley receives his prize from HRH The Princess Royal at the announcement of the winners of the third Queen Elizabeth Prize for Engineering on 1 February 2017



Samuel Bentley's winning trophy design, based on Snowdon, which was created using the *Create the Trophy* app

Lead the profession

“ The Academy has taken a leadership role across the profession in many areas, from assessing the impact of leaving the EU on engineering to a collaborative approach to diversity and inclusion. It has actively sought engagement from engineers and engineering employers across all of its activities to ensure that its work informs, supports and represents the profession as inclusively as possible. ”

Allan Cook CBE FEng, Vice President for Committee Coordination



Engineering the Future

Following the referendum vote for the UK to leave the EU, the Academy led work on the *Engineering a future outside the EU: securing the best outcome for the UK* report, which assessed the potential impacts on engineering of the UK leaving the EU.

The report was produced by an alliance of the UK's professional engineering organisations representing over 450,000 engineers. It drew on wide-ranging consultation with engineers from all corners of the profession, including industry, academia and the public sector.

A key finding was the need to maintain the supply of engineering skills to support the world-class quality and success of UK engineering companies and universities. In response, the report called on government and the engineering community to work together to take decisive action on the domestic engineering skills crisis and advocated straightforward solutions, such as temporary visas for skilled engineers from EU countries with the specialist skills that the UK lacks.

The report also highlighted how critical innovation is to the UK's economy and productivity. It addressed the role that EU support and collaboration has played in contributing to the UK's globally excellent and highly productive research and innovation

base, and the risks posed by losing access to EU research and innovation funding programmes.

Capitalising on the strong policy recommendations outlined in the EU report, the Academy has been well-positioned to make informed contributions to government policy. The President met the Secretary of State for Exiting the European Union, David Davis MP, and other ministers and senior officials in relevant government departments, to emphasise the importance of engineering and ensure that it is fully recognised in forthcoming negotiations. The coming together of the engineering profession to produce a collective view was universally welcomed.

Throughout the consultation process, one opportunity was repeatedly highlighted: the development of a new industrial strategy by the government, in partnership with academia and industry, as a route to enabling engineering to maintain and increase its contribution to economic development and social progress after the UK leaves the EU. Therefore, when the government announced a nationwide consultation on industrial strategy in January 2017, the announcement was welcomed by the Academy and hailed as a major opportunity to reinvigorate the engineering and manufacturing sectors. Under the leadership of the Academy, the 38 national organisations representing the engineering profession again joined



The LGBT engineers who took part in the *What's it like?* film series increasing the visibility of LGBT people in engineering

forces to commission a survey and a series of workshops to respond collectively to the consultation.

Statement of Ethical Principles for the Engineering Profession

Within the past year, the *Statement of Ethical Principles for the Engineering Profession* has been revised. A joint working group was established in late 2016 to review the Statement to ensure that it remains fit for purpose. It was also an opportunity for the Academy to maintain a leadership role on ethics within the profession.

This joint publication between the Academy and the Engineering Council was first published in October 2005 and was last revised in 2014. It is intended to be a statement of the values and principles that guide engineering practice and should supplement the codes of practice published by the professional engineering institutions (PEIs).

Diversity and inclusion

Structural changes have been made to the Academy's diversity programme in response to recommendations made in an evaluation of its first phase, which ended in March 2016. The *Diversity Programme Report*, published in June 2016, captured the work of the programme from 2011 to 2016 and sets out the new strategic aims for the second phase of the programme:

- Challenge the status quo.
- Lead the profession.
- Sustain and extend networks.
- Communicate and consult.
- Publish measures and benchmarks.

The Academy's Diversity Leadership Group was restructured to become the Diversity and Inclusion Leadership Group (DILG) to

have an increased focus on inclusion and provide opportunities for a larger number of companies to be actively involved in the programme. The DILG also comprises a small strategic steering group, which is supported by five industry-chaired action groups that each focus on a specific work theme: measurement, inclusive recruitment, procurement, inclusive cultures and communication approaches.

The Academy collaborated with the Science Council to create a *Diversity & Inclusion Progression Framework* for professional bodies that was launched in December 2016. The framework is a simple tool to help organisations plan and prioritise their diversity and inclusion activities in eight areas that are relevant to professional bodies, such as governance and leadership, awards and grants, and employment. Academy staff will use the framework in internal action planning during 2017 and will support the PEIs in their own framework rollout. The Academy's Engineering Diversity Concordat work with the PEIs has been brought under the Engineering the Future umbrella in order to reconnect with PEI presidents and chief executives.

As part of a growing focus on aspects of diversity beyond gender, a series of online videos profiling lesbian, gay, bisexual and transgender (LGBT) engineers was launched by the Academy, in partnership with InterEngineering and Mott MacDonald. Launched as part of LGBT history month, the *What's it like?* video series features 20 successful LGBT engineers, working in a variety of roles and settings, who share their stories of being LGBT in an engineering environment and encourage others to 'be yourself'. The films aimed to inspire prospective engineers who are LGBT, as well as existing engineers who may wish to come out or transition at work. The launch event for the films was supported by Past President Lord Browne of Madingley FREng FRS.

At a glance

Responses to consultations and inquiries

April 2016

Responses to inquiries from the House of Commons (HoC) Science and Technology (S&T) Committee into robotics and AI; the HoC Transport Committee on rail technology: signalling and traffic management; and a submission to the European Commission's call for ideas on a European Innovation Council.

June 2016

Response to the Higher Education Data and Information Improvement Programme as part of the subject coding reform.

July 2016

Response to the National Infrastructure Commission (NIC) consultation on 5G.

September 2016

Responses to inquiries from the HoC S&T Committee on leaving the EU: implications and opportunities for science and research; the Public Bill Committee on the Higher Education and Research Bill; and the Business, Innovation and Skills Committee on industrial strategy.

October 2016

A joint submission from the four UK National Academies to the HoC S&T Committee on the role and priorities of UK research and innovation.

November 2016

Response to the Lords Internal Market Sub-Committee inquiry on UK-EU trade in engineering services.

January 2017

Responses to inquiries from the HoC S&T Committee on closing the STEM skills gap.

February 2017

A submission to the Department for Business, Energy and Industrial Strategy review of the Small Business Research Initiative.

March 2017

Responses to the HoC S&T Committee inquiry into research integrity; and the UK higher education funding bodies consultation on the second Research Excellence Framework.

Engineering a Better World

In September 2016, the Academy hosted a major conference that was organised as part of its presidency of CAETS, the global federation of engineering academies.

The *Engineering a Better World* conference brought together over 400 global engineering leaders, international development practitioners and policymakers, industry stakeholders, government officials, and engineers from the developing world to highlight the vital importance of engineering in achieving the UN's Sustainable Development Goals (SDGs).

The conference was delivered as part of the Academy's portfolio of activities under the Global Challenges Research Fund. It focused on making links between the engineering and international development communities in the UK and the Global South, and building the capacity and networks of the UK's engineering research community to tackle global challenges.

The Academy developed a suite of communications materials that were launched at the conference, including:

- A short film, *Because Engineering*, which featured contributions from Bill Gates, Marissa Mayer, CEO of Yahoo, and Jack Ma, CEO of Alibaba, among others. The film was aimed at young people and showcased the human impact of engineering. It reached more than two million people on social media.
- A thought leadership publication with contributions from leaders including Dr Jan Eliasson, Deputy Secretary General of the UN, and Barbara Frost, CEO of WaterAid. The comment pieces in the publication explained how engineering contributes to the UN's SDGs. As well as being available at the conference, it was distributed with the December issue of the Academy's *Ingenia* magazine to over 11,000 contacts; another 10,000 copies will be distributed to the Academy's corporate and higher education contacts in the UK and internationally.
- A research study that demonstrated the link between investment in engineering and economic growth. An interactive map has been produced to showcase the key results of the research.
- An international survey of young engineers, which garnered responses from over 1,000 engineers on questions relating to their thoughts and perceptions of the engineering challenges and opportunities within their own countries.



Yassmin Abdel-Magied, Founder of Youth Without Borders, speaks at the *Engineering a Better World* conference

Since the conference took place, an *Engineering a Better World* LinkedIn platform has been created to maintain contact and discussion with networks across the Academy's international programmes. The Academy also held an event during Global Entrepreneurship Week that asked the question: Can startups drive sustainable development? The event consisted of a panel discussion that explored how engineering entrepreneurs in the UK and in developing countries can help deliver the SDGs.



Young engineers at the conference were able to meet and work with peers and stakeholders from 40 different countries

Greatly enhance the Academy's delivery capability

“ The credibility of the Academy with its partners, funders and the engineering community at large is underpinned by its ability to deliver. Its people and processes have to be more agile and responsive to take advantage of opportunities to work with others who share an agenda for the future of engineering. This is an exciting time for the Academy and strengthening capabilities in these areas will be crucial to its continuing success. ”

Dr Frances Saunders CB FREng, Chair, Membership Committee



(l-r) The Academy's first Director of Strategy and Deputy CEO Dr Hayaatun Sillem, CEO Philip Greenish CBE, the President Professor Dame Ann Dowling OM DBE FREng FRS, Ian Shott CBE FREng, Professor Haroon Ahmed FREng, and Shirin Dehghan, founder of telecoms company Arieso, at the launch of the new Taylor Centre © Rob Lacey

This year, the Academy appointed its first Director of Strategy and Deputy CEO. The post was created to increase the Academy's capacity to deliver its ambitious five-year strategy.

Dr Hayaatun Sillem, formerly the Academy's Director of Programmes and Fellowship, took up her post on 24 May 2016. The new role involves overseeing the implementation of the five-year strategic plan and, alongside the CEO, leading cross-Academy change and modernisation projects. It has also involved working closely with Fellows, Academy staff and partner organisations to increase the impact and enhance the contribution that engineering makes to society, both within and beyond the UK.

Dr Sillem continues to lead the Academy's Fellowship activities, award schemes and research policy, and has taken on a strategic oversight role across the Academy's increasing portfolio of programmes.

Redevelopment

After an extensive period of being closed for refurbishment, Prince Philip House reopened in early 2017. The basement and mezzanine floors of the building have been remodelled to accommodate the Taylor Centre (see page 7), and a modern kitchen has been installed to replace the previous facilities, which were almost 30 years old. RAE Trading Ltd (RAET), the Academy's trading subsidiary, was effectively dormant throughout most of the year, but has recommenced its operations since the reopening. RAET provides high-quality catering for the Academy's events and meetings in Prince Philip House, as well as marketing the building as an events venue, primarily to the corporate sector. RAET gift aids around £500,000 per annum to the Academy as unrestricted income.

The redevelopment has also resulted in significant investment being made to Prince Philip House's IT infrastructure. This has included new Wi-Fi networks for guests and the Taylor Centre, and state-of-the-art projectors and audio-visual equipment in meeting rooms and the Taylor Centre.

At the beginning of 2017, the Academy entered into a new 125-year lease with the Crown Estate, securing the home of the Academy for the future.

Development

In the last year, the Academy secured £5.1 million in new commitments for education, engagement, enterprise and research programmes. Support came from corporates, charitable foundations and

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.

The Academy's Fellowship engagement is led by Vice-President Professor Richard Williams OBE FREng, Principal and Vice-Chancellor at Heriot-Watt University.

Over the past year, focus has been placed on broadening the regional footprint of Academy activity. Fellows around the country have been given support to organise activities for Fellows in their local area. Activities have successfully taken place in the East Midlands, the North East and Yorkshire, while regional Fellows' lunches have taken place in Cardiff, Edinburgh, Coventry and Leeds.

One of the highlights of activity this year was Fellows' Day, held in January 2017. More than 160 Fellows and their guests attended this informal and social occasion. The day provided Fellows with an opportunity to learn about recent Academy activities and meet Trustees, other Fellows and Academy staff and talk to them about how to get involved in leading and shaping Academy work.

The event also gave Fellows the chance to see the recently opened Taylor Centre and to hear about the Academy's plans for using it as the home of the Enterprise Hub (see page 7). Fellows and their guests heard from the President, who was joined on stage by Enterprise Hub members who spoke about the difference the Hub has made to them and their companies. The event ended with a talk by Professor Williams, who highlighted the importance that the Fellowship plays in Academy activities.



Enterprise Hub member Dr Sam Chapman of KENOTEQ (right) demonstrates his sustainable bricks to Ian Ritchie CBE FREng FRSE and Professor Richard Williams OBE FREng FRSE at Fellows' Day

individuals, including Fellows. The continuing generosity of all donors and supporters is greatly appreciated, as is the assistance of the Development Advisory Board.

Education programmes received major support during the year. Royal Dutch Shell confirmed a further year of support for the *Connecting STEM Teachers* programme and Boeing UK joined as a new supporter. BAE Systems confirmed a new round of support for the Academy's STEM education and

outreach activities, while the Sir John Fisher Foundation, Drayson Foundation, Comino Foundation and Ogden Trust were among the many organisations also supporting the Academy's school STEM programmes. The Motorola Solutions Foundation continued its valuable support of the Academy's further education programmes by providing funding for continuing professional development for lecturers.

The Academy secured a major grant from

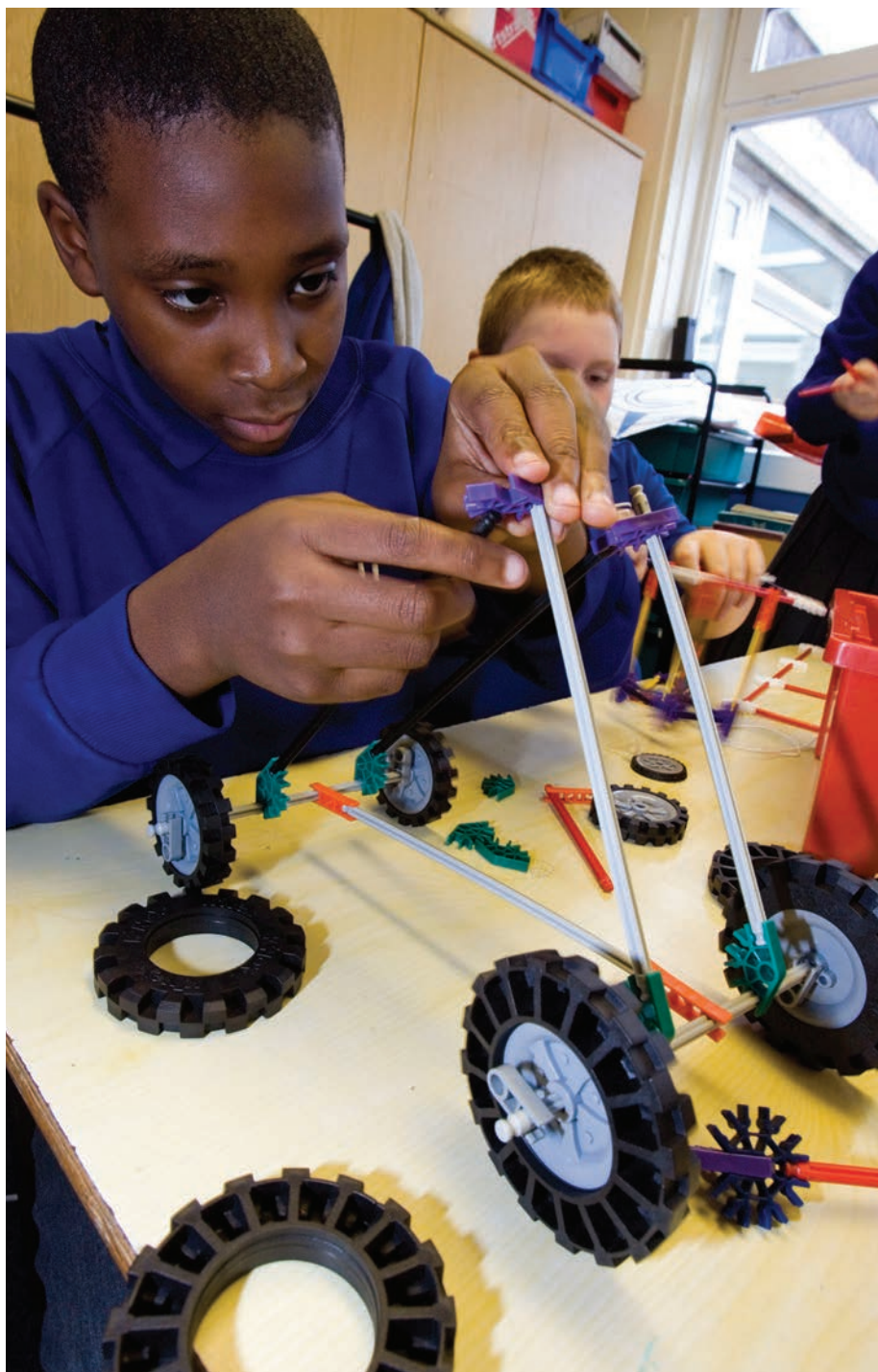
the European Regional Development Fund for the Enterprise Fellowships programme. The Enterprise Hub's partnership programme, which along with Fellows' pro-bono support is helping to enhance and expand the Hub's activities, attracted new multi-year funding from Weir Group, BP, Ultra Electronics and QinetiQ.

International programmes received funding from the Shell Centenary Scholarship Fund, which supported the Africa Prize for Engineering Innovation. Mott MacDonald supported the thought leadership publication that was published as part of the CAETS conference *Engineering a Better World*, as well as a series of inspiring video profiles of

LGBT engineers as part of the Academy's diversity and inclusion work.

Long-time corporate supporter Atkins was headline sponsor for the Academy's Awards Dinner 2016, and BAE Systems, BP, GKN, Jaguar Land Rover, Lockheed Martin and Petrofac were silver sponsors. BAE Systems also continued its support of the Academy's quarterly magazine *Ingenia*, as did Arup and Rolls-Royce.

This year, the Academy published *Build a Better World*, a publication that marked the launch of an initiative to develop lifetime and legacy giving to help the Academy achieve its ambitions.



The Academy's education programmes benefited from considerable support over the past year

At a glance

Examples of new funding

Enterprise

The Reece Foundation provided funding for Enterprise Fellowships for engineering graduates in the North East of England.

Research

Man Group supported a new Academy Research Chair in Machine Learning at the University of Oxford to develop machine learning and data analysis techniques for large-scale, real-world applications, including financial modelling.

Education

Boeing UK granted funding to expand the *Connecting STEM Teachers* programme and create new STEM teaching and learning resources

Awards

The Wellcome Trust supported a bursary programme to enable delegates from developing countries to attend the 2016 CAETS conference.

Public engagement

BAE Systems, GKN, QinetiQ, Weir Group and URENCO supported the Academy's Forum for Engineering events programme.



Trustee Board

The Trustee Board comprises 12 Trustees elected by and from the Fellowship and is chaired by the President, Professor Dame Ann Dowling.

Chair

Professor Dame Ann Dowling OM DBE FREng FRS
President

Vice Presidents

Allan Cook CBE FREng
Vice-President for Committee Coordination

Professor Richard Williams OBE FREng FRSE
Vice-President for Fellowship Engagement

Members

Professor Colin Bailey FREng

Professor Sir Michael Gregory CBE FREng

Norman Haste OBE FREng

Dr David Hughes FREng

Dr Robert Joyce FREng

Professor Elaine Martin OBE FREng

John Robinson CBE FREng

Dr Frances Saunders CB FREng

Professor Liz Tanner OBE FREng FRSE

Paul Westbury CBE FREng

New Fellows 2016

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 2016; their titles were correct at the time of their election.

Fellows



Richard Barber FREng

Group Head of Engineering, MMD



Richard Clegg FREng

Managing Director, Lloyd's Register Foundation



Alan Belfield FREng

Group Board Director, Arup Group



Graham Dalton FREng

Chief Executive, Defence Infrastructure Organisation, Ministry of Defence



Professor Andrew Bell FREng

Chair in Electronic Materials, University of Leeds



Professor Giles Davies FREng

Professor of Electronic and Photonic Engineering and Pro-Dean for Research and Innovation, Faculty of Engineering, University of Leeds



Jane Butler FREng

Vice-Dean (Enterprise), Faculty of Engineering, University College London



Steven Dearden FREng

President, Nuclear Submarines, Rolls-Royce plc



Gavin Campbell FREng

Director (Quality, Airworthiness and Technology Strategy), Bombardier Aerospace



Chris Dulake FREng

Major Projects Portfolio Director, Mott MacDonald



Andrew Carlick FREng

Chief Executive Officer, DBD Group Holdings



Professor Ahmed Elghazouli FREng

Professor of Structural Engineering and Head of Structures Section, Imperial College London

**Professor Mojtaba Ghadiri FREng**

Professor of Chemical Engineering, University of Leeds

**Anthony Graham FREng**

Chairman, UK Naval Engineering, Science and Technology

**Professor Sarah Hainsworth FREng**

Professor of Materials and Forensic Engineering, University of Leicester

**Antony Harper FREng**

Head of Research and Technology, Jaguar Land Rover

**Sir David Higgins FREng**

Non-Executive Chair, High Speed Two (HS2)

**Professor Sri Hinduja FREng**

Professor of Manufacturing Technology, University of Manchester

**Professor David Howard FREng**

Professor of Electronic Engineering and Founding Head of Department, Department of Electronic Engineering, Royal Holloway, University of London

**Professor Ron Hui FREng**

Chair Professor of Power Electronics, The University of Hong Kong and Imperial College London

**Professor David Hutchins FREng**

Professor of Engineering, University of Warwick

**Professor William Jones FREng**

Professor of Combustion and Deputy Head of Thermofluids Division, Imperial College London

**Robert Keiller FREng**

Chair, Scottish Enterprise

**Simon Knight FREng**

Naval Engineering Director, Babcock International

**Dr Barbara Lane FREng**

Fellow of Fire Engineering, Technology Group Leader, Arup; Visiting Professor, University of Edinburgh

**Professor Gary Lye FREng**

Professor and Head of Department of Biochemical Engineering, University College London

**Thomas McMichael FREng**

Former Engineering Director (Combat Air), BAE Systems Military Air and Information, BAE Systems

**Dr Paul Miller FREng**

Secretary (voluntary), Douglas Bomford Trust; Director, Silsoe Spray Applications Unit Ltd

**Professor Toby Mottram FREng**

Douglas Bomford Trust Professor of Farm Mechanisation, Royal Agricultural University

**Alan Newby FREng**

Director, Aerospace Technology and Future Programmes, Rolls-Royce plc

**Professor Bucur-Mircea Novac FREng**

Professor of Pulsed Power, Loughborough University

**Professor Paul O'Brien CBE FREng FRS**

Professor of Inorganic Materials, University of Manchester

**Professor Peter O'Hearn FREng**

Engineering Manager, Facebook; Professor of Computer Science, University College London

**Roderick Rainey FREng**

Director, Rod Rainey and Associates Ltd.



Professor Mark Rainforth FREng

Professor of Materials Science, University of Sheffield



Sir Hossein Yassaie FREng

Tech Entrepreneur and Investor



Dr Mark Raiss FREng

Engineering Director, Civil Infrastructure, EMIA, AECOM



Air Marshal Julian Young CB OBE FREng

Chief of Materiel (Air), Defence Equipment and Support, Ministry of Defence



David Rugg FREng

Engineering Senior Fellow, Rolls-Royce plc



Professor Zi-Qiang Zhu FREng

Royal Academy of Engineering/Siemens Research Chair and Head of the Electrical Machines and Drives Research, University of Sheffield



Professor Mark Sandler FREng

Professor of Signal Processing, Queen Mary University of London



Catriona Schmolke FREng

Senior Vice President, Jacobs Engineering



Professor Charbel Farhat FREng

Vivian Church Hoff Professor of Aircraft Structures, and Chair, Department of Aeronautics and Astronautics, Stanford University



Rakesh Sharma FREng

Chief Executive, Ultra Electronics Holdings plc



Dinesh Verma FREng

IBM Fellow, IBM Thomas J Watson Research Center



Professor Ian Smith FREng

Professor of Applied Thermodynamics and Director of the Centre for Positive Displacement Compressor Technology, City University London



Michael Tuke FREng

Founder and Chairman, MatOrtho Ltd



Gavin Twidale FREng

Chief Engineer, Land (UK), BAE Systems



Professor Robert Wood FREng

Associate Dean of Research, and Director, National Centre for Advanced Tribology, University of Southampton



Professor Philip Woodland FREng

Professor of Information Engineering, University of Cambridge

International Fellows

Thomas Heatherwick CBE RDI HonFREng

Founder, Heatherwick Studio

Professor Peter Jost CBE HonFREng*

President, International Tribology Council and World Tribology Congress

*elected before Professor Jost sadly passed away on 7 June 2016

Awards

2016 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:

Blatchford for its Linx limb system, the world's most intelligent prosthetic limb

2016 RAEng Engineers Trust Young Engineers of the Year and Sir George Macfarlane Medal

These awards are supported by the Worshipful Company of Engineers and recognise the potential of engineers working in the UK who have demonstrated excellence in the early stage of their career. The overall winner receives the Sir George Macfarlane Medal.

Awarded to:

**Dr Sithamparanathan Sabesan, Chief Executive Officer, PervasiveID
Winner of the Sir George Macfarlane Medal**

Dr T Ben Britton, lecturer, Department of Materials, Imperial College London

John Collins, senior engineer, Arup

Orla Murphy, acoustic engineer, Jaguar Land Rover

Dr Paul Shearing, senior lecturer in chemical engineering, University College London

2016 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 Damian Gardiner, Research Scientist/Business Development Manager, Johnson Matthey

Dr Demis Hassabis, Co-founder and CEO, Google DeepMind and Vice President Engineering, Google

Professor Tong Sun, Professor of Sensor Engineering, City, University of London

2016 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:

Dr Ian Nussey OBE FEng

2016 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 Roger Sargent FEng, Emeritus Professor of Chemical Engineering and Senior Research Fellow, Imperial College London

2016 Prince Philip Medal

Awarded biennially to an engineer of any nationality who has made an exceptional contribution to engineering.

Awarded to:

Dr Jonathan Ingram, CSO and Founder, Silent Sensors Ltd

2016 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:

Intermediate Frequency Modem System, BAE Systems AI Labs:

Nick James

Matthew Gore

Mark Westcott

2016 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:

Professor Danielle George MBE, Professor of Radio Frequency Engineering, University of Manchester

2016 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.

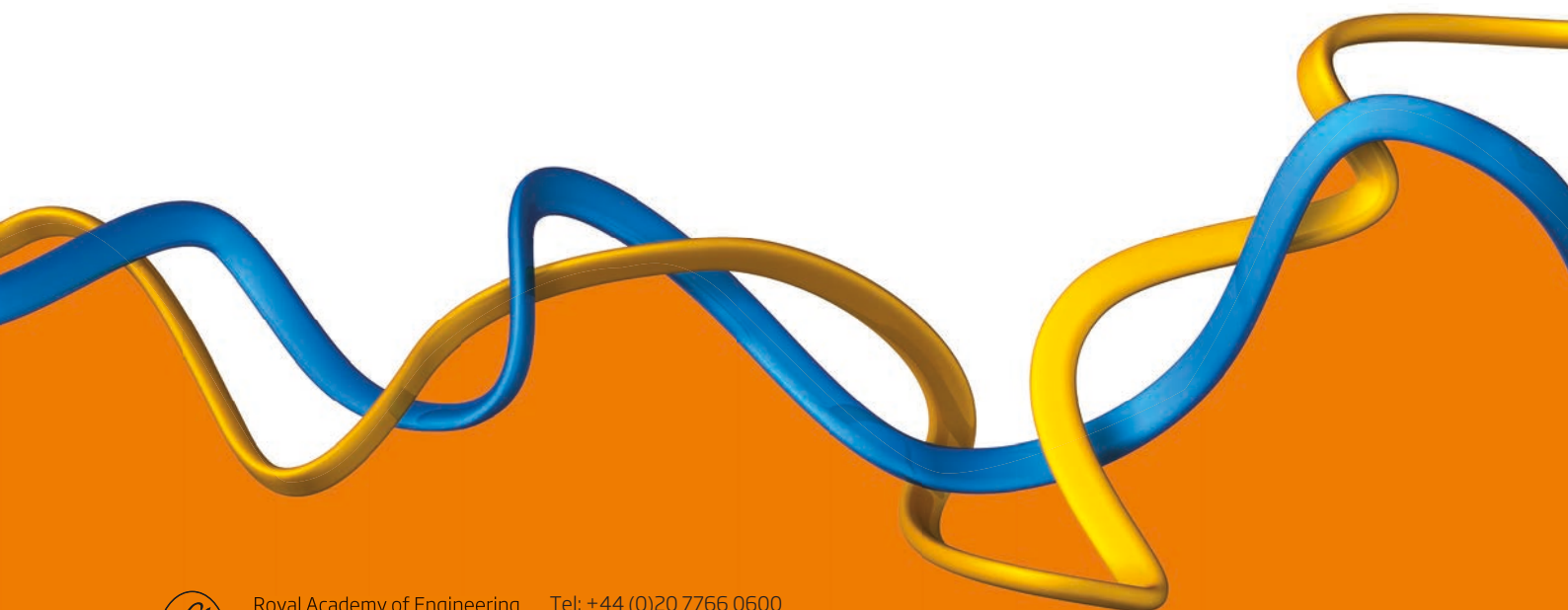
Awarded to:

Ultrahaptics:

Professor Sriram Subramanian

Dr Ben Long

Tom Carter



Royal Academy of Engineering
Prince Philip House
3 Carlton House Terrace
London SW1Y 5DG

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Annual **Review** Annex
2016/2017



Annex to the Annual Review

Contents

Fellows elected in 2016	2	Africa Prize for Engineering Innovation	28
International Fellows	2	Industrial Fellowships Scheme	29
Honorary Fellows	2	Engineering Leaders Scholarships	30
Fellows	2	Ingenious Public Engagement Awards	33
Trustee Board	4	Visiting Professors	34
Academy Governance Committees	5	Sainsbury Management Fellowships	35
Academy Operating Committees	8	Queen Elizabeth Prize for Engineering	36
Awards	11	Panel of judges	36
Grants, fellowships and programmes.	12	Queen Elizabeth Prize for Engineering Foundation Trustees	36
Research Chairs.	12	Donors	37
Research Chairs in Emerging Technologies.	14	Search group	37
Senior Research Fellowships	14	Development and fundraising	38
Leverhulme Trust Senior Research Fellowships.	15	Development Advisory Board	38
Daphne Jackson Trust Fellowships.	15	Contributors to Academy programmes.	39
Research Fellowships.	16	Royal Academy of Engineering 2016 Annual Fund	40
GCRF Frontiers of Engineering for Development Seed Funding	18		
RAEng/Lloyd's Register Foundation Research Fellowship	21		
Enterprise Fellowships	21		
Blavatnik Family Foundation Enterprise Fellowship Alumni Awards	22		
SME Leaders Programme	22		
Launchpad Competition	22		
RAEng-ERA Foundation Entrepreneurs Award	22		
Royal Commission for the Exhibition of 1851 Enterprise Fellowships.	23		
Distinguished Visiting Fellowships	23		
Newton Research Collaboration Programme.	25		
Leaders in Innovation Fellowships.	27		

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 2016 were:

Professor Charbel Farhat

Vivian Church Hoff Professor of Aircraft Structures, and Chair, Department of Aeronautics and Astronautics, Stanford University

Dinesh Verma

IBM Fellow, IBM Thomas J Watson Research Center

HONORARY FELLOWS

Elected in 2016 were:

Thomas Heatherwick CBE

Founder, Heatherwick Studio

Professor Peter Jost CBE*

President, International Tribology Council and World Tribology Congress

*Elected before Professor Jost sadly passed away

FELLOWS

Elected in 2016 were:

Richard Barber

Group Head of Engineering, MMD

Alan Belfield

Group Board Director, Arup Group

Professor Andrew Bell

Chair in Electronic Materials, University of Leeds

Jane Butler

Vice-Dean (Enterprise), Faculty of Engineering, University College London

Gavin Campbell

Director (Quality, Airworthiness and Technology Strategy), Bombardier Aerospace

Andrew Carlick

Chief Executive Officer, DBD Group Holdings

Richard Clegg

Managing Director, Lloyd's Register Foundation

Graham Dalton

Chief Executive, Defence Infrastructure Organisation, Ministry of Defence

Professor Giles Davies

Professor of Electronic and Photonic Engineering and Pro-Dean for Research and Innovation, Faculty of Engineering, University of Leeds

Steven Dearden

President, Nuclear Submarines, Rolls-Royce plc

Chris Dulake

Major Projects Portfolio Director, Mott MacDonald

Professor Ahmed Elghazouli

Professor of Structural Engineering and Head of Structures Section, Imperial College London

Professor Mojtaba Ghadiri

Professor of Chemical Engineering, University of Leeds

Anthony Graham

Chairman, UK Naval Engineering, Science and Technology

Professor Sarah Hainsworth

Professor of Materials and Forensic Engineering, University of Leicester

Antony Harper

Head of Research and Technology, Jaguar Land Rover

Sir David Higgins

Non-Executive Chair, High Speed Two (HS2)

Professor Sri Hinduja

Professor of Manufacturing Technology, University of Manchester

Professor David Howard

Professor of Electronic Engineering and Founding Head of Department, Department of Electronic Engineering, Royal Holloway, University of London

Professor Ron Hui

Chair Professor of Power Electronics, The University of Hong Kong and Imperial College London

Professor David Hutchins

Professor of Engineering, University of Warwick

Professor William Jones

Professor of Combustion and Deputy Head of Thermofluids Division, Imperial College London

Robert Keiller

Chair, Scottish Enterprise

Simon Knight

Naval Engineering Director, Babcock International

Dr Barbara Lane

Fellow of Fire Engineering, Technology Group Leader, Arup; Visiting Professor, University of Edinburgh

Professor Gary Lye

Professor and Head of Department of Biochemical Engineering, University College London

Thomas McMichael

Former Engineering Director (Combat Air), BAE Systems Military Air and Information, BAE Systems

Dr Paul Miller

Secretary (voluntary), Douglas Bomford Trust; Director, Silsoe Spray Applications Unit Ltd

Professor Toby Mottram

Douglas Bomford Trust Professor of Farm Mechanisation, Royal Agricultural University

Alan Newby

Director Aerospace Technology and Future Programmes, Rolls-Royce plc

Professor Bucur-Mircea Novac

Professor of Pulsed Power, Loughborough University

Professor Paul O'Brien CBE

Professor of Inorganic Materials, University of Manchester

Professor Peter O'Hearn

Engineering Manager, Facebook; Professor of Computer Science, University College London

Roderick Rainey

Director, Rod Rainey and Associates Ltd

Professor Mark Rainforth

Professor of Materials Science, University of Sheffield

Dr Mark Raiss

Engineering Director, Civil Infrastructure, EMIA, AECOM

David Rugg

Engineering Senior Fellow, Rolls-Royce plc

Professor Mark Sandler

Professor of Signal Processing, Queen Mary University of London

Catriona Schmolke

Senior Vice President, Jacobs Engineering

Rakesh Sharma

Chief Executive, Ultra Electronics Holdings plc

Professor Ian Smith

Professor of Applied Thermodynamics and Director of the Centre for Positive Displacement Compressor Technology, City University London

Michael Tuke

Founder and Chairman, MatOrtho Ltd

Gavin Twidale

Chief Engineer, Land (UK), BAE Systems

Professor Robert Wood

Associate Dean of Research, and Director, National Centre for Advanced Tribology, University of Southampton

Professor Philip Woodland

Professor of Information Engineering, University of Cambridge

Sir Hossein Yassaie

Tech Entrepreneur and Investor

Air Marshal Julian Young CB OBE

Chief of Materiel (Air), Defence Equipment and Support, Ministry of Defence

Professor Zi-Qiang Zhu

Royal Academy of Engineering/ Siemens Research Chair and Head of the Electrical Machines and Drives Research, University of Sheffield

Trustee Board

The Trustee Board comprises 12 Trustees elected by and from the Fellowship and is chaired by the President, Professor Dame Ann Dowling.

OFFICERS AND MEMBERS OF COUNCIL

Chair

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

Vice Presidents

Allan Cook CBE FREng

Vice-President for Committee Coordination

**Professor Richard Williams OBE
FREng FRSE**

Vice-President for Fellowship Engagement

Members

Professor Colin Bailey FREng

Professor Sir Michael Gregory CBE FREng

Norman Haste OBE FREng

Dr David Hughes FREng

Dr Robert Joyce FREng

Professor Elaine Martin OBE FREng

John Robinson CBE FREng

Dr Frances Saunders CB FREng

Professor Liz Tanner OBE FREng FRSE

Paul Westbury CBE FREng

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

John Robinson CBE FREng

Members

Professor Iain Gray CBE FREng FRSE

Professor Sir Michael Gregory CBE FREng

Dr Carolyn Griffiths FREng

Professor Jim Norton FREng

Dr Michael Purshouse FREng

Richard Sadler FREng

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

Dr Robert Joyce FREng

Members

Norman Haste OBE FREng

Graeme Hobbs FREng

Professor David Lane CBE FREng FRSE

Professor Jim Norton FREng

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, the Chair of the International Committee and an ex-officio. 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 Eileen Harkin-Jones OBE FREng

Panel 3 (Chemicals and Process)

Dr David Tomlinson FREng

Panel 4 (Aerospace)

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)

Professor Bashir Al-Hashimi FREng

Panel 8 (Energy and Power)

Dr Martin Grant FREng

Panel 9 (Medical and Bioengineering)

Dr Donal Cronin FREng

Panel 10 (Computing and Communications)

Professor Alan Bundy CBE FREng FRS FRSE

Panel 11 (Special)

Professor Gordon Masterton OBE FREng FRSE

Panel Members

Panel 1 (Civil and Environmental)

Professor Muhammed Basheer FREng
Professor David Butler FREng
Timothy Chapman FREng
Dr Steve Denton FREng
Professor Peter Hansford FREng
Steven Harridge FREng
Chris Hendy FREng
Doug King FREng
David MacKenzie FREng
Michelle McDowell MBE FREng
Professor Karen Scrivener FREng
Dr Toby Roberts FREng

Panel 2 (Materials and Mining)

Professor Stephen Bull FREng
Professor Paul Curtis FREng
Dr John Groom FREng
Professor Christopher Hall FREng FRSE
Professor Anthony Kinloch FREng FRS
Professor David Owen FREng FRS
Professor Mary Ryan FREng
Jeffrey Smith FREng
Dr Alan Turnbull OBE FREng FRS
Dr Paul Woollin FREng

Panel 3 (Chemicals and Process)

Professor Adisa Azapagic FREng
Professor Zhanfeng Cui FREng
Professor Michael Hounslow FREng
Professor Andrew Livingston FREng
Professor Raffaella Ocone FREng FRSE
Nigel Perry MBE FREng
Professor Robin Smith FREng
Paul Sinclair FREng
Phillip Tracy FREng

Panel 4 (Aerospace)

Sir Richard Brook OBE FREng
Professor Esteban Busso FREng
Dr Roger Digby FREng
Dr Richard Greaves FREng
Graham Hopkins FREng
Professor Andrew Keane FREng
Professor Tony Kinghorn FREng
Professor Constantinos Soutis FREng
Professor Michael Wisnom FREng

Panel 5 (Transport and Mechanical)

Professor David Cebon FREng
Professor Andrew Doherty FREng
Dr Simon Gallimore FREng
Professor Colin Garner FREng
Professor Karen Holford FREng
Dr Michael Purshouse FREng
Professor Paul Shayler FREng
Professor Raymond Snidle FREng
Dr Willem van Griethuysen FREng

Panel 6 (Manufacturing and Design)

Professor Peter Clarkson FREng
Richard Goodwin FREng
Dr Clive Hickman FREng
Professor Jane Jiang FREng
Professor Patrick Keogh FREng
Professor Lin Li FREng

Panel 7 (Electrical and Electronic)

Professor Clifford Burrows OBE FREng
Professor David Cardwell FREng
Professor Roger Goodall FREng
Professor Andrew Marvin FREng
Professor Barrie Mecrow FREng
Professor Mohamed Missous FREng
Professor Sir Michael Pepper FREng FRS
Professor Harvey Rutt FREng
Dr Andrew Shields 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 Rick Jefferys FREng
Dr Malcolm Kennedy CBE FREng FRSE
Dr Marcus Newborough FREng
Dr Win Rampen FREng FRSE
Professor Albert Rodger FREng FRSE
Nicholas Winser CBE FREng

Panel 9 (Medical and Bioengineering)

Dr Douglas Anderson OBE FREng FRSE
Professor Serena Best FREng
Professor Nicholas Medcalf FREng
Professor Mark Tooley FREng
Professor Guang-Zhong Yang CBE FREng

Panel 10 (Computing and Communications)

Professor Robin Bloomfield FREng
Professor Sheng Chen FREng
Professor Anthony Cohn FREng
Dr Andrew Fitzgibbon FREng
Professor Carole Goble CBE FREng
Professor Stephen Roberts FREng
Professor Daniel Rueckert FREng
Professor Angela Sasse FREng
Professor Jim Woodcock FREng

Panel 11 (Special)

Dr Alan Begg FREng
Professor Graham Davies FREng
Commodore Peter Hurford OBE FREng
Jonathan Lyle FREng
Professor Ian Wallace FREng

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 operating 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 FRSE**

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
Dr Robert Joyce FREng**

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 Alistair Borthwick FREng FRSE
Professor Anthony Bull FREng
Jane Butler FREng
Professor Trish Connolly FREng FRSE
Chris Hendy FREng
Professor Malcolm Macleod FREng
Dr Jim Ramage FREng
John Tubman FREng
Professor John Watts FREng

DIVERSITY AND INCLUSION COMMITTEE

The Diversity and Inclusion Committee's role is to advise and have oversight of all the Diversity and Inclusion Programme strands of work, including with employers, professional engineering institutions and within the Academy itself.

Chair

Dervilla Mitchell CBE FREng

Members (Fellows)

Allan Cook CBE FREng D.Sc.
Professor Anthony Finkelstein CBE FREng
Professor Pratibha Gai FREng FRS
Jonathan Lyle FREng
Professor Angela Sasse FREng
Professor Nilay Shah FREng
David Waboso CBE FREng

Members (Non-Fellows)

Elsbeth Finch

Committee Secretariats

Bola Fatimilehin
Jenny Young

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. It also provides oversight of the diversity work of the Academy, both internally and with external stakeholders and partners.

Chair

Professor Helen Atkinson CBE FREng

Members

Professor Claire Adjiman FREng
Chris Allam FREng
Professor Graham Davies FREng
Professor Eileen Harkin-Jones OBE FREng
Dr Paul Holbourn FREng
Professor Ian Hutchings FREng
Bernard Looney FREng
Howard Mathers CBE FREng
Colin Matthews CBE FREng
Professor Tony Ridley CBE FREng
Professor Nick Tyler CBE FREng
Dr Jean Venables CBE FREng

Ex officio

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

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

Gavin Campbell FREng
Tim Chapman FREng
Professor John Clarkson FREng
Dr Steve Denton FREng
Professor Paul Howarth FREng
Professor Nick Jennings CB FREng
Dr Mike Lloyd FREng
Professor Jim Norton FREng
Catriona Schmolke FREng
Paul Taylor FREng
Professor Mark Toohey FREng
Steve Yianni FREng

Ex officio

Professor Serena Best FREng

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

Deputy Chairs

Professor Norman Apsley OBE FREng
Dr Robert Sansom FREng

Members

Professor Steven Beaumont OBE FREng FRSE
Professor Richard Brook OBE FREng
Mike Carr OBE FREng
Suranga Chandratillake FREng
Anne Glover CBE HonFREng
Sir David Grant CBE FREng
Professor Iain Gray CBE FREng FRSE
Dr Andrew Harter CBE FREng
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 FRS
Sir Alan Rudge CBE FREng FRS
Dr John C Taylor OBE FREng
Dr Richard Whittington 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)

Professor Anthony Cohn FREng
Janice Crawford FREng
Professor Robin Grimes FREng
Professor Geoffrey Maitland FREng
Richard Maudslay CBE FREng
Michelle McDowell MBE FREng
Professor Saeed Zahedi OBE FREng

Ex officio

Professor Mark Miodownik FREng
(Chair of *Ingenious* selection panel)

Dr Scott Steedman CBE FREng
(Chair of *Ingenia*)

Members (Non-Fellows)

Clive Cookson
John Gardner
Dr Roger Highfield
Kelly Oakes

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 David Bogle FREng
Malcolm Brinded CBE FREng
Dr Andrew Chan FREng
Professor Muffy Calder OBE FREng FRSE
David Eyton FREng
Dr Alastair Glass FREng
Professor Sir Michael Gregory CBE FREng
Dr John Lazar CBE FREng
Professor William Lee FREng
Dr Timothy Leverton FREng
Professor John Loughhead OBE FREng
Professor Ric Parker CBE FREng
Professor John Perkins CBE FREng
Dr Gareth Williams FREng
Professor Florin Udrea FREng
Professor Hai-Sui Yu FREng

Committee secretariat
Shane McHugh

RESEARCH COMMITTEE

The role of the Research 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 Sir James McDonald FREng FRSE

Members

Professor Bashir Al-Hashimi FREng
Dr Alan Begg FREng
Professor Peter Cawley FREng FRS
David Eyton FREng
Professor Karen Holford FREng FLSW
Professor Michael Hounslow FREng
Professor John McDermid OBE FREng
Professor Stephen McLaughlin FREng FRSE
Professor Lionel Tarassenko CBE FREng FMedSci
Professor Hywel Thomas CBE FREng FRS FLSW
Dr David Watson CBE FREng

Member (Non-Fellow)

Professor Maire O'Neill

Ex officio

Professor Neil Alford MBE FREng
(Research Fellowships)
Professor Elaine Martin OBE FREng
(Industrial Fellowships)
Professor William Milne FREng
(Leverhulme Trust, Senior Research Fellowships)
Professor Stephen Williamson FREng
(Research Chairs, Senior Research Fellowships)

Committee secretariat

Christina Guindy

Awards

2016 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:

Blatchford for its Linx limb system, the world's most intelligent prosthetic limb

2016 RAEng Engineers Trust Young Engineers of the Year and Sir George Macfarlane Medal

These awards are supported by the Worshipful Company of Engineers and recognise the potential of engineers working in the UK who have demonstrated excellence in the early stage of their career. The overall winner receives the Sir George Macfarlane Medal.

Awarded to:

Dr Sithamparanathan Sabesan, Chief Executive Officer, PervasID

Winner of the Sir George Macfarlane Medal

Dr T Ben Britton, lecturer, Department of Materials, Imperial College London

John Collins, senior engineer, Arup

Orla Murphy, acoustic engineer, Jaguar Land Rover

Dr Paul Shearing, senior lecturer in chemical engineering, University College London

2016 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 Damian Gardiner, Research Scientist/Business Development Manager, Johnson Matthey

Dr Demis Hassabis, Co-Founder and CEO, Google Deepmind and Vice-President Engineering, Google

Professor Tong Sun, Professor of Sensor Engineering, City University London

2016 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:

Dr Ian Nussey OBE FREng

2016 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 Roger Sargent FREng, Emeritus Professor of Chemical Engineering and Senior Research Fellow, Imperial College London

2016 Prince Philip Medal

Awarded biennially to an engineer of any nationality who has made an exceptional contribution to engineering.

Awarded to:

Dr Jonathan Ingram, CSO and Founder, Silent Sensors Ltd

2016 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:

Intermediate Frequency Modem System, BAE Systems AI Labs:

Nick James

Matthew Gore

Mark Westcott

2016 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:

Professor Danielle George MBE, Professor of Radio Frequency Engineering, University of Manchester

2016 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:

Ultrahaptics:

Professor Sriram Subramanian

Dr Ben Long

Tom Carter

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	Project title	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	Space environment and radio frequency engineering	University of Birmingham
Professor Ashraf Ayoub	Pell Frischmann	Nuclear infrastructure engineering	City, University of London
Professor Luke Bisby	Arup	Fire and structures	University of Edinburgh
Professor Robert Bowman	Seagate Technology	Advanced materials for data storage	Queen's University Belfast
Professor Christoph Breucker	BAE Systems	Aeronautical engineering	City, University of London
Professor Richard Butler	GKN	Composites analysis	University of Bath
Professor Jon Carrotte	Rolls-Royce	Aerothermal technology	Loughborough University
Professor George Constantinides	Imagination Technologies	Digital computation	Imperial College London
Professor Jonathan Cooper	Airbus	Aeronautical engineering	University of Bristol
Professor Andrew Davison	Dyson Technology Ltd	Efficient vision for robotics	Imperial College London
Professor Yulong Ding	Highview Power Storage	Cryogenic energy storage	University of Birmingham
Professor Hongbiao Dong	TWI Ltd	Innovative metal processing	University of Leicester
Professor Fionn Dunne FEng	Rolls-Royce	Integrative mechanistic design	Imperial College London
Professor Daniel Esser	SELEX ES	Laser device physics and engineering	Heriot-Watt University
Professor Brian Falzon	Bombardier	Aerospace composites	Queen's University Belfast
Professor Chris Gerada	Cummins Generator Technologies	Electrical machines	University of Nottingham
Professor Alistair Gibb	ECI	Complex project management	Loughborough University
Professor Kenneth Grattan FEng	George Daniels' Educational Trust	Next generation optical and fibre-optic instrumentation	City, University of London
Professor Hugh Griffiths FEng	Thales UK	Radio frequency sensor systems	University College London
Professor Matthew Hall	British Geological Survey	Carbon capture, storage and alternative hydrocarbons	University of Nottingham
Professor Eileen Harkin-Jones FEng	Bombardier	Composites engineering	Ulster University
Professor Ian Hunter FEng	Radio Design Limited	Microwave signal processing	University of Leeds
Professor Lorenzo Iannucci	Defence Science and Technology Laboratory	Multiscale composite armour design	Imperial College London
Professor Xiangqian (Jane) Jiang DBE FEng	Renishaw	Precision metrology	University of Huddersfield

Name	Co-sponsor	Project title	University
Professor Nikil Kapur	GlaxoSmithKline	Pharmaceutical processing	University of Leeds
Professor Alan Kemp	Fraunhofer UK	Advanced laser engineering	University of Strathclyde
Professor Jianguo Lin FEng	TATA Steel	Multidisciplinary studies of hot stamping	Imperial College London
Professor Omar Matar	Petronas	Multiphase fluid dynamics	Imperial College London
Professor Bruno Merk	National Nuclear Laboratory	Computational modelling for nuclear engineering	University of Liverpool
Professor John Miles FEng	Arup	Energy transitions	University of Cambridge
Professor James Moore	Bagrit Trust	Medical device design	Imperial College London
Professor Stephen Muggleton FEng	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 - Existing Nuclear	Structural integrity assessment	Imperial College London
Professor Chris Pearce	EDF Energy	Computational mechanics for nuclear power engineering	University of Glasgow
Professor Stephen Roberts FEng	MAN Group Plc	Machine learning at industrial and commercial scale	University of Oxford
Professor Mary Ryan FEng	Shell	Interfacial nanoscience for engineering materials	Imperial College London
Professor Vladimiro Sassone	Roke	Cyber security	University of Southampton
Professor Sven Schroeder	Infineum UK / Diamond Light Source	Engineering applications of synchrotron science	University of Leeds
Professor Thomas Scott	AWE	Performance and detection of actinide materials	University of Bristol
Professor Sridhar Seetharaman	TATA Steel	Low-carbon materials technologies	University of Warwick
Professor Spencer Sherwin	McLaren Racing Next Generation	Transient flow simulation for advanced race and road cars design	Imperial College London
Professor Iain Todd	GKN Aerospace	Additive manufacture and advanced structural metallics	University of Sheffield
Professor Andrew Tyas	Defence Science and Technology Laboratory	Protection engineering against high explosive blast	University of Sheffield
Professor Phillip Webb	Airbus	Aero-structures design	Cranfield University
Professor Jennifer Whyte	Laing O'Rourke	Systems integration	Imperial College London
Professor Michalis Zervas	SPI Lasers	Advanced fibre laser technologies for future manufacturing	University of Southampton
Professor Zi-Qiang Zhu FEng	Siemens Wind Energy	High efficiency and power density windpower generator systems	University of Sheffield

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. The Academy provides funding for 10 years.

Name	Project title	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 to support strategically important research in UK universities. The Academy provides funding for an initial period of five years.

Name	Co-sponsor	Project title	University
Professor Brian Connolly	EDF Energy	Corrosion performance of energy systems	University of Manchester
Dr Stephen Neethling	Rio Tinto	Heap advanced leaching	Imperial College London
Dr Graham Spinardi	Ove Arup Foundation	Integrating technical and social aspects of fire safety expertise and engineering	University of Edinburgh
Dr Sophie Williams	DePuy Synthes	Hip replacement technology	University of Leeds
Dr Xibo Yuan	Safran Electrical & Power UK	Advanced aircraft power generation systems	University of Bristol

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	Project title	University
Dr James Covington	How does the future smell?	University of Warwick
Dr Kevin Curran	Device-free location-oriented activity identification in the home	Ulster University
Dr Piotr Dudek	Analog computation with novel nanodevices for machine learning	University of Manchester
Dr Raul Fuentes	Developing infrastructure robotics - a low-cost small robot for infrastructure inspection	University of Leeds
Dr Stephen Garrett	Understanding transition in boundary-layer flows over rotating geometries	University of Leicester
Dr Christopher Keylock	Characterising the complexity of environmental, turbulent flows	University of Sheffield
Dr Denis Kramer	Glass-fibre solar redox receiver for grid-scale electricity provision	University of Southampton
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 Rachel Oliver	Understanding and utilising nitride nanostructures	University of Cambridge
Dr Jonathan Pearson	Coastal flood risks under extreme events: creating resilience through retrofitting	University of Warwick
Dr Justin Philips	A non-invasive continuous monitor of intracranial pressure	City, University of London
Dr Aleksandra Vuckovic	Home-based patient-managed neurorehabilitation following spinal cord injury	University of Glasgow
Dr Fang Xie	Nanoscale engineering of photoelectrodes for whole spectrum light harvesting	Imperial College London

DAPHNE JACKSON TRUST FELLOWSHIPS

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

Name	Project title	University
Dr Maria Ribera Vicent	Satellite FEM validation with advanced optimisation and virtual vibration testing	University of Surrey

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 four years' postdoctoral experience.

Name	Project title	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 Maris Azarpeyvand	Source and propagation modelling for wind turbine and turbomachinery noise	University of Bristol
Dr Ralf Bauer	Miniaturised 3D-printed biomedical imaging system using optical MEMS	University of Strathclyde
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 pyroelectrodynamics nanoscale trapping and sensing	University of Glasgow
Dr David Clifton	Machine learning for the intelligent patient record	University of Oxford
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 Enrique Galindo-Nava	Developing novel materials for gas turbine engines: an integrated computational and modelling approach	University of Cambridge
Dr Peter Gammon	Novel interlayer cooling for harsh environment (NICHE) devices and circuitry	University of Warwick
Dr Sabina Hatch	High-efficiency, low-cost solar cells using III-V nanowires on flexible substrates	University College London
Dr Tawfique Hasan	Graphflex: fully flexible graphene-based transparent conductors	University of Cambridge
Dr Gregory Jasion	Hollow microstructured optical fibres for high power laser delivery	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

Name	Project title	University
Dr Edward Laird	Quantum computing devices based on carbon nanomaterials	University of Oxford
Dr Domanic Lavery	Simplified transceiver architectures for high capacity optical networks	University College London
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 Jan Mol	Single-molecule electronics	University of Oxford
Dr Ana Namburete	Ultrasound-based atlas for longitudinal analysis of fetal brain maturation	University of Oxford
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 Samuel Powell	Engineering a new approach to biomedical imaging using sound and light	University College London
Dr Ludovic Renson	Developing next generation testing methods for nonlinear mechanical structures	University of Bristol
Dr Robert Richards	Development of indium gallium arsenide bismide for mid-wavelength infrared applications	University of Sheffield
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

Name	Project title	University
Dr Nikos Tzevelekos	Game semantics for program analysis	Queen Mary, University of London
Dr Thomas Vetter	Understanding impurity incorporation into organic crystals from measurements and simulations	University of Manchester
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
Dr Min Zhang	Fully superconducting machines for next generation electric aircraft propulsion	University of Bath

GCRF FRONTIERS OF ENGINEERING FOR DEVELOPMENT SEED FUNDING

This scheme, a Global Challenges Research Fund programme, is for attendees of the Frontiers of Engineering for Development symposia, which bring together early- to mid-career engineers to network, engage and collaborate to tackle global grand challenges. It supports interdisciplinary projects inspired by the events.

Tranche 1

Names	Project title	Institutions
Dr Ioannis Papakonstantinou Dr Anh Tran Dr Maria-Chiara Ferrari	Low-energy drinking water filtration system with nanopore membranes	University College London Coventry University University of Edinburgh
Dr Martin Lavery Dr Ralf Bauer	Enhanced heliostat-based energy generation for deployment across the developing world	University of Glasgow University of Strathclyde
Mr Boris Ochoa Tocachi Mr Dustin Caniglia Dr Wouter Buyaert Dr Adrian Butler	Monitoring and mapping of water availability in East Africa enabled by low-cost sensor technologies	Imperial College London Concern Worldwide, Somalia Imperial College London Imperial College London
Dr Fleur Loveridge Ms Vera Bukachi Dr Mark Trigg	Resilience of linear infrastructure in East Africa	University of Leeds University College London University of Leeds
Dr Philipp Rudolf Thies Ms Morwesi Ramonyai Ms Mbali Mabaso	Socio-technical assessment of risk in community energy projects – STAR	University of Exeter BORNEA Energy Stellenbosch University
Dr Tingting Zhu Dr Kristine Magtubo Mr Mathaniel D. Cruz Professor David Clifton Professor Portia Grace F. Marcelo	Machine learning for improved decision-making with telemedicine	University of Oxford University of the Philippines University of the Philippines University of Oxford University of the Philippines

Names	Project title	Institutions
Dr Muyiwa Oyinola Dr Boksun Kim Dr Yewande Akinola Dr Fatai Anafi Dr Amal Abuzeinab Dr Farukh Farukh Dr Karthikeyan Kandan Dr Timothy Whitehead	Developing local capacity for building affordable, self-sufficient homes	De Montfort University Plymouth University Laing O'Rourke Ahmadu Bello University, Nigeria De Montfort University De Montfort University De Montfort University De Montfort University
Dr Marcelle McManus Dr Thomas Rogers Dr Fleur Loveridge Dr Simon Rees	A resilient low-carbon energy transformation for Small Island Developing States	University of Bath University of the West Indies University of Leeds University of Leeds
Dr Joanne Rose Dr Ksenia Chmutina	Promoting resilience in the informal construction sector in Nepal	University of York Loughborough University
Dr Maryam Imani Dr Luiz Fernando Bittencourt Dr Jo Ueyama Dr Leandro Aparecido Villas Mr Boris Ochoa Tocachi	Towards water quality resilience promotion in São Carlos, Brazil: GIS maps development	Anglia Ruskin University University of Campinas University of São Paulo State University of Campinas Imperial College London
Dr Paolo Paoletti Mr James van der Walt Dr Alex Brinkmeyer Dr Sebastiano Fichera	AutoTurtle – Auto unfold solar turtle	University of Liverpool Solar Turtle Oxford Space Systems University of Liverpool
Professor Gilberto Brambilla Dr Roberto Speicys Cardoso Professor Daniel Cordeiro Dr Ali Masoudi	Distributed fibre sensing system to monitor vehicles in smart cities	University of Southampton Scipopulis University of São Paulo University of Southampton
Dr Paolo Paoletti Dr Luiz Fernando Bittencourt Dr Ioannis Papakonstantinou	Towards an autonomous sensing platform for pollution monitoring	University of Liverpool University of Campinas University College London
Dr Ana Namburete Mr Sesinam Dagadu	Portable toolbox for first-response emergency medicine	University of Oxford TinyDavid Ltd
Dr Boksun Kim Mr Tony Chan Professor Danie Hattingh	Development of a mirror-support system for concentrating solar power plant	Plymouth University CPG Consultants Pte Ltd Nelson Mandela Metropolitan University

Tranche 2

Names	Project title	Institutions
Dr Satheesh Krishnamurthy Dr Namrata Sengar Dr Tim Drysdale Professor Nick Braithwaite	Internet of things – smart remote solar PV lab	The Open University University of Kota The Open University The Open University
Dr Ross Wilkins Dr Andrew Fox Mr Isabelo Rabuya	Post-earthquake structural health monitoring system (PE-SMS)	Coventry University Plymouth University University of San Carlos

Names	Project title	Institutions
Dr Mirella Di Lorenzo Dr Francesca Pianosi Mr Rodolfo Rueda	MAPwater: mapping availability and pollution of water resources in rural mexican communities	University of Bath University of Bristol Fomento Mexicano
Dr Cindy Smith Dr Alison Parker Dr Ruth Quinn	Re-engineering Kenyan sand dams by biological design	University of Glasgow Cranfield University Cranfield University
Dr Devin Sapsford Dr Cindy Smith Dr Chris Johnson Dr Kazi Matin Ahmed Dr Richard Crane	Manganese in drinking water: biogeochemistry, analysis and treatment	Cardiff University University of Glasgow Bio Nano Consulting University of Dhaka Cardiff University
Dr Manish Tiwari Dr Richard Bowman Dr Cindy Smith Dr Stavroula Balabani Dr Saugata Hazra Dr Anup Kr. Tewari	A low cost, microengineered platform for rapid point-of-care antibiotic susceptibility testing for developing countries	University College London University of Bath University of Glasgow University College London IIT Roorkee, India Indian Veterinary Research Institute
Professor Carolina Palmer Naveira Cotta Mr Sherif Hamed Dr Lena Ciric Dr Manni Bhatti		Federal University of Rio de Janeiro University College London University College London University College London Hospital
Professor Andrew Hayward		University College London Hospital
Dr Carmel Curtis		University College London Hospital
Ms Bernadette Porter		University College London Hospital
Dr Jeremy Chataway		University College London Hospital
Dr Harry van der Weijde Mr Greg Francis Mr Anand Upadhyay	Decision support systems for local energy policy in India	The University of Edinburgh BOXARR Ltd. The Energy and Resources Institute
Dr Manish Tiwari Dr Namrata Sengar Dr Satheesh Krishnamurthy Mr Anand Upadhyay	Self-cleaning surface coatings for solar photovoltaic and thermal systems to minimise water wastage in cleaning	University College London University of Kota The Open University The Energy and Resources Institute
Mr Pranab Gadhia Dr Ioannis Papakonstantinou Mr Zhuyang Chen		MSA BIO-Energy Pvt Ltd University College London University College London

Names	Project title	Institutions
Dr Andrew Fox Dr Askwar Hilonga	Water for Africa: leveraging local innovations through organisation networks (Water-LION)	Plymouth University The Nelson Mandela African Institution of Science and Technology
Dr Veronica Kiluva		Masinde Muliro University of Science and Technology
Professor Sibilike Makhanu		Oshwal College

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' post-doctoral experience.

Name	Subject	University
Dr Mark Batty	Holographic light shaping for reverse engineering neural circuit learning	University of Kent
Dr Rebecca Boston	Nanostructured oxides for sustainable energy storage and recovery	University of Sheffield

ENTERPRISE FELLOWSHIPS

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

Name	Project title	University
Dr Enass Abo-Hamed	H2GO Power: hydrogen-storage 'plug and play' units for clean and consistent power	Imperial College London
Dr Felicity de Cogan	NitroPep	University of Birmingham
Dr Paul de Sciscio	Cambridge Cardiology: developing catheter-based treatments for valvular heart disease	University of Cambridge
Dr Patrick Dodds	Hexigone inhibitors: self healing solutions	Swansea University
Dr Rob Oldfield	SALSA Sound: the future of live sports audio	University of Salford
Dr Phi Phan	InspiWave: a non-invasive cardiopulmonary monitoring technology	University of Oxford
Dr Katerina Spranger	Oxford Heartbeat: correct stent - ViVa (virtual vascular) project	University College London
Dr Chris Williamson	Flexypix: switchable window panels with high efficiency	University of Cambridge

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 Samuel Chapman	KENOTEQ: 'breathing' bricks that reduce waste in the construction sector	Heriot-Watt University
Dr Alexander Enoch	Robotical Ltd: programmable 3D-printed robot	University of Edinburgh
Dr Loren Picco	Bristol Nano Dynamics: early and accurate leukaemia diagnosis informing custom treatment	University of Bristol
Dr Angus Webb	Dynamon: increasing customer engagement and passing on lessons learned to future entrepreneurs	University of Southampton

SME LEADERS PROGRAMME

The SME Leaders Programme supports promising leaders of high growth engineering SMEs, with a grant towards the cost of training courses and executive education, plus monthly scale-up workshops at the Academy.

Awardee companies

Bodle Technologies	Dulas	React Engineering
BOXARR	Oxford Space Systems	Senergy Innovation
CyberOwl	Onlicar	Spiro Control

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	Startup company	Project title
Michael Tougher	Spark&Rocket	Soundbops – enabling musical play

RAENG-ERA FOUNDATION ENTREPRENEURS AWARD

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

Winner

Name	Project Title	University
Sorin Popa	Stent Tek	Imperial College London

ROYAL COMMISSION FOR THE EXHIBITION OF 1851 ENTERPRISE FELLOWSHIPS

The Royal Commission for the Exhibition of 1851 Enterprise Fellowships provide funding and support to outstanding entrepreneurial engineering graduates to build a business based on their innovation.

Name	Startup company	Project title
Ming Kong	TangiO	Smart 3D sensing material to replace buttons and trackpads
Henrik Hagemann	CustoMem	Customised membranes for the treatment of polluted water
Yang Lu	VivaCity Labs	Intelligent cameras for better transport planning
Jack Hooper	doppel	Wearable to help users keep calm or stay alert

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
Professor Allan Matthews, University of Sheffield	Professor Gary Doll, University of Akron, USA	Interactions between tribological coatings and lubricants
Professor Ying Zheng, University of Edinburgh	Professor Ajay Dalai, University of Saskatchewan, Canada	Biofuels production from lignocellulosic biomass via supercritical technologies
Dr Hongying Meng, Brunel University	Professor Weihua Zhang, Southwest Jiaotong University, China	Deep learning based artificial intelligence methods for fault detection in high speed railway applications
Dr Xiangming Zhou, Brunel University	Professor Zhimin Wu, Dalian University of Technology, China	Integrated structural health monitoring and damage and integrity assessment system with model updating from field measurement for critical civil infrastructure
Professor John Robert Varcoe, University of Surrey	Professor Mohamed Nasef, Universiti Teknologi Malaysia, Malaysia	Elucidating the mechanism of radiation-grafted ion-exchange membrane formation to enable scale-up for application in electrochemical technologies
Yuqiang Bao, London South Bank University	Professor Xianlin Dong, Shanghai Institute of Ceramics, Chinese Academy of Sciences, China	Novel multiferroic composite thin films and devices
Professor Dr Mary Grace Burke, University of Manchester	Professor Qian Chen, University of Illinois at Urbana-Champaign (UIUC), USA	UK-US Collaboration in materials science: quantitative in-situ electron microscopy of adjustable, reconfigurable nanoparticle assemblies
Dr Ombretta Romice, University of Strathclyde	Professor Robert Gifford, University of Victoria, Canada	A new dimension for data-driven urbanism: studying the form of preference

Award holder	Distinguished visitor	Area of collaboration
Dr Jie Huang, University College London	Professor Roger Narayan, University of North Carolina and North Carolina State, USA	Advanced manufacturing for 21st century healthcare
Professor Christopher Alan McMahon, University of Bristol	Professor Eswaran Subrahmanian, Carnegie Mellon University, USA	Design for resilience and sustainability
Professor Janet Carole Read, University of Central Lancashire	Professor Ian MacKenzie, York University, Canada	Engineering interaction and communication for children with special needs
Professor Blanca Rodriguez, University of Oxford	Professor Yoram Rudy, Washington University in St Louis, USA	Computational investigations of cardiac hereditary disease
Professor Manu Haddad, Cardiff University	Professor Aberrahmane Beroual, Ecole Centrale de Lyon, France	Environmentally friendly insulating gases for high-voltage equipment
Professor Stephen Thomas Newman, University of Bath	Professor George Huang, The Hong Kong University, Hong Kong	Application of Industry 4.0 for hybrid manufacturing
Professor Yakun Guo, University of Bradford	Professor Jinhai Zheng, Hohai University, China	Study of wave interaction with offshore wind energy devices
Dr Wim Vanderbauwhede, University of Glasgow	Professor Saji Hameed, University of Aizu, Japan	Investigating the state-of-the-art high level programming compliant, FPGA platforms for accelerating weather and climate modelling
Professor Azizur Rahman, City, University of London	Professor Siddharth Ramachandran, Boston University, USA	Intermodal nonlinear fibre optics using orbital angular momentum
Wuqiang Yang, University of Manchester	Professor Masahiro Takei, Chiba University, Japan	Medical application of electrical impedance tomography
Professor Brian Falzon, Queen's University Belfast	Professor Pascal Hubert, McGill University, Canada	Virtual testing and smart manufacturing of composite materials
Dr Tomasz Witold Liskiewicz, University of Leeds	Professor Pascal Andrey Voevodin, University of North Texas, USA	In-situ wear process diagnostic of adaptive coating compositions
Dr Alison Caroline Raby, Plymouth University	Professor James Goff, University of New South Wales, Australia	Tsunami generation from combined earthquake rupture and landslide
Professor Nduka Nnamdi Ekere, University of Wolverhampton	Professor Yan Cheong Chan, City University of Hong Kong, Hong Kong	Virtual laboratory for development of paste materials used in microsystems assembly
Dr Michail Matthaiou, Queen's University Belfast	Professor Peter Smith, Victoria University of Wellington, New Zealand	Fundamentals of millimetre wave channels: applications to 5G beamforming design
Professor Peter Bruce, University of Oxford	Professor George Crabtree, Argonne National Laboratory, USA	UK - US energy storage research cooperation
Dr Alexander David Shaw, Swansea University	Professor Michael Brennan, São Paulo State University, Brazil	Nonlinear vibration isolators for multiple degree of freedom systems
Boris Grot, University of Edinburgh	Professor Daniel Sorin, Duke University, USA	Computer processors for robotics applications
Dr Geev Mokryani, University of Bradford	Professor Taher Niknam, Shiraz University of Technology, Iran	Optimal mix of renewable energy sources and energy storage systems in distribution networks
Professor Anthony Roy West, University of Sheffield	Professor Rishi Raj, University of Colorado Boulder, USA	Flash sintering of ceramic electrolytes

Award holder	Distinguished visitor	Area of collaboration
Professor Raziye Farmani, University of Exeter	Professor Maria da Conceição Cunha, University of Coimbra, Portugal	Flexible design and management of water distribution systems under deep uncertainty

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	Professor James Woodcock, University of York	Software engineering for mobile autonomous robots	Professor Augusto Sampaio, Centro de Informática, Universidade Federal de Pernambuco
Brazil	Dr Emmanouil Benetos, Queen Mary University London	Automatic transcription of polyphonic music recordings	Dr Rodrigo Schramm, Universidade Federal do Rio Grande do Sul
Brazil	Dr Abir Hussain, Liverpool John Moores University	A data science approach for the detection of variable light sources in uneven time-domain astronomy	Professor Marley Vellasco, Pontifical Catholic University of Rio de Janeiro
Brazil	Dr Jeff Kettle, Bangor University	Low cost and stable UV sensor for early warning of over exposure to sunlight	Professor Lucas Santos, Universidade Estadual Paulista
Brazil	Dr Juliana Bowles, University of St Andrew's	Improving the efficiency of complex processes through scalable quantitative analysis techniques	Dr Ricardo Czekster, Universidade de Santa Cruz do Sul
Brazil	Professor James Woodcock, University of York	Software engineering for mobile autonomous robots (part 2)	Professor Augusto Sampaio, Centro de Informática at Universidade Federal de Pernambuco (UFPE)
Brazil	Dr Gowsihan Poolagasundarampillai, University of Manchester	Cotton-wool-like bioactive glass fibres for oral and maxillofacial regeneration	Dr Felipe Perozzo Daltoé, Federal University of Santa Catarina
Brazil	Dr Yue Huang, Liverpool John Moores University	The role of additive manufacturing in promoting the use of safety barriers to protect vulnerable road users in Brazil	Professor Rafael Santiago, Federal University of ABC
Brazil	Dr Jarmila Glassey, Newcastle University	Novel bioactive molecule production in innovative microbial biotransformation system based on submerged biofilms	Professor Edvaldo Anton Ribeiro Rosa, Pontifical Catholic University of Paraná
Brazil	Dr Andrey Petrov Jivkov, University of Manchester	Modernising the technology for assessment of cleavage fracture probability	Professor Claudio Ruggieri, University of Sao Paulo
Brazil	Dr Ulrich Ofterdinger, Queen's University Belfast	Enhancing water resources management capacity by integrating multi-scale ground and airborne geophysics	Dr Oderson Antonio de Souza Filho, Serviço Geológico do Brasil

Partner country	UK researcher	Project title	Partner country researcher
Brazil	Professor Robin Graham Allaby, University of Warwick	Bioengineering Brazilian indigenous crop diversity into peanuts for a changing climate	Dr Fabio Freitas, EMBRAPA (Brazilian Agricultural Research Corporation)
Brazil	Professor Zheng-Tong Xie, University of Southampton	Mathematical modelling of the mass transfer mechanisms at the top of an urban canopy: an LES and DNS study	Professor Jane M Santos, Universidade Federal do Espirito Santo
Brazil	Professor Ke Chen, University of Liverpool	Development of fast multilevel optimisation techniques for image segmentation and registration models with application to oncology	Professor Jinyun Yuan, Federal University of Paraná
Brazil	Dr Stephanie Gabriele Zihms, Heriot-Watt University	Linking micro- and macro- scale deformation features with experimental and modelling techniques for fractured carbonate reservoirs and beyond	Dr Tiago Miranda, Federal University of Pernambuco
Brazil	Dr Omar Hamza, University of Derby	Improved geohazard assessment and prediction in unplanned urban areas: geotechnical monitoring and modelling of slope instability	Professor Tiago Vargas, Autonomous Water and Wastewater Service of Caxias
Malaysia	Dr Paul Fergus, Liverpool John Moores University	Blueprint for a decision support system for classification and early prediction of polygenic obesity in humans using genetic loci	Professor Rosni Abdullah, Universiti Sains Malaysia
Malaysia	Dr Bipro Nath Dubey, Sheffield Hallam University	Sustainable transformation of food waste for energy generation and byproduct utilisation	Dr Cheng Chin Kui, Universiti Malaysia Pahang
Malaysia	Dr Henriette Stokbro Jensen, University of Sheffield	Opportunities for managing environmental impacts from sewers under hot climate conditions	Dr Wan Hanna Melini Wan Mohtar, National University of Malaysia
Malaysia	Dr Annela Seddon, University of Bristol	Combating antimicrobial resistance through engineering and education	Dr Huey Ling Tan, Universiti Teknologi MARA
Mexico	Dr Raman Maiti, University of Sheffield	Orthopedic implant diagnostic tool for stratified patients	Professor Alejandro Ramirez-Reivich, National Autonomous University of Mexico
South Africa	Dr Waheed Afzal, University of Aberdeen	Carbon capture using ionic solvents for large coal-fired power plants	Professor Deresh Ramjugernath, University of KwaZulu-Natal
South Africa	Dr John Orr, University of Bath	Reducing the environmental impact of concrete structures using fabric-formed fibre reinforced concrete	Professor Billy Boshoff, Stellenbosch University
South Africa	Dr Samuel Edward Rigby, University of Sheffield	Prediction of landmine effects on vehicles	Professor Genevieve Langdon, University of Cape Town
Turkey	Dr Ashraf Ahmed, Queen's University Belfast	The use of physical barriers to reduce saltwater intrusions in coastal aquifers	Dr M Ekrem Karpuzcu, Istanbul Technical University
Turkey	Dr Nicola Ann Morley, University of Sheffield	Anisotropic magnetocaloric effect in polycrystalline ribbons	Dr Aris Quintana-Nedelcos, Marmara University
Turkey	Dr Volkan Degirmenci, University of Warwick	Utilisation of agricultural waste in Turkey: a study on the development of decentralised small scale biomass conversion process	Dr Emre Kiliç, Izmir Yuksek Teknoloji Enstitüsü

Partner country	UK researcher	Project title	Partner country researcher
Turkey	Professor Thanh Thi Kim Nguyen, University College London	Engineering hydrogel nanoparticles to enhance transdermal local anesthetic delivery	Dr Bengi Ozkahraman, Hitit University
Vietnam	Professor Constantinos Stathopoulos, Abertay University	Antimicrobial and antioxidant edible films and coatings prepared from chitosan and bio-agents and their application in seafood preservation	Professor Si Trung Trang, Nha Trang University
Vietnam	Dr Oliver Hensengerth, Northumbria University	Soft engineering approaches to disaster risks reduction. A case study on flood management in the Mekong River Delta in Vietnam	Dr Thi Lan Huong Nguyen, Water Resources University
Vietnam	Professor Keith Scott, Newcastle University	Zinc removal and recovery from industrial wastewater using bioelectrochemical systems	Dr Hai Pham, Vietnam National University
Vietnam	Professor Qi Shi, Liverpool John Moores University	A UK-Vietnam research collaboration on smart cyber-attack detection and mitigation in critical network infrastructure	Dr Tran Nguyen Ngoc, Le Quy Don Technical University
Vietnam	Dr Trung Thanh Nguyen, Liverpool John Moores University	Modelling and optimising rail operations for more sustainable urban transport - a passenger-oriented approach	Dr Minh Hoang Ha, FPT Research Institute, FPT University

LEADERS IN INNOVATION FELLOWSHIPS

The Leaders in Innovation Fellowship (LIF) 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 210 researchers from Brazil, Chile, China, Colombia, Indonesia, India, Malaysia, Mexico, the Philippines, South Africa, Thailand, Turkey, and Vietnam. All LIF participants also have the opportunity to partake in a follow-on support programme lasting up to six months with their individual coaches.

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.

2015/2016 winner

Arthur Zang	Cameroon
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2015/2016 finalists

Edmand Aijuka	Uganda
Felix Kimaru	Kenya
Matt Wainwright	South Africa

2016/2017 shortlist

Arnold Achiri	Cameroon
Godwin Benson	Nigeria
Sesinam Dagadu	Ghana
Dr Wilfred Fritz	South Africa
Kelvin Gacheru	Kenya
Edwin Inganji	Kenya
Joel Kariuki	Kenya
Alex Makalliwa	Kenya
Peter Mbiria	Kenya
Hindu Nabulumba	Uganda
Andre Nel	South Africa
Lawrence Ojok	Tanzania
Aline Okello	Mozambique
Fredrick Ouko	Kenya
Brian Turyabagye	Uganda
James van der Walt	South Africa

INDUSTRIAL FELLOWSHIPS SCHEME

This scheme facilitates knowledge transfer between universities and industry in the UK by providing engineering academic staff with exposure to industrial and commercial practice in a Fellowship for up to one year in industry. It aims to strengthen university and industry relations and enhance teaching upon the Fellow's return.

Name	University	Project title	Host
Dr Richard Bourne	University of Leeds	Self-optimising reactors for pharmaceutical process development	AstraZeneca
Dr Liana Mirela Cipcigan	Cardiff University	Future balancing services for high levels of embedded electricity generation	National Grid
Dr Daniel Edward Clark	Heriot-Watt University	Multi-sensor multi-target tracking applications for UK defence	Defence Science and Technology Laboratory
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 Fatih Kurugollu	Derby University	Media content analysis for cyber security using deep packet inspection	Titan IC Systems Ltd
Dr Chenfeng Li	Swansea University	Temporary works: embedded physics, structural reliability and risk assessment	Costain Group PLC
Dr Dongfang Liang	University of Cambridge	Integrated dynamic modelling of surface and ground waters	Mott MacDonald Ltd
Dr Ioannis Paraskevopoulos	University of Greenwich	Industrial secondment in collective innovative training environments (xCite)	QinetiQ
Dr Christopher Power	University of York	Methods for positive user experiences in big data analytics	International Business Machines Corporation
Dr Rajesh Ransing	Swansea University	7Epsilon: process control and productivity/quality improvement for turbocharger wheel production	Polycast Limited
Dr Karen Renaud	University of Glasgow	Engaging with Scotland's SMEs to improve their digital security	Scottish Business Resilience Centre
Dr Benito Sanz	University of Kent	Development of electronically reconfigurable antennas	Leonardo UK
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 Tim Storer	University of Glasgow	Conversation-oriented software project management	Global Rugby Network

Name	University	Project title	Host
Dr Sebastian Timme	University of Liverpool	Airframe aeroelastic analysis, design and development using computational fluid dynamics	BAE Systems
Dr Rafael Viviescas	University of Leicester	Test of constrained multi-objective control for future helicopter rotor technologies	AgustaWestland
Dr Richard Williams	University of Glasgow	Engineering river freedom for resilience	cbec eco-engineering
Dr Tuck Seng Wong	University of Sheffield	Sustainable manufacturing of surface-active chemicals using biocatalysis	Croda Europe Limited
Dr Rong Zhang	University of Southampton	Novel cross-talk cancellation technique for achieving multi-gigabit broadband over copper	British Telecom

ENGINEERING LEADERS SCHOLARSHIPS

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	Subject	University
Sushant Achawal	Engineering	University of Cambridge
Aminah Ahmad	Chemical engineering	University of Aberdeen
Imran Ahmed	Engineering	University of Cambridge
Ishan Alam	Engineering design	University of Bristol
Lucia Albelda Gimeno	Biomedical engineering	University College London
George Anderson	Mechanical engineering with aerospace	University of Southampton
Anam Balbolia	Civil engineering	Imperial College London
Christopher Bartolo	Mechanical engineering	Queen's University Belfast
Leigh Baxter	Electrical and mechanical engineering	University of Strathclyde
Serban Berariu	Civil engineering	University of Southampton
Thomas Bewley	Engineering design	University of Bristol
Ciprian Blujdea	Mechanical engineering with management	University of Southampton
Georgina Box	Engineering	Durham University
Jake Brown	Mechanical engineering	University of Sheffield
Charlotte Bryant	Chemical engineering	Aston University
Francesca Capaldi	Chemical engineering	University of Strathclyde
Billy Cavanagh	Mechanical engineering	University of Surrey
Jessica Charter	Civil and environmental engineering	Imperial College London
Martina Cheadle	Engineering	University of Cambridge
Yun-Hang Cho	Mechanical engineering	University of Sheffield
Stephen Colbert	Aerospace engineering	Queen's University Belfast
Jennifer Coyle	Chemical engineering	University of Edinburgh
Felix Cox	Mechanical engineering	Queen Mary University London

Name	Subject	University
Matthew Curtis	Engineering design	University of Bristol
Michael Daley	Engineering	University of Cambridge
Olivia Daniel	Engineering design	University of Bristol
Leah Edwards	Mechanical engineering	Loughborough University
Timothy Engstrom	Mechanical engineering	Imperial College London
Tirion Evans	Mechanical engineering	University of Edinburgh
Rachael Eynon	Electronic and electrical engineering	University of Strathclyde
Luke Falzon	Civil engineering	University of Dundee
Federica Freddi	Engineering	University of Cambridge
Thomas Findlay	Civil engineering	University of Edinburgh
Bradley Fowler	Engineering	University of Cambridge
James Fraser	Mechanical engineering	University of Bath
Henri French	Aerospace engineering	University of Bristol
Luca Frondoni	Mechanical engineering	Cardiff University
Olga Fuhrmann	Chemical engineering with management	University of Edinburgh
Ignacio Garcia Leon	Engineering design	University of Bristol
Cherie Gardiner	Mechanical engineering	Queen's University Belfast
Harry Garstka	Engineering design, aerospace	University of Bristol
Miroslav Gasperek	Biomedical engineering	Imperial College London
Alexander Gleed	Medical engineering	University of Surrey
Alexander Goff	Mechanical engineering	Cardiff University
Adam Gristock	Engineering	University of Cambridge
Siddharth Gupta	Engineering	University of Cambridge
Joanna Hartnell	Civil engineering	University of Surrey
Tahir Hassuji	Mechanical engineering	University of Bath
Aurelia Hibbert	Engineering	University of Cambridge
Esme Hotston Moore	Aeronautical engineering	Imperial College London
Jodie Howlett	Mechanical engineering	Sheffield Hallam University
George Imafidon	Mechanical engineering	University College London
Dmitro Khroma	Engineering design	University of Bristol
James Kinch	Mechanical engineering	University of Leeds
James Lamyman	Ship science with small craft	University of Southampton
Sarah Linnell	Civil and architectural engineering	University of Bath
Susan Little	Electrical and mechanical engineering	University of Strathclyde
Allan MacLeod	Chemical engineering	University of Aberdeen
Charlotte MacNair	Engineering design	University of Bristol
Dominic Maskell	Electronic engineering	University of Southampton
Ella Maule	Mechanical engineering	University of Edinburgh
Javier Maurino-Alperovich	Aeronautical engineering	Imperial College London
John McBride	Mechanical engineering	Queen's University Belfast

Name	Subject	University
Joel McGrath	Mechanical engineering	Queen's University Belfast
Peter McGrattan	Mechanical engineering	Queen's University Belfast
Kieran McHugh	Computer science	University of York
Marnie McKay	Electrical and mechanical engineering	University of Strathclyde
Emma McQuiggan	Mechanical engineering	Queens University Belfast
Connor McShane	Mechanical engineering	Queen's University Belfast
Erin Meredith	Chemical engineering	Loughborough University
Michel Mesquita	Aerospace engineering	University of Surrey
Vladislav Morgen	Electrical and mechanical engineering	University of Strathclyde
Alexander Mulroy	Engineering design	University of Bristol
Charles Newton	Mechanical engineering	Loughborough University
Karolina-Verzhiniya Nikolova	Aerospace engineering	University of Bath
Ronan O'Connell	Biomedical engineering	University of Glasgow
Katherine Oxley	Chemical engineering	University of Sheffield
Hanesh Patel	Engineering	University of Cambridge
Marcia Pryce	Chemical engineering	Newcastle University
Alice Purcell	Mechanical engineering	Queen's University Belfast
Alice Quinn	Innovative manufacturing engineering	Loughborough University
Osian Rees	Engineering design	University of Bristol
Lewis Roberts-James	Mechanical engineering	University of Bristol
Lisa Rossi	Chemical engineering	University of Aberdeen
Max Schinke	Engineering	University of Cambridge
Peter Simmons	Engineering design	University of Bristol
Holly Smith	Civil engineering	University of Bristol
Gareth Stephenson	Product design engineering	Queen's University Belfast
Hugo Stock	Mechanical engineering	Imperial College London
Alexa Strobel	Chemical engineering	University of Cambridge
Monika Szczyrba	Civil engineering with a modern language	University of Sheffield
Kathryn Taheny	Electronics and electrical engineering	University of Edinburgh
Conor Taylor	Aerospace engineering	Queen's University Belfast
Enrico Varano	Engineering design	University of Bristol
Julian Vercruysse	Structural engineering with architecture	University of Edinburgh
Matthew Walker	Chemical engineering	Loughborough University
Liam Warnock	Electronic and electrical engineering	University of Strathclyde
Lucinda Wilkinson	Civil and environmental engineering	Imperial College London
Rhys Williams	Aeronautical engineering	Imperial College London
Robert Winn	Ship science	University of Southampton
Rebecca Wray	Product design engineering	Queen's University Belfast
Jerome Wynne	Engineering design	University of Bristol
Thomas Yard	Mechanical engineering	Imperial College London

Name	Subject	University
Paul Yuile	Electrical and mechanical engineering	University of Strathclyde
Mareks Zevalds	Engineering design	University of Bristol

INGENIOUS PUBLIC ENGAGEMENT AWARDS ROUND 11 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
Abed Alaswad	Birmingham City University	Birmingham City Engineering Week
Jonny Boux	New Hackney Education Business Partnership	iDiscover: introducing primary pupils to STEM careers
Colin Dowding	University of Lincoln	Lincolnshire Engineering Festival: SPARK! 2017 – school involvement and legacy projects
Malcolm Dunn	Cheltenham Festivals	Makespace: engineers and makers engaging us with the material world
Zara Gladman	Glasgow Science Festival, University of Glasgow	Imagineer
Wyn Griffiths	Middlesex University	SMASHfestUK: The Earth and Sky Tour
Mark Haw	University of Strathclyde and University of Edinburgh	The Sludgy Stuff Engineering Roadshow
Ben Johnson	Graphic Science Ltd	Heritage heresy: re-imagining Bath by breaking all the rules
Katherine Kirk	University of the West of Scotland	A car for women and other stories: engineering via storytelling
Shane McCracken	Gallomanor Communications	I'm an engineer: online STEM engagement for schools
Tim Minshall	University of Cambridge	How does stuff get made? Developing primary manufacturing outreach capabilities
Neil Noble	The Smallpeice Trust	Public engagement in automotive engineering
Christopher Parkin	Museum of the History of Science	Hooked on invention: a young inventors' club in a museum
James Piercy	Science Made Simple Ltd	Engineering your future
Xanthe Pitt	Discovery Planet C.I.C	Turbines: a wind-wind solution?
Helen Szoor-McElhinney	University of Edinburgh and University of Glasgow	Circuits: connecting engineers with teachers to create novel teaching tools
Gregory Watson	Children's Radio UK Ltd	Engineering Britain's railways for a digital age

VISITING PROFESSORS

The Visiting Professors 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 68 Visiting Professors at 37 universities.

Name	University	Name	University
Richard Baker	University of Leeds	Mark Joynson	University of Liverpool
Professor Anthony Banford	University of Manchester	Steve Kaye	Brunel University London
Neil Barron	Royal College of Art	Andrew Langridge	University of Bath
Steven Adams and Dr Sam Beale	University of Cambridge	Chris Lawrence	University of Nottingham
Ron Bell	Liverpool John Moores University	Dr Darren Lee	Lancaster University
Massimo Bombino	Middlesex University	Dr Ivan Lucic	City, University of London
Dr Rick Bradford	University of Bristol	Dr Jon Machtynger	University of Surrey
Dr Andrew Bradley FREng	Loughborough University	Professor Norman MacLeod	University of Leeds
Dr Caspar Clark	University of the West of Scotland	David Maroney	Queen's University Belfast
Dr Andy Clough	WMG, University of Warwick	Brian McFarland	Queen's University Belfast
Professor David Daniels CBE	University of Manchester	Tim Milne	University of Leicester
Dr Ashish Darbari	University of Southampton	Anthony (Tony) Morgan	University of Leeds
Dr Paul Davies	Liverpool John Moores University	Crispin Oakman	University of Nottingham
Peter Debney	University of Bradford	Dr Nelson Ogunshakin OBE	Aston University
David Drew	University of Nottingham	Dr Scott Owens	Imperial College London
Professor Colin Eddie FREng	University of Warwick	Dr Vili Panov	University of Lincoln
Dr Allen Edwards	Cardiff University	Dr Richard Pearson	Brunel University London
Dr Shaun Fitzgerald FREng	University of Cambridge	Xavier Poteau	University of Manchester
Professor Malcolm Fox	University of Bradford	Paul Rawlinson	University of Manchester
Professor Steve Franklin	University of Sheffield	Dr Michael Raxworthy	University of Leeds
Pierre French	University of Huddersfield	Dr Mei Juan Ren	University of Manchester
Dr David Goddard	University of Manchester	Dr Ian Robertson	University of Warwick
Professor Martin Goosey	Loughborough University	Professor Peter Robery FREng	University of Birmingham
Dr Steve Graham	University of Liverpool	Philip Sams	Northumbria University
Dr Isabel Hadley	University of Bristol	Robert Shanks	Coventry University
Dr John Haine	University of Bristol	Professor Graeme Shaw	University of Southampton
Robert Harris FREng	University of Southampton	Dr Andrew Sherlock	University of Edinburgh
Dr Erol Hepsaydir	University of Kent	Dr Aaron Smith	University of Edinburgh
Dr Walter Holweger	University of Southampton	Kevin Steptoe	University of York
Robert Hutchison	University College London	Dr Vaughan Thomas	University College London
Dr Robin Irons	University of Nottingham	Paul Tymkow	Brunel University London
Andrew Jackson	University of Sheffield	Dr Dick Whittington FREng	University of York
Christina Jackson	University of Birmingham	Dr David Williams	Loughborough University
Paul Jennings	University College London	Teo Heng Jimmy Yang	Cardiff University

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, nine Fellowships were awarded.

Name	Business school
Taha Rahman Dar	London Business School
Jonathan Dyson	London Business School
Alessio Falcone	IESE Business School – University of Navarra
Deviyani Misra-Godwin	Harvard Business School
Bishrut Mukherjee	London Business School
Fani Pournara	INSEAD
Samarth Sharma	INSEAD
Jie Shen	London Business School
Animish Sivaramakrishnan	Wharton- University of Pennsylvania

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
Dr Jean-Lou Chameau	President, King Abdullah University of Science and Technology	Saudi Arabia
Professor Brian Cox OBE FRS	Royal Society Research Fellow, University of Manchester	UK
Professor Lynn Gladden CBE FREng FRS	Pro-Vice-Chancellor for Research, Shell Professor of Chemical Engineering, University of Cambridge	UK
Professor John Hennessy	Past President, Stanford University	USA
Professor Carlos Henrique de Brito Cruz	Science Director, São Paulo Research Foundation	Brazil
Professor Dr Dr hc Reinhard Huettl	Past 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 CBE 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.

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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

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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:

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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 Advanced Mineral Recovery	UK
Professor John Clarkson FREng	Professor of Engineering Design, University of Cambridge	UK
Naomi Climer FREng	President, Institution of Engineering and Technology (until 30 September 2016)	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	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. In anticipation of a major new Academy fundraising campaign the Board is currently being reconstituted.

Chair

Ian Barlow *(until July 2016)*

Steve Holliday FREng *(from July 2016)*

Members

Ayman Asfari FREng *(until November 2016)*

Malcolm Brinded CBE FREng

Iain Conn FREng FRSE

Andrew Gould *(until October 2016)*

Dr Andrew Harter FREng *(until October 2016)*

Dr Tony Hayward *(until September 2016)*

Dr Mike Lynch OBE DL FREng FRS

David Thomlinson FREng

CONTRIBUTORS TO ACADEMY PROGRAMMES

The role of the Development Advisory Board is to support the realisation of the Academy's goals and in particular its fundraising efforts. In anticipation of a major new Academy fundraising campaign the Board is currently being reconstituted:

AECOM	Fraunhofer UK	Radio Design Ltd
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The Bagrit Trust	Infineum UK Ltd	Shell Centenary Scholarship Fund
The Blavatnik Family Foundation	Jaguar Land Rover Limited	Shell International Ltd
Boeing UK	Johnson Matthey plc	Siemens Wind Energy
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The Comino Foundation	Mathys & Squire LLP	Tata Steel
Cummins Generator Technologies	Dr Michael Lynch OBE DL FREng FRS	Dr John C Taylor OBE FREng
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DePuy Synthes	Motorola Solutions Foundation	Ultra Electronics
The Drayson Foundation	Mott MacDonald Group Ltd	URENCO Ltd
Dyson Technology Ltd	National Nuclear Laboratory	Walney Extension Community Fund
ECI	Network Rail	Weir Group plc
EDF Energy plc	The Nuclear Decommissioning Authority	The Wellcome Trust
Elster	The Ogden Trust	Welsh National Research Network
The ERA Foundation	The Panasonic Trust	The Wolfson Foundation
European Regional Development Fund	Sir John Parker GBE FREng	Sir Martin Wood OBE DL HonFREng FRS
The Sir John Fisher Foundation	Pell Frischmann Ltd	The Worshipful Company of Engineers
	Petrofac plc	
	QinetiQ plc	

ROYAL ACADEMY OF ENGINEERING 2016 ANNUAL FUND

The Academy would like to thank the following* donors to the Annual Fund and also those Fellows who have made regular gifts for some years:

Hugh Allen FREng	Professor Christopher Fleming FREng	Trevor Massey OBE FREng
William Baker FREng	Sir Peter Gershon CBE FREng	Mr Michael Morris OBE FREng
Dr Alasdair Biggart OBE FREng	Professor Sir Peter Gregson FREng	Dr Alastair Paterson CBE FREng
Peter Blair OBE FREng	Dr Peter Hackett OBE DL FREng	Professor William Powrie FREng
Professor John Bourne FREng	Raymond Hall CBE FREng	Michael Reeve FREng
Professor John Brown CBE FREng	Sir David Harrison CBE FREng	Professor John Shannon FREng
Maurice Cahalan OBE FREng	Mr Ewan Hewitt FREng	Air Marshal Sir Colin Terry KBE CB FREng
Peter Carr FREng	Sir Robert Hill KBE FREng	Keith Thrower OBE FREng
Dr Andrew Charles FREng	Professor Antony Hoare FREng FRS	Anthony Trinick FREng
Nicholas Donofrio FREng	Mr Derek Kingsbury CBE FREng	Professor Richard Williams OBE FREng
Henry Duxbury FREng	Professor Joseph Lee FREng	FRSE
Professor Rodney Eatock Taylor FREng	Sir Christopher Lewinton FREng	Mr Christopher Wyatt FREng
John Evans OBE JP FREng	Mr Geoffrey Lomer CBE FREng	
Professor Patrick Farrell FREng	Bernard Looney FREng	

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

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National Westminster Bank plc
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London WC2H 0NN

Solicitors

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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



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Registered charity number 293074

Financial Report and Accounts

For the year ended 31 March 2017



Contents

	Page
Chair of the Finance Committee's statement	1
Report of Trustee Board	
Reference and administrative details	2
Structure, governance and management	3
Election to the Trustee Board	3
Induction and training of Trustee Board members	3
Internal control	4
Objectives and activities for the public benefit	6
Charitable activities	6
Activities, achievements and performance	6
Financial review	8
Review of transactions for the year	8
Academy's reserves policy	9
Recipients of Academy grants	10
Grant-making policy	11
Remuneration policy	11
Plans for future periods	12
Statement of Trustee Board's responsibilities	13
Independent auditor's report to the Trustee Board of the Royal Academy of Engineering	14
FINANCIAL STATEMENTS	
Consolidated statement of financial activities	15
Balance sheets	16
Consolidated statement of cash flows	17
Notes to the accounts	18-32

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. 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 £27.4 million. Group expenditure on charitable activities was £26.2 million. The cost of generating funds across the group was £1.1 million. The carrying value of the group's net assets was £64.4 million.

ROYAL ACADEMY OF ENGINEERING

Total income for the year was £25.0 million. The largest element, core grants from the Department for Business, Energy and Industrial Strategy, was £11.7 million.

Income from other grants and contracts increased to £11.2 million.

Expenditure on charitable activities was £26.2 million compared to £22.0 million in the previous year. An analysis based upon the principal objective of each activity shows that, of the total charitable expenditure of £26.2 million: 78% on enhancing engineering capacity; 8% on inspiring

young people; 9% on promotion of and leadership in engineering; and 6% on leading and shaping engineering policy. Employment costs increased from the previous year by 19% to £5.1 million due to additional recruitment to deliver programmes such as the Global Challenge Research Fund.

THE QUEEN ELIZABETH PRIZE FOR ENGINEERING FOUNDATION

Total income for the year was £1.9 million. Expenditure on charitable activities was £1.8 million. The Queen Elizabeth Prize for Engineering is awarded biennially and an award was 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 £0.5 million and operating expenditure, including the cost of providing a service to the Academy, was £0.6 million. The net loss for the year was £65,000. The company paused trading during the year while refurbishment work, including new kitchens, took place in Prince Philip House. Trading resumed in January 2017.

GROUP ASSET VALUE

The carrying value of the group's net assets was £64.4 million. Investments were valued at £47.9 million, with the Academy holding £24.6 million and the Foundation holding £23.3 million. Tangible fixed assets valued at £24.9 million included the £11.4 million value of the Carlton House Terrace lease and

the £12.8 million of leasehold improvements to Prince Philip House. The main liability was a bank loan of £11.5 million, which funded the extension of Academy's property lease secured in 2017. The value of the group's restricted funds decreased over the year by £2.2 million. The Academy's general fund value increased by £8.2 million.

INVESTMENTS

The value of the Academy's investment portfolio increased over the year by £0.6 million to £24.6 million. Realised and unrealised investment gains during the year were £2.3 million. 100% of the Academy's investment portfolio is held in UK equities. Income to the Academy from dividends increased by 4% during the year to £906,000 while bank interest decreased to £9,000 from £22,000. Group investment income increased by £167,000 to £1.6 million, of which £587,000 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 £7.2 million purchase of the new lease for Prince Philip House extending for 125 years.

Dr Robert Joyce FEng,
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

Vice President for Committee Coordination

Professor R Williams OBE FREng

Vice President for Fellowship Engagement

TRUSTEE BOARD

Chair Finance Committee

Dr Robert Joyce FREng

Trustee Board members

Professor Dame Ann Dowling
OM DBE FREng FRS

Allan Cook CBE FREng

Professor Richard Williams OBE FREng

Professor Colin Bailey FREng

Professor Sir Michael Gregory CBE FREng

Norman Haste OBE FREng

Dr David Hughes FREng

Dr Robert Joyce FREng

Professor Elaine Martin OBE FREng

John Robinson CBE FREng

Dr Frances Saunders CB FREng

Professor Liz Tanner OBE FREng FRSE

Paul Westbury CBE 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

Dr Robert Joyce FREng (Chair)
Ian Ritchie CBE FREng FRSE (until September 2016)
Allan Cook CBE FREng
Norman Haste OBE FREng

Graeme Hobbs FREng
Professor David Lane FREng FRSE
Professor Jim 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. These risks are managed by only implementing programme activities when funding is available.

The Queen Elizabeth Prize for Engineering Foundation has yet to raise all the funds required to sustain the prize in perpetuity. This risk is managed by regular monitoring of QEPrize fundraising by internal management and the Academy's trustees. A new Development Director has been appointed to manage QEPrize and Academy fundraising in parallel.

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. Strategy is set by the Trustee Board, implemented by the Senior Management Team and oversight is provided by Academy Committees. The remuneration of the Chief Executive and directors is set annually by the Remuneration Committee. In setting appropriate levels of senior management pay, the Remuneration Committee considered the skills, experience and competencies required for each role, and the remuneration level for those roles in sectors where suitable candidates would be found.

The directors are as follows:

Chief Executive	Mr Philip Greenish CBE
Deputy CEO & Director, Strategy and Planning	Dr Hayaatun Sillem
Director, Finance and Corporate Services	Mr Stuart Anthony
Director, Programmes	Mr Andrew Clark
Director, Education Programmes	Dr Rhys Morgan
Director, Policy and Public Affairs	Ms Beverley Parkin
Director, Development	Ms Samantha Bagchi
Director, Queen Elizabeth Prize	Ms Keshini Navaratnam

Report of Trustee Board

Objectives and activities for the public benefit

Charitable activities

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

- supporting engineering innovation
- inspiring young people and nurturing education and skills
- engaging the public with engineering
- leading and shaping engineering policy.

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

"Supporting engineering innovation"

Main public benefits:

- Improving the wealth generation of the UK economy by supporting high-quality engineering and technology research and encouraging entrepreneurs and innovators to develop ideas and grow businesses.
- Facilitating links between industry and universities to translate innovative research into economic success.
- Enhancing the links between UK and international engineers and encouraging cross-country collaboration to address global challenges.

Main achievements

The Enterprise Hub's new physical home, the Taylor Centre, was opened in February 2017. It provides a base for the Hub's community of innovators, mentors and investors. Just after the opening, the fourth cohort of 12 Enterprise Fellows was announced. They will benefit from a comprehensive support package that includes seed funding, mentoring, and marketing and PR support.

Under the Global Challenges Research Fund, which supports cutting-edge research that addresses the challenges faced by developing countries, the Academy launched Frontiers of Engineering for Development. The symposia bring together early- and mid-career engineers

from across the world to network, engage and collaborate to tackle global grand challenges, and apply for £20,000 seed funding to help start a collaborative project inspired by the event. Two events took place during the year and resulted in 24 seed-fund awards.

The second Africa Prize for Engineering was awarded to Arthur Zhang, an innovator from Cameroon who invented a heart monitoring device that allows any medical professional to perform heart diagnostics at any location, which can then be sent to a cardiologist and interpreted in less than 20 minutes. He and three other finalists each received prize money, support and business training.

Achievements in programmes funded by the parliamentary grant included: more than 45 Research Chairs and Senior Research Fellows were in post during the year; two Research Chairs in Emerging Technologies were in post; 44 Research Fellows (including RAEng/ EPSRC Research Fellowships, RAEng Research Fellowships and RAEng/MOD Fellowships) were in post; 11 Fellowships were awarded under the new Industrial Fellowships scheme; under the Newton Fund, 181 Leaders in Innovation Fellowships were awarded to researchers from 14 Newton Fund partner countries, including the first attendees from Indonesia and Malaysia, and 46 bilateral collaborations with six countries were funded as part of the Industry-Academia Partnership Programme.

"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 in STEM subjects.

Main achievements

The Academy continued to support the Big Bang Fair in 2017, the largest celebration of science, technology, engineering and maths for young people in the UK. An estimated 10,000 attendees visited the Academy's stand over the four days.

The Academy's education projects worked with hundreds of teachers to strengthen the quality of engineering education in schools and colleges. The *Connecting STEM Teachers* programme supported more than 1,000 teachers in 54 schools across the UK. Three engineering projects in

Lowestoft, Barrow-in-Furness and Stoke-on-Trent worked with 32 primary schools, 15 secondary schools and six post-16 colleges.

A total of 35 students were in receipt of Engineering Leaders Scholarships; nine Sainsbury Management Fellowships were awarded; and 28 new Visiting Professors were appointed, bringing the total on the scheme to 68 across 37 different universities.

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

The Academy has hosted around 300 students at three engineering fast-track workshops as part of the Engineering Engagement Programme, which aims to attract undergraduates from diverse backgrounds into engineering employment. After attending the workshops, 56 students secured graduate or placement positions in engineering companies.

The Academy continued to host Education for Engineering (E4E), which contributed to the consultation for the new Institute of Apprenticeships and supported the Department for Education in the development of T-levels.

“Engaging the public with engineering”

Main public benefits:

- Engaging the public in debate on engineering and its impact on society.
- Communicating the excitement and diversity of engineering to varied audiences.
- Recognising great engineering through prizes and awards.

Main achievements

The MacRobert Award for innovation in UK engineering for 2016 was awarded to a team from Blatchford for its Linx limb system, which is an intelligent prosthetic limb with integrated robotic control of the knee and foot so that it works together like a human leg.

Other awards in 2016 were:

- Sir Frank Whittle Medal – awarded to Professor Roger Sargent FREng, Emeritus Professor of Chemical Engineering and Senior Research Fellow, Imperial College London, for his work in process systems engineering.

- Sir George Macfarlane Medal – awarded to Dr Sithamparanathan Sabesan for his work in electronic engineering.
- Colin Campbell Mitchell Award – awarded to a team from Ultrahaptics, a University of Bristol spin-out company that has revolutionised the way people interact with machines through a novel use of ultrasound.
- Silver Medals – awarded to Dr Damian Gardiner, Research Scientist/Business Development Manager, Johnson Matthey; Dr Demis Hassabis, Co-founder and CEO of DeepMind and Vice President Engineering, Google; Professor Tong Sun, Professor of Sensor Engineering, City, University of London.
- Major Project Award – awarded to a team from BAE Systems AI Labs for the Intermediate Frequency Modem System.
- President’s Medal – awarded to Dr Ian Nussey OBE FREng for his exceptional service to the Academy during his 30 years as a Fellow.
- Rooke Award – awarded to Professor Danielle George MBE, Professor of Radio Frequency Engineering, University of Manchester, for her remarkable contribution to the public promotion of engineering through her work with various media channels.

The Queen Elizabeth Prize for Engineering was awarded to four engineers who together were responsible for the creation of digital imaging sensors, technology that has transformed medicine, science, personal communication and entertainment on a global scale.

A number of significant events were held throughout the year, including the annual Academy Awards Dinner, *In conversation with MacRobert Award 2016 winners: Blatchford, Ingenia* live!, and a number of lectures and meetings.

The *Ingenious* public engagement grant scheme awarded funding to 23 projects in 2016. Now in its 10th year, the scheme has funded more than 189 projects, reached over 2.5 million members of the public and worked with more than 5,000 engineers.

The Academy participated in public engagement activity at science festivals, hosting a *Superhuman vs. Superhero* stand at *New Scientist* Live and a panel discussion on the same topic at the Cheltenham Science Festival.

Report of Trustee Board

“Leading and shaping engineering policy”

Main public benefits:

- Acting as a leadership body and promoting the value of engineering by harnessing the strengths of the engineering organisations.
- Working with the other national academies on a range of policy issues.
- Providing written responses and advice to parliamentary, governmental and other national bodies on a range of engineering topics, including the government’s *Spending Review*.

Through Engineering the Future (EtF), which brings together the professional engineering institutions (PEIs), the Engineering Council and EngineeringUK, the Academy led work on the *Engineering a future outside the EU: securing the best outcome for the UK* report. Following the referendum vote for the UK to leave the EU, the report assessed the potential impact that this would have on engineering and the UK’s economy and productivity.

The Academy published *Living without electricity*, a report that was put together with Lancaster University and the Institution of Engineering and Technology. The report detailed the loss of virtually all modern infrastructure in Lancaster for four days in December 2015, caused by unprecedented flooding in north Lancashire and Cumbria, and how it was dealt with. The findings of the report have since been discussed at a number of meetings of emergency responders and planners around the country.

In collaboration with the Science Council, the Academy created a *Diversity & Inclusion Progression Framework* for professional bodies to help organisations plan and prioritise their diversity and inclusion activities.

The Academy launched a series of online videos profiling lesbian, gay, bisexual and transgender (LGBT) engineers that aimed to inspire prospective engineers who are LGBT, as well as existing engineers who may wish to come out or transition at work.

Financial review

Review of transactions for the year

The financial statements are presented in the format required by the 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 £27.4 million. Total income decreased by £1.8 million over the previous year.

GOVERNMENT GRANT

The Academy is grateful to the Department for Business, Energy and Industrial Strategy for providing a government core grant to support activities aimed primarily at promoting engineering research in the UK. The government core grant at £11.7 million was the largest contribution to funds and represented 43% of total group incoming resources. The Department for Business, Energy and Industrial Strategy made an additional grant of £4.8 million to the Newton Fund programme and £3.1 million to the Global Challenge Research Fund.

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, Energy and Industrial Strategy and a group of aerospace sector companies donated £0.5 million to the MSc Aerospace Bursary Programme.

DONATIONS AND LEGACIES

During the year, donations totalled £1.9 million, of which £1.3 million was to the Queen Elizabeth Prize for Engineering Foundation.

OTHER INCOME

Other major sources of income during the year were: investments, subscriptions, events and facilities hire income at a total of £2.5 million.

CHARITABLE ACTIVITIES

Expenditure on charitable activities was £26.2 million during the year or 96% of total resources expended. Of this total, £22.7 million represented charitable activities and grants paid under various programmes and £3.5 million represented the costs of operating those programmes.

RAISING 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 £1.1 million or 4% 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 100% UK equities; this allocation is reviewed regularly. During the year, the general fund generated £906,000 of income and achieved an investment gain of £2.3 million.

FIXED ASSETS

Capital expenditure during the year amounted to £6.3 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 £40 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	2017 £000	2016 £000
Total funds as per group balance sheet	64,421	58,465
Exclude:		
Restricted funds	32,655	34,893
Unrestricted funds tied up in tangible fixed assets	11,918	4,508
Designated and special funds	339	505
Free reserves	19,508	18,560

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 2016/17 totalling £13.7 million. The first 50 organisations, in order of 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	1,055,482	43,990	-		1,099,471
2	University of Oxford	776,289	38,748	-		815,037
3	University College London	489,418	106,429	10,887		606,734
4	University of Leeds	488,373	71,856	5,624		565,853
5	University of Southampton	421,876	122,485	15,324		559,685
6	University of Bristol	382,469	69,390	-		451,859
7	University of Cambridge	361,742	52,495	4,874		419,112
8	University of Manchester	280,423	79,869	6,000		366,291
9	University of Glasgow	287,208	25,087	49,204		361,499
10	University of Bath	195,694	126,853	-		322,548
11	University of Sheffield	233,948	52,584	17,494		304,027
12	Cranfield University	5,000	286,043	-		291,043
13	University of Edinburgh	184,314	78,862	5,458		268,633
14	Heriot Watt University	227,678	9,392	11,592		248,662
15	University of Warwick	181,561	51,200	-		232,761
16	University of Birmingham	180,909	26,774	-		207,683
17	Loughborough University	85,656	83,760	6,000		175,416
18	University of Surrey	112,830	38,238	5,839		156,906
19	Queen's University Belfast	116,610	35,484	-		152,094
20	University of Strathclyde	114,575	37,062	-		151,636
21	City, University of London	98,201	52,616	-		150,817
22	Queen Mary & Westfield College	128,077	19,007	-		147,084
23	University of Exeter	105,215	34,827	-		140,042
24	Shandong University	-	140,000	-		140,000
25	University of Liverpool	71,650	47,528	10,306		129,484
26	Tsinghua University	-	126,467	-		126,467
27	University of York	42,702	65,547	1,358		109,606
28	University of Nottingham	72,764	32,751	-		105,515
29	University of Ulster	98,340	7,166	-		105,506
30	Swansea University	35,921	-	53,881		89,802
31	University of Kent	63,000	630	22,528		86,158
32	Cardiff University	57,720	20,000	5,276		82,996
33	University of Leicester	64,923	10,000	5,261		80,185
34	Royal Society	72,042	-	-		72,042
35	Lancaster University	66,203	5,400	-		71,603
36	National University of Science & Technology	-	70,000	-		70,000

Amount in £	Visiting Professors and other programmes			Industrial secondments	Total
	Research				
37 Moi University	-	70,000	-	-	70,000
38 Fuzhou University	-	70,000	-	-	70,000
39 Dalian University of Technology	-	70,000	-	-	70,000
40 University of Dar es Salaam	-	70,000	-	-	70,000
41 University of Botswana	-	70,000	-	-	70,000
42 Makerere University College of Engineering	-	70,000	-	-	70,000
43 Beijing Union University	-	70,000	-	-	70,000
44 Beijing Institute of Technology	-	70,000	-	-	70,000
45 Beijing Jiaotong University	-	69,855	-	-	69,855
46 Huazhong University of Science & Technology	-	69,440	-	-	69,440
47 IFM Education and Consultancy Services Ltd	-	69,114	-	-	69,114
48 SEO London Ltd	-	67,750	-	-	67,750
49 Liverpool John Moores University	-	64,552	-	-	64,552
50 Jilin University	-	57,190	-	-	57,190
Total	7,158,812	3,026,440	236,907		10,422,159

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 2019.

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 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
- 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 that 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.

**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 24 July 2017.

**Dr Robert Joyce FREng,
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 2017, which comprise consolidated statement of financial activities, the consolidated and parent balance sheet, the consolidated statement of cash flows 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 trustees' 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 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 FRC'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 parent charity's affairs as at 31 March 2017 and

of the group's and parent charity's incoming resources and application of resources, including the income and expenditure, for the year then ended

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

OPINION ON OTHER MATTER AS REQUIRED BY BEIS GRANT LETTERS

In our opinion, in all material aspects, the grant payments received from the Department for Business, Energy and Industrial Strategy (BEIS) have been applied for the purposes set out in the Grant Letters and in accordance with the terms and conditions of the agreements.

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: 9 August 2017

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 2017	Notes	Unrestricted funds	Restricted funds	Total 31 March 2017	Total 31 March 2016
		£	£	£	£
Income from:					
Charitable activities	2, 3, 4	-	22,979,068	22,979,068	20,144,797
Donations and legacies	5	57,802	1,883,282	1,941,084	5,777,690
Other trading activities	6a	912,148	-	912,148	1,914,862
Investments	6	915,446	662,678	1,578,124	1,410,798
Total income		1,885,396	25,525,028	27,410,424	29,248,147
Expenditure on:					
Raising funds		954,023	160,658	1,114,681	1,480,813
Charitable activities	7	1,373,559	24,842,415	26,215,974	21,972,992
Other	8	37,632	2,700	40,332	95,950
Total expenditure		2,365,214	25,005,773	27,370,987	23,549,755
Net gains/(losses) on investment	11	2,259,599	3,656,512	5,916,111	(1,122,112)
Net income /(expenditure)		1,779,781	4,175,767	5,955,548	4,576,280
Transfer between funds	16	6,413,514	(6,413,514)	-	-
Net movement in funds		8,193,295	(2,237,747)	5,955,548	4,576,280
Fund balances brought forward 1 April		23,572,559	34,892,655	58,465,214	53,888,933
Fund balances carried forward 31 March	16, 17	31,765,854	32,654,908	64,420,762	58,465,214

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 2017		Group		Charity	
	Notes	2017 £	2016 £	2017 £	2016 £
Tangible fixed assets	10	24,925,780	12,176,284	24,925,780	12,176,284
Investments	11	47,867,821	40,959,431	24,602,451	24,027,935
Total fixed assets		72,793,601	53,135,715	49,528,231	36,204,219
Current assets:					
Debtors	12	4,901,907	6,341,676	4,862,799	5,592,107
Stock	13	2,309	2,703	2,309	2,703
Cash at bank		3,876,765	6,067,191	2,068,299	2,233,966
Short term deposits		876,578	1,606,200	506,240	1,506,321
		9,657,559	14,017,770	7,439,647	9,335,097
Liabilities					
Creditors (amounts falling due within one year)	14a	(6,530,398)	(7,711,874)	(5,767,548)	(7,453,276)
Net current assets		3,127,161	6,305,896	1,672,099	1,881,821
Total assets less current liabilities		75,920,762	59,441,611	51,200,330	38,086,040
Creditors (amounts falling due beyond one year)	14b	(11,500,000)	(976,397)	(11,500,000)	(976,397)
Total net assets		64,420,762	58,465,214	39,700,330	37,109,643
The funds of the charity:					
Restricted income funds	16	32,654,908	34,892,655	7,841,602	13,551,788
Unrestricted funds					
Special funds		41,204	205,351	41,204	205,351
Designated fund		298,186	299,586	298,186	299,586
General fund		31,426,464	23,067,622	31,519,338	23,052,918
Total unrestricted funds		31,765,854	23,572,559	31,858,728	23,557,855
Total charitable funds		64,420,762	58,465,214	39,700,330	37,109,643

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

Signed on behalf of the Trustee Board on 24 July 2017

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

**Dr Robert Joyce FREng,
Chair of Finance Committee**

Consolidated statement of cash flows

Year ended 31 March 2017

	2017 £	2016 £
Cash flows from operating activities:		
Net cash provided by operating activities	(930,457)	4,675,517
Cash flows from investing activities:		
Dividends, interest and rents from investments	1,578,125	1,410,798
Purchase of property, plants and equipment	(13,099,036)	(1,126,758)
Proceeds from the sale of investments	3,780,960	4,258,173
Purchase of investments	(4,773,243)	(8,754,080)
Net cash provided by investing activities	(12,513,194)	(4,211,867)
Cash flows used in financing activities:		
Repayments of borrowing	(976,397)	(122,733)
Cash inflows from new borrowing	11,500,000	-
Net cash used in financing activities	10,523,603	(122,733)
Change in cash and cash equivalents in the reporting period	(2,920,049)	340,917
Cash and cash equivalents at 1 April	7,673,391	7,332,474
Cash and cash equivalents at 31 March	4,753,342	7,673,391
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)	5,955,548	4,576,280
Net losses/(gains) on investments	(5,916,111)	1,122,112
Adjustments for:		
Depreciation charges	349,540	412,804
Dividends, interest and rents from investments	(1,578,125)	(1,410,798)
Decrease in stocks	394	497
Decrease in debtors	1,439,769	1,529,193
(Decrease) in creditors	(1,181,473)	(1,554,570)
Net cash provided by operating activities	(930,457)	4,675,517
Analysis of cash and cash equivalents		
Cash in hand	3,876,765	6,067,191
Notice deposits	876,578	1,606,200
Total cash and cash equivalents	4,753,342	7,673,391

Notes to the accounts

For the year ended 31 March 2017

Note 1 – Accounting policies

(a) Basis of preparation of the accounts

The annual report, incorporating the financial statements for the year ended 31 March 2017, 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 prepared under FRS102.

(b) 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.

(c) 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.

(d) 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.

(e) 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.

(f) 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.

(g) Support costs

Support costs are those functions that assist the work of the Academy and mainly comprise of staff costs and overheads. Support costs are assigned to the Academy's charitable objectives in line with the direct expenditure under each heading.

(h) Operating leases

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

(i) 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.

(j) Investments

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) 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.

(l) 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.

(m) 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.

(n) Stock

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

(o) Cash and cash equivalents at bank

Cash and cash equivalents at bank includes cash and short term highly liquid investments obtainable within 3 months.

(p) Creditors

Creditors 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 are normally recognised at their settlement amount after allowing for any trade discounts due.

(q) 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..

(r) 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.

(s) Going Concern

The Academy's accounts have been prepared on the basis of being a going concern. The trustees have made their own assessment of the Academy's ability to continue as a going concern and assured themselves of the validity of this assumption. In making this assessment, the Academy's trustees have taken into account all available information about the future for at least, but not limited to, 12 months from the date the accounts are approved. Sufficient reserves and funding is secured for the Academy to continue to fulfil its charitable objectives.

(t) Government Grants

Government grants are charged in the year in which the commitments to pay the grants are made.

Notes to the accounts

Year ended 31 March 2017	Unrestricted funds	Restricted funds	Totals 31 March 2017	Unrestricted funds	Restricted funds	Totals 31 March 2016
	£	£	£			£

Note 2 - Grants

Government grant (See note 3)	-	(11,738,894)	(11,738,894)	-	(12,399,875)	(12,399,875)
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Note 3 - Government grant

Grant was expended on:

External projects	-	(10,491,000)	(10,491,000)	-	(9,693,295)	(9,693,295)
Cost of managing external projects	-	(1,247,894)	(1,247,894)	-	(2,706,580)	(2,706,580)
	-	(11,738,894)	(11,738,894)	-	(12,399,875)	(12,399,875)

Note 4 - Other grants and contracts

Newton Fund	-	(4,822,593)	(4,822,593)	-	(3,822,872)	(3,822,872)
MSc Aerospace Bursary Programme	-	(486,358)	(486,358)	-	(1,722,688)	(1,722,688)
Connecting Teachers	-	(389,785)	(389,785)	-	(368,607)	(368,607)
Leverhulme Fellowships	-	(284,261)	(284,261)	-	(328,633)	(328,633)
Africa Prize for Engineering Innovation	-	(606,135)	(606,135)	-	(313,666)	(313,666)
Sainsbury Management Fellowships	-	(290,117)	(290,117)	-	(300,000)	(300,000)
RAEng/EPSRC Research Fellowships	-	(87,086)	(87,086)	-	(211,009)	(211,009)
Engineering FE	-	(39,279)	(39,279)	-	(163,511)	(163,511)
KS2 STEM Resources & CPD Programme	-	-	-	-	(75,000)	(75,000)
Engineering Leadership Scheme	-	-	-	-	(68,645)	(68,645)
Industrial Secondment	-	(53,654)	(53,654)	-	(65,347)	(65,347)
Enterprise Hub	-	(237,271)	(237,271)	-	(64,550)	(64,550)
MOD Fellowships	-	-	-	-	(52,738)	(52,738)
Stoke Engineering Programme	-	(13,200)	(13,200)	-	(40,500)	(40,500)
Enriching Engineering Education Programme	-	(234,667)	(234,667)	-	(30,667)	(30,667)
Petrofac Fellowships	-	-	-	-	(30,000)	(30,000)
MacRobert Award	-	(26,000)	(26,000)	-	(26,000)	(26,000)
Other awards and contracts	-	-	-	-	(13,750)	(13,750)
Barrow Engineering Programme	-	(23,300)	(23,300)	-	(20,340)	(20,340)
Education Studies and Support	-	-	-	-	(20,000)	(20,000)
Lowestoft Engineering Programme	-	(48,600)	(48,600)	-	(6,400)	(6,400)
RAEng/WCE Awards	-	(17,809)	(17,809)	-	-	-
Executive Engineers Programme	-	(3,270)	(3,270)	-	-	-
Biomedical Engineering	-	(22,000)	(22,000)	-	-	-
1851 Royal Commission	-	-	-	-	-	-
Enterprise Fellowships	-	(194,500)	(194,500)	-	-	-

Year ended 31 March 2017	Unrestricted funds	Restricted funds	Totals 31 March 2017	Unrestricted funds	Restricted funds	Totals 31 March 2016
	£	£	£			£
Global Challenge Research Fund	-	(3,059,363)	(3,059,363)	-	-	-
Tier 1 Visa Applications	-	(46,900)	(46,900)	-	-	-
Biofuels	-	(49,918)	(49,918)	-	-	-
Visiting Professors	-	(12,839)	(12,839)	-	-	-
UK Intelligence Community (IC) Postdoctoral Research Fellowships	-	(105,000)	(105,000)	-	-	-
RAF Centenary Programme	-	(23,500)	(23,500)	-	-	-
Sir Angus Paton Bequest Fund	-	(2,500)	(2,500)	-	-	-
Computing In Schools	-	(17,121)	(17,121)	-	-	-
Ms Morag Campbell-Nelder	-	(3,148)	(3,148)	-	-	-
History of the Royal Academy of Engineering	-	(40,000)	(40,000)	-	-	-
		(11,240,174)	(11,240,174)	-	7,744,922	7,744,922
Total charitable activities	-(22,979,068)	(22,979,068)		-(20,144,797)	(20,144,797)	

Note 5 - Donations and legacies

Development appeal	500	-	500	4,311	-	4,311
Annual appeal	48,011	-	48,011	61,011	-	61,011
Enterprise Hub capital project	-	408,282	408,282	-	1,186,900	1,186,900
Engineering Talent Project	-	175,000	175,000	-	375,000	375,000
Queen Elizabeth Prize for Engineering	-	1,300,000	1,300,000	-	4,042,408	4,042,408
Other	9,292	-	9,292	108,060	-	108,060
	57,802	1,883,282	1,941,084	173,381	5,604,308	5,777,690

Note 6 - Investment income

Dividends and income from equity investments and fixed interest bonds	906,219	656,034	1,562,253	873,322	506,455	1,379,777
Interest on bank deposits	9,227	6,644	15,871	21,513	9,508	31,021
	915,446	662,678	1,578,124	894,835	515,963	1,410,798

Note 6a - Other income

Sponsorship and events	343,551	-	343,551	277,390	-	277,390
Subscription income	232,580	-	232,580	275,605	-	275,605
Advertising income and merchandising	49,059	-	49,059	50,278	-	50,278
Conferencing business	286,958	-	286,958	1,311,589	-	1,311,589
	912,148	-	912,148	1,914,862	-	1,914,862

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 2017	Total 31 March 2016
	£	£	£	£	£	£	£
Note 7 - Charitable activities							
Unrestricted							
Charitable activities	89,073	-	-	-	-	89,073	68,435
Charitable grants	10,295	-	-	-	-	10,295	54,349
Direct salaries	363,890	-	-	-	-	363,890	335,784
Support costs	910,302	-	-	-	-	910,302	362,716
	1,373,559	-	-	-	-	1,373,559	821,284
Restricted							
Charitable activities	376,526	288,521	2,439,035	500,391	1,307,325	4,911,797	1,558,872
Charitable grants	411,461	263,960	13,091,069	795,737	-	14,562,227	14,710,300
Direct salaries	413,196	667,464	1,124,460	322,218	257,073	2,784,411	2,293,152
Support costs	148,722	147,233	2,010,004	195,315	82,707	2,583,981	2,589,384
	1,349,905	1,367,178	18,664,568	1,813,660	1,647,105	24,842,416	21,151,708
Total charitable activities	2,723,464	1,367,178	18,664,568	1,813,660	1,647,105	26,215,974	21,972,992
Total support costs of £3,494,283 are made up of indirect staff costs totalling £1,394,948 and accommodation costs and overheads totalling £2,099,335.							
2016 Total charitable activities	2,278,443	1,769,648	14,861,740	2,424,867	638,294		21,972,992

	2017 £	2016 £
Note 8 - Other costs		
Auditor's fees:		
- Audit	14,191	40,742
- Other services	-	30,218
Legal and professional fees	26,141	24,990
	40,332	95,950
£5,225 was charged to the Academy in relation to operating leases		

Note 9 - Staff and pensions costs

Gross salaries	3,581,916	3,162,129
Employer's National Insurance less NI Allowance	404,067	349,518
Benefits in kind	28,874	23,198
Pension charge	306,530	286,140
Other costs	747,945	431,441
	5,069,333	4,252,425

Average number of staff in the year by activity:	Number	Number
- Engineering and education	13	7
- Programmes and fellowship	26	31
- Policy and external affairs	14	11
- Executive, development, finance and administration	24	16
- Queen Elizabeth Prize for Engineering Foundation	5	3
	83	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 ten board members in 2016/17 amounting to £14,955 (2015/16 £19,434 - seven members).

	2017	2016
The emoluments of higher paid staff within the following scales were:	Number	Number
£60,000-£70,000	-	-
£70,001-£80,000	1	1
£80,001-£90,000	2	1
£90,001-£100,000	1	1
£100,001-£110,000	-	1
£120,001-£130,000	1	1
£130,001-£140,000	2*	-
£180,000-£190,000	1*	1*

Emoluments include salary, bonuses and benefits in kind but exclude pension scheme contributions. Staff numbers are based on full time equivalent.

The senior management team comprises of a chief executive, deputy chief executive and five directors who manage the day-to-day operations of the charity. Their aggregate remuneration in the year was £1,070,275 (2015-16 £874,933).

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

**One member of staff from each of these payment scales did not benefit from pension scheme contributions.*

Notes to the accounts

Note 9(b) - Pensions

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	Loan finance costs	Total
	£	£	£	£			£
Tangible fixed assets (group and charity)							
Cost							
At 1 April 2016	592,853	180,269	5,310,000	7,291,672	1,043,431	-	14,418,225
Additions	335,216	118,740	7,199,165	6,271,330	(1,043,431)	218,015	13,099,035
At 31 March 2017	928,069	299,009	12,509,165	13,563,002	-	218,015	27,517,260
Depreciation							
At 1 April 2016	(450,618)	(136,916)	(987,751)	(666,654)	-	-	(2,241,939)
Charge for year	(99,908)	(27,936)	(114,892)	(103,171)	-	(3,634)	(349,541)
At 31 March 2017	(550,526)	(164,852)	(1,102,643)	(769,825)	-	(3,634)	(2,591,480)
Net book value							
At 31 March 2017	377,543	134,157	11,406,522	12,793,177	-	214,381	24,925,780
At 31 March 2016	142,234	43,352	4,322,249	6,625,018	1,043,431	-	12,176,284

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.

These medal collections are not held on the balance sheet, 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.

	2017 General fund (Charity)	2017 Designated income funds (Charity)	2017 Total funds (Charity)	2017 Restricted fund (Subsidiary)	2017 Total Portfolio (Group)
Market value at 1 April	22,331,676	1,696,159	24,027,835	16,931,596	40,959,431
Add acquisitions at cost	1,004,852	-	1,004,852	3,768,391	4,773,243
Less: sales proceeds	(2,836,259)	-	(2,836,259)	(944,701)	(3,780,960)
Net investment (losses)/gains for the year	2,259,599	146,325	2,405,924	3,510,186	5,916,110
Market value at 31 March	22,759,868	1,842,484	24,602,352	23,265,472	47,867,824

All investments consist of securities listed on the London Stock Exchange of which fixed interest bonds amount to approximately £2.18 million in value.

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 £	2017 Total £	2016 Total £
Market value at 1 April	37,236,913	3,722,518	40,959,431	37,585,637
Market value at 31 March	45,690,080	2,177,744	47,867,824	40,959,431
Cost at 31 March 2014	27,107,355	3,648,556	30,755,911	25,806,203

Notes to the accounts

	Group		Charity	
	2017	2016	2017	2016
	£	£	£	£
Note 12 - Debtors				
Grants and sponsorship receivable	3,728,908	4,443,096	3,728,908	4,443,096
Prepayments	186,463	103,288	186,463	103,288
Other debtors	889,242	1,795,292	614,286	573,850
Amounts due for subsidiary undertakings	-	-	235,848	471,873
Other taxes and social security costs	97,294	-	97,294	-
	4,901,907	6,341,676	4,862,799	5,592,107
Note 13 - Stocks (Group and Charity)				
Publications, Academy ties, presentation plates and medals	2,309	2,703	2,309	2,703
Note 14a - Creditors (amounts falling due within one year)				
Committed grants and prizes	3,747,736	4,972,950	3,747,736	4,972,950
Deferred income	965,552	801,390	965,552	801,390
Subscriptions in advance	162,167	137,944	162,167	137,944
Other creditors	1,650,958	1,676,669	862,286	1,402,091
Amounts due to subsidiary undertakings	-	-	25,822	15,980
Social security and other costs	3,985	2,813	3,985	2,813
Bank loan	-	120,108	-	120,108
	6,530,398	7,711,874	5,767,548	7,453,276
Note 14b - Deferred income (amounts falling beyond one year)				
Deferred income comprises of advance funding for the provision of the MSc Aerospace Bursary Programme, sponsorship of the Academy Awards ceremony, Connecting Teachers Programme and Research Fellowships.				
Balance at 1 April 2016	801,390		801,390	
Amount released to income earned from charitable activities	(612,471)		(612,471)	
Amount deferred in year	776,632		776,632	
Balance as at 31 March 2017	965,552		965,552	
Note 14b - Creditors (amounts falling beyond one year)				
Bank loan*				
- Due one to two years	-	122,042	-	122,042
- Due within two to five years	-	378,038	-	378,038
- Due after five years	11,500,000	476,317	11,500,000	476,317
	11,500,000	976,397	11,500,000	976,397
*The Academy has a secured loan of £11.5 million with Aviva, the capital sum is repayable in 10 years, an interest rate of 3.11% fixed being applied. The loan is secured against 3 Carlton House Terrace, which was valued at £29.5 million on 7 November 2016. There is currently a 39% loan to value ratio. There is a maximum 45% loan to value ratio set out in the terms of the loan.				
Note 15 - Future commitments				
Total minimum commitments under operating leases				
Maturing between one and five years (equipment)	7,768	13,627	7,768	13,627
	7,768	13,627	7,768	13,627

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 for Business, Energy and Industrial Strategy (BEIS)** 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 (EPSRC).
- **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.
- **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.
- **MSc Aerospace Bursary Programme** for students studying for MSc degrees in aerospace engineering is funded by BEIS and delivered in collaboration with the Royal Aeronautical Society.
- **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.
- **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.
- **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.
- **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.
- **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 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.
- Other awards and contracts are donations and contracts by a number of companies for specific programmes each year.
- **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.
- **Global Challenges Research Fund** is a £1.5 billion UK government fund to support cutting-edge research that addresses the challenges faced by developing countries through collaborative research and innovation, and research and innovation capacity building within both the UK and developing countries.

Notes to the accounts

- **UK Intelligence Community (IC) Postdoctoral Research Fellowships** are offered by the Government Office for Science with the Academy acting as academic engagement partner, support outstanding early career science or engineering researchers to promote unclassified basic research in areas of interest to the intelligence, security and defence community.

(b) Designated funds

- **The Building Maintenance Fund** is used for major items of building repair and redecoration.
- **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 2016	Incoming resources	Resources expended	Transfers between funds	Net investment losses	Balance at 31 March 2017
	£	£	£	£	£	£
Restricted funds						
Government grant	-	11,738,894	(11,738,894)	-	-	-
Sainsbury Management Fellowships	-	290,117	(290,117)	-	-	-
RAEng/EPSRC Research Fellowships	-	87,086	(87,086)	-	-	-
Leverhulme Fellowships	-	284,261	(284,261)	-	-	-
ExxonMobil Fellowships	75,495	-	-	-	-	75,495
Engineering Leadership Scheme	295,462	-	(34,547)	-	-	260,915
Connecting Teachers	208,428	389,785	(389,785)	-	-	208,428
Engineering FE	345,514	39,279	(105,640)	-	-	279,153
MSc Aerospace Bursary Programme	-	486,358	(486,358)	-	-	-
Barrow Engineering Programme	3,814	23,300	(18,014)	-	-	9,100
KS2 STEM Resources & CPD Programme	66,026	-	(47,077)	-	-	18,949
Enterprise Hub	327,629	237,271	(202,292)	-	-	362,608
Africa Prize for Engineering Innovation	55,931	606,134	(604,879)	-	-	57,186
Carlton House Terrace Fund	6,424,033	-	-	(6,271,330)	-	152,703
Ms Morag Campbell-Nelder	433,202	19,081	(15,933)	-	35,472	471,824
Newton Fund	-	4,822,593	(4,822,593)	-	-	-
Enterprise Hub capital project	3,586,900	408,282	-	-	-	3,995,182
Engineering Talent Project	355,137	175,000	(389,912)	-	-	140,225
Industrial Secondment	-	53,654	(53,654)	-	-	-
Lowestoft Engineering Programme	-	48,600	(48,600)	-	-	-
Enriching Engineering Education Programme	-	234,667	(37,450)	-	-	197,217
Sir Angus Paton Bequest Fund	55,648	2,500	(1,500)	-	-	56,648
Hinton Bequest Fund	8,400	-	(3,349)	-	-	5,051
MacRobert Award	1,247,673	85,628	(98,231)	-	110,854	1,345,923
MacFarlane Award	18,038	-	-	-	-	18,038
Other awards and contracts	44,459	-	-	-	-	44,459
Stoke Engineering Programme	-	13,200	(6,174)	-	-	7,026
RAEng/WCE Awards	-	17,809	(17,809)	-	-	-
Executive Engineers Programme	-	3,270	(3,270)	-	-	-

	Balance at 1 April 2016	Incoming resources	Resources expended	Transfers between funds	Net investment losses	Balance at 31 March 2017
	£	£	£	£	£	£
Biomedical Engineering	-	22,000	(22,000)	-	-	-
1851 Royal Commission Enterprise Fellowships	-	194,500	(173,229)	-	-	21,271
Global Challenge Research Fund	-	3,059,363	(3,059,363)	-	-	-
Tier 1 Visa Applications	-	46,900	(46,900)	-	-	-
Biofuels	-	49,918	(49,918)	-	-	-
Visiting Professors	-	12,839	(12,839)	-	-	-
UK Intelligence Community (IC) Postdoctoral Research Fellowships	-	105,000	(3,015)	-	-	101,985
RAF Centenary Programme	-	23,500	(23,500)	-	-	-
Computing In Schools	-	17,121	(17,121)	-	-	-
History of the Royal Academy of Engineering	-	40,000	-	-	-	40,000
Queen Elizabeth Prize for Engineering	21,340,866	1,887,118	(1,810,463)	(142,184)	3,510,186	24,785,524
Total restricted funds	34,892,655	25,525,028	(25,005,773)	(6,413,514)	3,656,512	32,654,908
Designated funds						
Special funds						
- Building Maintenance Fund	205,351	-	(164,147)	-	-	41,204
Total special funds	205,351	-	(164,147)	-	-	41,204
Education Support Designated Fund	26,017	-	-	-	-	26,017
External Education Designated Fund	105,122	-	-	-	-	105,122
Ingenia Designated Fund	6,400	47,507	(47,507)	-	-	6,400
Forum Partnerships Programme Designated Fund	162,047	43,600	(45,000)	-	-	160,647
Total designated and special funds	504,937	91,107	(256,654)	-	-	339,390
General fund	23,067,622	1,794,289	(2,108,560)	6,413,514	2,259,599	31,426,464
Total funds	58,465,214	27,410,424	(27,370,987)	-	5,916,112	64,420,762

The general fund deficit of £314,272 is the difference between incoming resources of £1,794,290 and resources expended of £2,108,562.

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

Notes to the accounts

	Balance at 1 April 2016 £	Incoming resources £	Resources expended £	Transfers between funds £	Net investment losses £	Balance at 31 March 2017 £
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	-	-	-	-	-	-
Petrofac Fellowships	53,253	30,000	(83,253)	-	-	-
Engineering FE	345,514	-	-	-	-	345,514
Engineering Further Education Programme	-	163,511	(163,511)	-	-	-
MSc Aerospace Bursary Programme	-	1,722,688	(1,722,688)	-	-	-
Barrow Engineering Programme	3,814	20,340	(20,340)	-	-	3,814
KS2 STEM Resources & CPD 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)	-	-	-
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	-	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	1,276,463	80,206	(103,440)	-	(5,556)	1,247,673
MacFarlane Award	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

	Balance at 1 April 2016 £	Incoming resources £	Resources expended £	Transfers between funds £	Net investment losses £	Balance at 31 March 2017 £
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	(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.

Note 17 - Analysis of net assets between funds

	Tangible fixed assets £	Investments £	Current assets £	Liabilities £	Total net assets £
Restricted funds	12,793,177	23,265,472	8,584,183	(503,941)	44,138,891
Special and designated funds		1,842,484	339,390	(1,842,484)	339,390
General funds	12,132,605	22,759,868	733,985	(15,683,971)	19,942,486
Total funds	24,925,782	47,867,824	9,657,558	(18,030,397)	64,420,767

Note 18 - 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.

RAE Trading Limited has had significantly reduced income in the 2016/17 financial year while renovation works were carried out in the lower ground floors of Prince Philip House. This has led to RAE Trading Limited making a loss in the 2016/17 financial year. RAE Trading Limited is supported by the Academy and is expected to make a profit in the 2017/18 financial year and is therefore deemed to be a going concern.

The Academy owns all 100 £1 shares in RAE Trading Limited.

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.

Notes to the accounts

At 31 March 2017	RAE Trading Ltd		Queen Elizabeth Prize for Engineering Foundation	
	2017 £	2016 £	2017 £	2016 £
Total incoming resources	492,246	1,517,260	1,887,118	4,486,818
Total resources expended	(557,338)	(1,098,015)	(1,952,647)	(917,973)
	(65,092)	419,245	(65,529)	3,568,845
Total investment (losses)/gains		-	3,510,186	(551,615)
Net funds before gift aid	(65,092)	419,245	3,444,658	3,017,230
Gift aid to Royal Academy of Engineering	-	(419,245)	-	-
Retained net funds for the year	(65,092)	-	3,444,658	3,017,230
The aggregate of the assets, liabilities and funds was:				
Assets	321,283	580,905	25,294,825	21,468,591
Liabilities	(380,577)	(580,805)	(582,421)	(127,723)
Funds	(59,294)	100	24,712,405	21,340,868

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

	Academy	
	2017 £	2016 £
Gross income	25,025,477	23,888,962
Retained net funds for the year	172,960	728,465

Note 19 - 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	-	295,548	142,184	73,321	-
RAE Trading Limited	205,288	-	-	162,527	25,822

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

