On 6 December, the 2017 Queen Elizabeth Prize for Engineering (QEPrize) was presented at a ceremony held at Buckingham Palace. The day also marked the release of the second Create the Future report, an international survey on the perceptions of engineering.

HRH The Prince of Wales presented three of the winners, Eric Fossum, Nobukazu Teranishi and Michael Tompsett, with their prize, while fourth winner George Smith was unable to attend. One of the key aims of the QEPrize is to inspire the next generation of engineers, so attendees included representatives from QEPrize donor companies and leading young engineers from the QEPrize Global Engineering Ambassadors’ network. Ambassadors and High Commissioners from around the world were also in attendance, including His Excellency Mr Koji Tsuruoka, Japanese Ambassador to the United Kingdom, and His Excellency Mr Robert Wood Johnson, United States Ambassador.

Samuel Bentley, winner of the 2017 Create the Future competition, was present to see his design being awarded. This year’s winners were honoured for their combined contribution to the creation of digital image sensors. Their three innovations created over three decades have revolutionised the way that visual information is captured and shared. Digital imaging now enables society to access a vast array of intricately detailed pictures and video, ranging from the minute scale of cell structures to images of far-flung stars and galaxies billions of light years from Earth.

In the afternoon, guests travelled to Guildhall for an afternoon tea hosted by the City of London Corporation. Representing the Lord Mayor, Alderman The Lord Mountevans paid tribute to the winning engineers and highlighted the phenomenal impact of engineering on the world.

The second Create the Future report studies the results from the inaugural international survey in 2015 in more detail. Responses were gathered from more than 10,000 people across 10 global centres for engineering, including the US, Japan, Turkey, India and Brazil. This year’s study examines the changing perceptions of engineering worldwide.

Key findings from this year’s report suggest that engineering is entering a new era, where technology-related innovations are seen to have the greatest impact on our way of life. Artificial intelligence and robotics are hailed as the top modern inventions; however, the public believes that innovations such as the internet and computers have more relevance to their daily lives.

The study also highlighted that engineering is becoming a vessel for progress, with people seeing engineers as being as influential as politicians in solving major world challenges. Overall, the industry is recognised as a respectable, prestigious and highly trusted career choice. However, 8 in 10 respondents agreed that there is an urgent need for more visible, leading female role models. In addition, the study suggested that schools, businesses, governments and institutions are important factors in empowering young people to become the engineers of the future.

The presentation of the prestigious award is a major highlight in the global engineering calendar so it, and the publication of the Create the Future report, received significant interest from the world’s media. News of the presentation reached audiences of 1.7 billion worldwide, including the UK, USA and China. For the first time since its inauguration in 2013, the QEPrize generated significant news coverage across Japanese media, marking a major breakthrough in publicising the prize in East Asia.
At the end of this year, Philip Greenish will be stepping down after 14 years as Chief Executive of the Academy. Philip has been an outstanding Chief Executive and has overseen a sustained period of growth and development for the Academy. I want to thank him on behalf of all Fellows for everything he has done. His contribution has been enormous and it has been a real pleasure and privilege to work with him. In the new year, there will be opportunities for Fellows to show their gratitude and celebrate his achievements.

Over the past six months, members of the appointment committee and I have been involved in the search and selection of our new Chief Executive. In doing so, we have been supported by an executive search agency and I am grateful to all Fellows who suggested names of potential candidates or who expressed an interest in the role themselves. We had an outstanding field of candidates. I am delighted that Deputy CEO Hayaatun Sillem has been appointed. She impressed us all at interview with her vision for the Academy and her clarity about how she would deliver it. Hayaatun’s appointment as Chief Executive will start on 1 January 2018. She has made a huge difference and is well placed to lead it in the years to come. I am sure that you will all join me in wishing Hayaatun well in her new role.

The last few months of Academy activity have put engineering and its impact on an international stage. This was particularly evident at the presentation of the Queen Elizabeth Prize for Engineering at Buckingham Palace. The audience that gathered to see HRH Prince of Wales award the trophy to the winners included diplomatic ambassadors from across the world and members of the QEPrize Global Engineering Ambassadors’ network. Such a prestigious event attracted worldwide media coverage, including Japanese media for the first time. The presentation was accompanied by the publication of Create the Future, a global survey of perceptions of engineering, which found that the diverse nature of current global challenges means that engineering is now regarded as being more important to the world than ever before. Engineers themselves are trusted to help meet those challenges: 87% say they trust engineering businesses to make the world a better place, and a similar percentage feel engineering is a valuable industry for the economy.

I was also pleased to attend the International Council of Academies of Engineering and Technological Sciences (CAETS) meetings and conference in Madrid in November. It was great to see that the theme of Engineering a Better World, introduced by the Academy when it hosted the 2016 CAETS convocation, was adopted for this conference and will also be the theme of the next two meetings in Uruguay and Sweden. The legacy of the Academy’s CAETS presidency was also apparent in the range of academies that are interested in collaboration on international development. At the Madrid meeting, the Academy presented on diversity and inclusion and shared the Diversity and Inclusion Progression Framework as a tool that other academies could use. I hope that this Academy initiative will have beneficial impact on the valuable work already being done across multiple national academies. I was particularly pleased that the Academy’s own progress on diversity and inclusion has been recognised recently; it won an award at the Excellence in Diversity Awards for its What’s it like? video series that profiles LGBT engineers, created in collaboration with InterEngineering and Mott MacDonald, and was also announced as one of the top 50 inclusive employers in the UK.

In the autumn newsletter, I touched on engineering’s role in enabling growth and highlighted that this had been recognised by the government through its investment in science and innovation. I was therefore pleased that the Autumn Budget reinforced this commitment with announcements about research and innovation, industry and technical education, including implementation of T levels, which the Academy is supporting by providing independent advice on content. We are also in discussions with the Department for Business, Energy and Industrial Strategy regarding further investment in talented engineering researchers over the next 10 years. The Budget addressed some of the key issues that will help to secure the UK’s prosperity in the future, and the publication of the industrial strategy White Paper shortly afterwards further cements the government’s assurance to support industry and the UK’s thriving startup sector. Engineering is a vital part of this country’s economy, and these actions represent an important step towards positioning the UK as an outward-looking, leading trading nation.

As 2017 ends, the Academy has much to look forward to in the coming year. In January, we launch This is Engineering, a major digital campaign to rebrand engineering for young people and their teachers and parents. The campaign will highlight the variety, creativity and problem-solving to be found in engineering, and aims to encourage young people to pursue a career in the profession. This is a campaign that has been professionally created to appeal to young people, with several organisations pooling resources and providing content that all can use to attract the next generation of talent. It will be supported by work on public policy and workplace cultures that will address barriers to increasing take up of engineering careers.

The launch of This is Engineering in timed to coincide with, and support, the government-led initiative to make 2018 the Year of Engineering. The government has called on engineering organisations and engineers to use this opportunity to help raise the visibility of engineering and the opportunities a career in engineering provides. The Academy is an active partner in the Year and I would encourage Fellows to get involved.

Those future engineers might, years from now, find themselves supported by the Enterprise Hub, which celebrates its fifth anniversary in 2018. Over this time, the Hub has supported more than 70 early-career researchers and entrepreneurs, and around 90% of the companies they started are still going strong. This success is undoubtedly worth celebrating and plans to do so will be announced soon.

As we look forward to supporting and inspiring more current and future innovators, I would like to wish you all a Merry Christmas and Happy New Year and look forward to seeing many of you at the Fellows’ Day on 8 February.

Meetings and visitors

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

- Lord Prior for discussion on industrial strategy
- Lord Adair Turner for high-level discussion meeting on a fresh case for investment in research and innovation

She attended the following events and meetings:

- Gala dinner Brazilian Chamber of Commerce
- BEIS Innovation roundtable
- IET President’s Address
- Visit to Northumbria University for opening of the STEM facilities and dinner
- North East Fellows Dinner at Teeside University
- Engineering the Future industrial strategy meeting
- High level stakeholder group on EU Exit
- Talking heads recording for the SS Great Britain Trust
- POWERful Women Ministerial dinner with Claire Perry
- ICE President’s address
- CAETS Annual Convocation in Madrid
- CAETS Executive Committee and Council Meetings
- Radio interviews with the Today Programme on Radio 4, Radio 5 Live and Radio Wales regarding the skills and diversity/inclusion agenda
New Fellows’ Dinner

On 18 October, 50 new Fellows were formally welcomed into the Academy.

During the afternoon, the new Fellows were invited to Prince Philip House to hear from the Academy’s President about Fellows’ role in leading the Academy’s work through key engineering challenges. The new Fellows also heard from some of their counterparts, who told their own stories and highlighted their engineering successes.

After the briefing, new Fellows were officially inducted during a short ceremony and dinner held at Drapers’ Hall in London. The new Fellows were addressed by the President, who spoke of the progress made “towards a more diverse Fellowship reflecting a more diverse profession”. She explained that “we have become an Academy with impact and influence”, providing leadership to the profession and growing “a vibrant programme of work that reaches across the UK, and beyond”.

The evening concluded with a speech by new Fellow Dr Caroline Hargrove FREng, Technical Director of McLaren Applied Technologies. Dr Hargrove spoke of the exciting times that we are living in, with technological advances in the internet, smart sensors, robotic surgery and artificial intelligence. She called upon Fellows to embrace this moment in time and set themselves the target of being ambitious and bold.

Dr Hargrove proposed that they champion a ‘grand challenge’ and bring together multidisciplinary teams from both academia and industry to tackle it at scale.

Africa Prize shortlist announced

On 16 November, the 2018 shortlist for the Africa Prize for Engineering Innovation was announced in Cape Town, South Africa, during Global Entrepreneurship Week.

The shortlist recognises the most talented engineering entrepreneurs from across sub-Saharan Africa, including innovators working to make malaria and reproductive health tests easier, engineers who are using dolphin-inspired echo-location for visually impaired people, and researchers who are recovering precious metals from car parts for re-use in manufacturing.

This shortlist represents the fourth group of engineers supported through the Africa Prize, and features 16 entrepreneurs from Cameroon, Ghana, Kenya, Nigeria, Rwanda, South Africa and Uganda. After six months of mentoring and training, four finalists will be selected from the shortlist. In June 2018, the finalists will present their businesses to judges and a live audience, after which one winner will receive £25,000, and three runners up will be awarded £10,000 each.

The Africa Prize was launched in 2014, and is a six-month programme that provides funding, comprehensive business training, bespoke mentoring and access to a network of high-profile, experienced engineers and business development experts. It is funded by the Global Challenges Research Fund and the Shell Centenary Scholarship Fund. The Africa Prize would like to thank the Fellows who offer their time as mentors, particularly Malcolm Brinded CBE FREng and Dr John Lazar CBE FREng, who sit on the judging panel.

For more information on this shortlist and alumni, please visit www.raeng.org.uk/africaprize
In September, the Academy partnered with Disney for a second time at New Scientist Live to present a stand demonstrating ‘Engineering inspired by Star Wars’.

Held at ExCel London, the four-day festival saw over 30,000 visitors enjoy talks and demonstrations about the world’s most innovative science and engineering.

The Academy’s stand showcased how engineering innovation is moving closer to the fictional world of Star Wars. Visitors could take part in a range of interactive activities, including fighting Stormtroopers in an immersive virtual reality game and building and racing droids with LittleBits electronic blocks.

Professor Matt Dickinson from the University of Central Lancashire demonstrated the technology behind thought-controlled prosthetics with a robotic arm inspired by Luke Skywalker and a helmet that let users pinpoint movement using audio signals from ultrasonic direction sensors.

Guests also explored state-of-the-art ultrasound technologies with Professor Sriram Subramanian and his team from the University of Sussex and spin-out company Ultrahaptics. By taking part in a ‘haptic challenge’, visitors were tasked with identifying invisible shapes created in mid-air using ultrasound and could try their hand at small-scale levitation.

Several Academy Fellows gave talks at the event including: Dr Demis Hassabis FREng, Co-founder and CEO of DeepMind; digital security guru Professor Angela Sasse FREng; and materials science expert Professor Mark Miodownik FREng. The Academy’s Enterprise Hub was also well represented with stalls from Hub members Bento Lab, Gravity Sketch and doppel.

To celebrate the crucial role of technicians, the Academy partnered with the Gatsby Foundation, BCS – The Chartered Institute for IT and the Science Council on the Technicians Make It Happen stand, where engineering technicians shared stories about the incredible work they have been part of.

Top: A school group meets a droid built by UK R2-D2 Builders
Centre: Visitors try out a haptic game from the University of Sussex's Ultrahaptics team
Bottom: The virtual reality Star Wars game was the stand’s star attraction
Manchester Science Festival

In October, the Academy took part in Manchester Science Festival for the first time, hosting an event titled *What’s engineering got to do with it?*

The event was hosted on the Platform for Investigation, a space in the programme for scientists, researchers and STEM professionals to demonstrate their work and research to the public through participatory experiences.

*What’s engineering got to do with it?* had almost 1,300 visitors, both adults and children, interacting with a variety of engineering activities. Visitors could extract DNA from strawberries with Enterprise Hub member Bento Lab, and turn their voice into a musical instrument with a smart microphone from Vochlea Music, also a Hub member.

A team from the University of Bristol’s Quantum Engineering Technology Labs showed visitors how encryption works with an interactive demonstration. Visitors were also able to build structures with electronic circuits using conductive building blocks from Brixo Toys.

Battle of Ideas

In October, the Academy sponsored a debate titled *From AI to Big Data: can technology save the NHS?* at the Battle of Ideas, a weekend of debates held at the Barbican in London about the key issues of our time.

The panel discussed whether engineering technology and innovation can help to deliver new approaches to healthcare and was chaired by Martyn Perks, a consultant and technology writer. The panel consisted of healthcare professionals including Professor Mark Tooley FREng, Honorary Consultant Clinical Scientist at Royal United Hospitals Bath, Dr Isabel Van De Keere, CEO and Founder of Immersive Rehab, and journalist and broadcaster Timandra Harkness.

The debate attracted an engaged audience who debated and discussed how engineering principles and systems, such as machine learning, smartphone health apps, virtual reality and artificial intelligence, could revolutionise healthcare in the coming decades. There was also discussion about the potential issues these approaches may raise, from personal data privacy concerns to public backlash against artificial intelligence.

Autumn Lecture

On 4 October, Roma Agrawal, Associate Director at AECOM and winner of the Academy’s 2017 Rooke Award for promotion of engineering, delivered this year’s Autumn Lecture in conversation with Professor Mark Miodownik FREng.

The discussion focused on the future of engineering and the importance of engaging the wider world with the sector.

The audience, which included many students, heard about the challenges that Roma had faced trying to get TV editors interested in engineering stories, the years of perseverance it took to achieve this, and the logistics of balancing a full-time engineering job with public engagement work.

Roma and Professor Miodownik also discussed subject specialism and whether the UK’s educational system means students rule themselves out of engineering careers too early. Roma recalled her own studies in India and highlighted how a broader curriculum might help students make more informed career decisions, especially if it enabled them to study subjects such as maths for longer.

The conversation also touched on the importance of boosting diversity in the sector and the impact that new materials, automation and 3D printing will have on engineering.
Selfies, space and surgery at the Science Museum

On 7 December, QEPrize winners Eric Fossum, Nobukazu Teranishi and Michael Tompsett took part in an exciting, live conversation at the Science Museum for 120 secondary school students from across the UK.

Recognised for creating digital image sensors, the winning engineers have not only made the digital camera and modern smartphone a reality, but have helped us to explore new worlds, from the depths of space to inside the human body.

The conversation was hosted by BBC Click presenter LJ Rich, who told the story of the digital image sensor and how its invention has helped to shape the world. The winners were joined on stage by Professor Alison Noble OBE FREng FRS, from the Institute of Biomedical Engineering, and Vinita Marwaha Madill, a Space Operations Engineer at the European Space Agency, who shared how image sensors have revolutionised the way they work.

After a potted history of digital imaging sensors, students were invited to ask their own questions, quizzing some of the world’s leading engineers on everything from the discovery of the selfie to the future of imaging.

To watch the event, please visit youtube.com/queenelizabethprize

In conversation with Raspberry Pi

On 14 November, Dr Eben Upton CBE FREng and Pete Lomas, co-founders of the Raspberry Pi, which won the 2017 MacRobert Award, gave a talk at Prince Philip House.

Raspberry Pi is a small microcomputer that has revolutionised control systems and redefined how people engage with coding. Dr Upton and Pete Lomas discussed how the company has developed since it was conceived as a way of boosting computer science applications to the University of Cambridge. The talk focused on the challenges of launching new technology, including the balance between engineering, entrepreneurship and corporate responsibilities, and also discussed what is next for Raspberry Pi.

The event was introduced by Dr Dame Sue Ion DBE FREng FRS, Chair of the MacRobert Award judging panel, and chaired by science journalist Dr Anjana Ahuja. It was supported by the MacRobert Trust and the Worshipful Company of Engineers.

Known for spotting the ‘next big thing’, the MacRobert Award is presented to the engineers behind the UK’s most exciting engineering innovation. As well as gaining from the prestige of the award, the winners receive a gold medal and a £50,000 prize.

Applications for the 2018 MacRobert Award are now open. For further information, please visit www.raeng.org.uk/prizes/macrobert or email macrobert@raeng.org.uk

Closing date: 31 January 2018.

Academy discusses role of research and innovation in growth at party conferences

During the political party conference season, the Academy, alongside the other National Academies, hosted breakfast roundtable meetings at each of the UK’s major political party conferences.

The meetings explored how the research, innovation and business communities can work with government to deliver growth and prosperity for the UK. Academy Fellows and grant holders were joined by parliamentarians and representatives from industry, academia, charities, and the wider research and development (R&D) community to discuss ways to meet cross-party ambitions to invest at least 3% of GDP in UK R&D.

Richard Maudslay CBE FREng spoke for the academies at the Conservative Party Conference event, discussing current levels of public and private investment in R&D. Jo Johnson MP, Science Minister, heard that people, funding and regional development must be prioritised, and current international perceptions must be addressed if the UK is to remain a global force in research and innovation.

Dr Rob Oldfield, an Enterprise Fellow, shared his experiences of creating a spin-out company Salsa Sound, which develops technologies to enhance viewers’ experience of sports broadcast. In particular, Dr Oldfield highlighted the University of Salford’s ‘industrial collaboration zones’, which build closer links between academia and industry, as critical to Salsa Sound’s success.
View from the top

On 10 October, David Pitchforth, President of BDS Global Operations and Managing Director at Boeing Defence UK, gave the Academy’s View from the top lecture.

Over 120 guests attended the second of this year’s lecture series, entitled Engineering the UK’s future success. David Pitchforth used the lecture to explore how engineering acuity is often more important than business acumen. He emphasised Boeing’s focus on continuing its investment in the UK, and its support for cutting-edge research and development of the engineering skills pipeline. He stated that one of the challenges that Boeing faces is thinking ahead to the next 50 years and the chief engineer that will be required then.

The lecture attracted a record number of students and those studying aerodynamics asked many engaging questions during the Q&A session.

Ingenia live!

On 26 September, Ingenia live! returned for its fourth year, discussing the theme of Engineering the past and shaping the future.

Three specialist speakers shared case studies of using CT-scanning technology to delve into the past. Professor Sarah Hainsworth FREng, Pro-Vice Chancellor and Executive Dean of the School of Engineering and Applied Science at Aston University, discussed how the technology helped discover how Richard III died and demonstrated the extent of the wounds to his skull by giving the audience 3D glasses to view a specially created image.

A 3D-printed scale model of a megalosaurus jaw bone, presented by Professor Mark Williams, Project Evaluation Technologies Group Leader of the Warwick Manufacturing Group at the University of Warwick, was circulated through the audience. Scanning technologies recently discovered that the dinosaur had more teeth than originally thought.

David Mearns, a chartered marine scientist, historical researcher and expedition leader of deep ocean projects, spoke about how the technology had helped to recently confirm that an astrolabe found at the shipwreck of the Esmerelda was the oldest known discovery of a marine navigation tool.

The event concluded with a Q&A session chaired by Dr Scott Steedman CBE FREng, Editor-in-Chief of Ingenia magazine.

Hinton Lecture 2017

On 21 November, Vincent de Rivaz CBE FREng, former CEO of EDF Energy, was joined by over 100 guests at the Academy’s flagship Hinton Lecture, as he reflected on a career spanning four decades at the forefront of the energy sector.

His talk explored the changing face of the UK’s energy market and what’s next for the industry, such as how we can embrace a lower carbon future and encourage the next generation of engineers.

The lecture was chaired by the Academy’s President, and was attended by Fellows, representatives from academia and industry, and members of the public.

You can watch the Hinton Lecture at http://raeng.tv
Research and innovation

Research Chair: awardee profile

Professor Rebecca Lunn MBE from the University of Strathclyde has taken up the post of BAM Nuttall/RAEng Research Chair in Biomineral Technologies for Ground Engineering. This is a five-year post that will examine and scale-up the application of bacteria to solidify soil to reduce the use of cements in construction, and unlock low-carbon alternatives for industry.

The microbially induced calcite precipitation (MICP) process uses naturally-occurring bacteria and urea solutions injected into soil to change its properties, making the soil stronger and more stable. Bacteria precipitate calcite is a hard mineral that binds together particles in the soil, turning loose soil into an intact rock. This technology can be used to build and repair infrastructure, minimising carbon-intensive use of cement.

Professor Lunn’s research, which extends her well-established partnership with BAM Nuttall, will look at how to develop the technology into a full commercial solution. To build confidence in the industry, she will examine ways to create a sufficiently homogenous and hard material by deploying the technology at a site scale, and will subsequently excavate and test the resulting soils/rocks.

The five-year Research Chair posts are co-sponsored by industry to support academics in UK universities who are undertaking use-inspired research with industrial partners. The next deadline for applications is 4pm on Tuesday 6 March. For further information, please see www.raeng.org.uk/researchchairs or contact lucy.wheeler@raeng.org.uk

Academy conference in South Africa

In early October, the Academy and the South African Department of Higher Education and Training co-hosted a two-day conference in South Africa, which showcased ongoing projects and aimed to develop ideas for collaboration in education and research capacity building in the country.

Three of the Academy’s international programmes took part in the conference. The programmes are funded by the government’s Newton Fund, Global Challenges Research Fund (GCRF) and the Anglo American Group Foundation. They all aim to build capacity in higher education, research and innovation, and to encourage collaborations between institutions in the UK and South Africa or sub-Saharan Africa to promote economic and social development.

Throughout the conference, awardees from the Academy’s Industry-Academia Partnerships programme, GCRF Africa Catalyst, and Higher Education Partnerships in sub-Saharan Africa convened to present their project achievements, share lessons learnt and to seed collaboration. The event showcased the improvements within engineering education and research capacity. It also enabled work towards international accreditation and celebrated how the Academy’s programmes are helping to strengthen the professional engineering institutions and partnerships between industry and academia.

The conference was co-chaired by Professor Ken Grattan FREng, a professor of scientific instrumentation at City, University of London, on the first day, and Dr Allyson Lawless FREng, Managing Director of the South African Institution of Civil Engineering, on the second day. The event was supported by the British High Commission in South Africa, which was represented by Deputy High Commissioner Ben Llewellyn.

Delegates at the event in South Africa

Professor Rebecca Lunn MBE is conducting research into using bacteria to solidify soil for use in construction
Frontiers of Engineering for Development symposium: Pretoria

In early December, the fourth symposium of the GCRF Frontiers of Engineering for Development programme took place at the Sheraton Hotel in Pretoria, South Africa.

The event saw 60 early- to mid-career engineers from across the world come together to build new interdisciplinary, collaborative partnerships and discuss themes of data, agriculture and the knowledge economy in the context of international development.

At the end of the event, groups of two or more participants collaborated to write applications for follow-up seed funding between £15,000 and £30,000 to help kick-start a new interdisciplinary project. Successful awards will be announced in early 2018.

The event was co-chaired by Distinguished Professor Umezuruike Linus Opara, President of the Pan-African Society for Agricultural Engineering, and Dr Prasad Ram, Founder and CEO of education platform, Gooru.

For the announcements, more information about the programme, or to nominate someone to attend a future symposium, please visit www.raeng.org.uk/FoE-for-Dev

UK IC Postdoc Research Fellowships

The first four UK Intelligence Community (IC) Postdoctoral Research Fellows, awarded in July 2017, began their two-year Fellowships in November and December.

The awardees are: Dr Fabio Alessio Vittoria, University College London; Dr James Robinson, University College London; Dr Jonathan Silver, City, University of London; and Dr David Haynes, City, University of London.

The UK IC Postdoctoral Research Fellowships programme promotes unclassified basic research in areas of interest to the intelligence, security and defence community. Since 2015, the UK programme has partnered with the US to identify common research needs and collaborate with US and UK academia, promoting research that supports new capabilities while building an international science and technology research community. The UK Fellowships, offered by the Government Office for Science and curated by the Academy, are aimed at outstanding early-career science and engineering researchers.

The next call for applications will open in February 2018. For more information, visit www.raeng.org.uk/ic-postdoc

Industrial Fellowship scheme

In September, 10 awardees of the Industrial Fellowship scheme began their research projects. The awardees are:

- Indika Dinesh Bandara Pamunuwa, University of Bristol/ Microsemi Semiconductor Ltd: Nanoelectromechanical relay-based electronics
- Birgit Painter, De Montfort University/ Pick Everard: Integrated building performance evaluation: practical assessment of management tools
- Christie Maddock, University of Strathclyde/ Orbital Access Ltd: Preliminary design of a UK small satellite launch system
- Mehrnoosh Sadrzadeh, Queen Mary University of London/ British Broadcasting Corporation Research and Development: Vectors and tensors for textual understanding of subtitles and news
- Zhenyu Zhang, University of Birmingham/ DuPont Teijin Films: Nanotechnology enabled polyester film production
- Dimitrios Gerogiorgis, University of Edinburgh/ Molson Coors Brewing Company Ltd: Data analytics for high-performance multiobjective beer fermentation and filtration optimisation
- Kevin Briggs, University of Bath/ Network Rail: Industrial Fellowship in railway infrastructure resilience
- Robert William Hewson, Imperial College London/ Airbus: Design optimisation of 3D printed hierarchical structures
- Abby Megan Jayne Paterson, Loughborough University: Industrial Fellowship researching quality of additive manufactured parts and services
- James Ernest Green, University of Sheffield/ Controlled Power Technologies Ltd: Advanced electronic instrumentation systems for electric vehicle motors and generators

The Industrial Fellowships scheme provides an invaluable opportunity for early- to mid-career academics to undertake a collaborative research project in an industrial environment. This scheme aims to strengthen the strategic relationship between the university and the industry host by providing an opportunity to establish or enhance collaborative research between the two parties. For more information, visit www.raeng.org.uk/ifs
Enterprise Hub’s Launchpad Competition winner announced

On 28 September, the Launchpad Competition final, which enables budding engineering entrepreneurs to start a business based on their engineering innovation, took place at Prince Philip House.

The competition was won by Nick Schweitzer, who was chosen by a panel of judges composed of the UK’s most successful engineering and technology business leaders. The 25-year-old won with his web-tracking and machine-learning technology that aims to help businesses become more innovative. His technology offers novel solutions to business problems, using the internet as its source of inspiration. It identifies what the future of an industry should be, helping business innovation succeed where it currently fails.

The current methods used by agencies to identify client problems and solutions – ranging from desk research to face-to-face interviews – are often slow and, if carried out incorrectly, prone to error. Nick’s technology brings creative intelligence to bear on these processes, establishing a new way to bring about positive change by combining existing business intelligence and best practice. Nick Schweitzer was awarded a £15,000 cash prize, and will be invited to join the Enterprise Hub at the Academy.

Membership of the Enterprise Hub provides access to mentoring from the Academy’s prestigious Fellowship, and training and networking opportunities to help entrepreneurs build the skills and contacts crucial to success.

A separate People’s Choice Award was presented following an audience vote and online voting in the run up to the event. It was won by Brittany Harris for her technology Qualis Flow, a remote-sensing and data-management tool to help users to manage their resources more sustainably.

For more information about the Enterprise Hub, visit enterprisehub.raeng.org.uk

Academy staff member receives CIWEM award

Louise Olofsson, GCRF Programme Manager in the Academy’s international team, has received the Chartered Institution of Water and Environmental Management (CIWEM) President’s Award, which is given to someone who has made a significant contribution to the water and environmental management profession.

Louise received the award for her management of the Academy’s GCRF Africa Catalyst programme and working in collaboration to help meet the UN’s Sustainable Development Goals. Bruce Keith, Past President of CIWEM, described Louise as demonstrating partnership working in both ‘spirit and endeavour’, and commended her for championing the GCRF Africa Catalyst programme and inspiring others.

Education and skills

How does the Institute for Apprenticeships plan to deliver on its promise?

On 27 October, the Academy hosted education charity the Edge Foundation’s annual lecture, which asked: how does the Institute for Apprenticeships plan to deliver on its promise?

Attendees heard from Toby Peyton-Jones, who is an Institute for Apprenticeships board member, an Edge Foundation trustee and HR Director at Siemens. Toby highlighted that apprentices can be better equipped with the speed and adaptability needed for the 21st century workplace.

Alice Barnard, CEO of the Edge Foundation, chaired a panel discussion between Dexter Hutchings, a digital marketing apprentice at the Edge Foundation, Sanna Shabir, a civil engineering technician apprentice at Atkins, Rebecca Plant from training provider QA Apprenticeships and Richard Folkson who started his career at Ford’s apprentice training school before becoming the company’s chief engineer.

L-R: Lord Baker, Chair of the Edge Foundation, with Alice Barnard, CEO of the Edge Foundation, and Academy Chief Executive Philip Greenish CBE at the event
On the weekend of 30 September, the annual networking event for the Engineering Leaders Scholarships (ELS) was held at Conference Aston, Birmingham. Around 90 of the scheme’s current awardees attended, and undertook training activities to enhance their leadership skills, networked with other awardees, and met and built relationships with scheme alumni, Academy Fellows and Sainsbury Management Fellows.

Professor John Nolan, current President of the Construction Industry Council and a Past President of the Institution of Structural Engineers, gave a pre-dinner speech on the Saturday.

Applications for the current round of scholarships are open. Please encourage any engineering undergraduates you know who are likely to be engineering leaders and role models in the future to apply.

For further information, please contact Jacqueline Clay at els@raeng.org.uk

Connecting STEM Teachers training days

In October, the Academy held two training days for teacher coordinators (TCs) from its Connecting STEM Teachers programme.

The autumn term training days held at the Academy prepared TCs for the year ahead through a variety of presentations and practical activities. After a brief introduction that outlined the programme plan to work closely with the Academy’s engineering partners, TCs were introduced to the Academy’s latest STEM learning resource – Mission to Mars. The resource brings the engineering challenges of space exploration to the classroom through a series of fun exercises.

Vinita Marwaha Madill, an engineer who has worked for NASA and is currently based at the European Space Agency working on future human spaceflight projects, gave a talk on why she is an advocate of women in engineering. She shared her journey to her current role of space operations engineer, and discussed how she developed a passion for human spaceflight and exploration. Robotics and coding are increasingly relevant in schools, so TCs also participated in a robot-building, programming and driving tournament delivered by fellow TC Michael Nelson.

The new Engineering in the Movies STEM learning resource was also introduced at the event. It is a thematic educational resource that explores the creative and practical side of STEM in the film industry, and emphasises the important role that engineers play in making films.

It features 12 problem-solving projects to give students from both primary and secondary schools the opportunity to develop their reasoning skills and work together in teams.

The resource will be available to download in December from www.raeng.org.uk/education/schools/teaching-and-learning-resources

Tomorrow’s Engineers Week posters

The Academy created a set of posters for schools that illustrate the amazing breadth and depth of engineering to celebrate Tomorrow’s Engineers Week 2017, which took place between 6 to 10 November.

The new series of posters, titled Engineering in the real world, builds on the success of the Academy’s previous Engineering is... posters and aims to inspire pupils to consider careers in the field. They showcase how engineering is involved in all school subjects, from English to art and PE.

Five hundred posters were printed and sent to schools around the UK, with further digital copies available on the website.
Thought leadership

Future of work

In November, the Academy hosted two roundtable events to discuss the future of work, chaired by Dr John Lazar CBE FREng.

The topic has received a lot of recent media attention sparked by fears of job losses due to technological advances. The workshops brought together representatives from industry, including startups and multinationals, academics, learned societies and policymakers to discuss the technological, social and economic impact. They included presentations from a range of perspectives and a lively discussion ensued.

It was agreed that the social changes would be significant and impossible to predict accurately. However, it was expected that in the medium term there would mainly be automation of tasks rather than jobs. Concerns were raised about how technology could increase social inequality, and the difficulties in balancing the implementation of automated processes to increase productivity while considering impacts on the workforce. Reskilling and global regulation were deemed necessary for widespread technological adoption to be successful.

AFBE-UK Awards Dinner

On 2 November 2017, the Association for Black and Minority Ethnic Engineers (AFBE-UK) held its 10th Anniversary Gala Dinner and Awards at the Institution of Engineering and Technology in London to celebrate its impact on the engineering landscape, and recognise the achievements of black, Asian and minority ethnic engineers.

The Academy works with AFBE-UK through its diversity and inclusion programme and sponsored the Company Recognition Award category.

Allan Cook CBE FREng presented the award to UK Power Networks (UKPN) in recognition of the work it has done to promote diversity and inclusion.

This includes integrating diversity and inclusion into organisational strategy, and actively supporting schemes and programmes to encourage more underrepresented groups, including women, ethnic minorities and those from socioeconomically disadvantaged backgrounds, into more senior roles.

According to UKPN, developing a culture in which all employees feel valued and engaged is critical to its continued success and in consistently delivering the best performance. As part of its Everyone Matters strategy, UKPN has signed up to the EY National Equality Standard, signalling its commitment to diversity and inclusion.

Science+ energy policy meeting

In early October the first Science+ meeting was held at the Royal Society on the subject of Decarbonising UK energy: effective technology and policy options for achieving a zero-carbon future.

The three-day event covered all aspects of energy policy and featured presentations from a number of Fellows. Professor Ric Parker CBE FREng chaired two sessions: one on energy systems that included talks by Professor John Loughhead OBE FREng and David Eyton FREng; and one on heating, cooling and industrial processes that featured talks by Nick Winser FREng and Professor Mike Kelly FREng FRS.

Julia King, Baroness Brown of Cambridge DBE FREng, chaired a session on transport and Dr Dame Sue Ion DBE FREng FRS also gave a presentation on nuclear energy.

The meeting was a great success and it is hoped that it will be the first of a series of such collaborations by the academies. The meetings are intended to address multidisciplinary issues that require the partnership of multiple national academies, in this case, the Royal Society, the British Academy and the Academy.

Inquiries and consultations

Over the autumn there have been responses to several inquiries including: the House of Commons Select Committee joint inquiry on air quality; the House of Commons Science and Technology Committee inquiry on the science budget and industrial strategy; HM Treasury’s financing growth in innovative firms consultation; and an Engineering the Future response to Dame Judith Hackitt FREng’s independent review on building regulations and fire safety.

The Academy also contributed to the Academy of Medical Sciences’ response to the Health Committee’s Brexit – medicines, medical devices and substances of human origin inquiry. Additionally, the Academy was called to give oral evidence for two inquiries. Professor Mark Tooley FREng gave evidence to the Lord’s Science and Technology Committee inquiry on life sciences and the industrial strategy and Professor Nick Jennings CB FREng gave evidence to the Lord’s Select Committee on artificial intelligence.
Engineering Engagement Programme

This autumn, 200 students have taken part in Engineering Engagement Programme (EEP) events, at the Academy, Amey in Birmingham, CH2M in London and Siemens in Northampton.

The EEP aims to encourage the transition of diverse engineering graduates into engineering employment to contribute to addressing the engineering skills gap. It brings female, ethnic minority and socially disadvantaged engineering students (with a focus on the newer universities established after 1992) to the attention of engineering employers through a series of events and follow-up activities.

The EEP is in the final year of a three-year pilot and it is anticipated that it will continue after the pilot concludes at the end of March 2018. Over the first two years, around 300 students took part in the employer-led events.

A group of 13 engineering employers and SEO London have taken part in the programme. Feedback suggests that the pilot is having a positive impact on both employers and students. A student who attended the Amey event said that it "opened my eyes to the opportunities in the engineering industry and truly made me feel that the firms present want to see me succeed and support me in the future”.

Fiona Tabraham, Lead Capability and Development Manager at Network Rail, described it as a “fabulous opportunity to not only meet lots of great potential talent in engineering but also to network with other organisations and learn from them”.

For more information on EEP, please visit www.raeng.org.uk/eep

MEbioeng/MPEC 2017

On 13 September, the Academy hosted two sessions at the MEbioeng/MPEC 2017 conference, which brought together engineers and physicists from across academia, industry and the NHS.

The first of the Academy’s sessions was a panel discussion about influencing decision-makers that explored how biomedical engineering researchers can interact with and influence policy decisions. With panelists from the Institution of Mechanical Engineers, the Department for Business, Energy and Industrial Strategy, the Medicines and Healthcare Products Regulatory Agency, and the Association of British Healthcare Industries, the panel generated a lively discussion, particularly on how regulation can support innovation in the sector.

The second session focused on entrepreneurship with speakers from across academia and industry and at different career stages, including a member of the Academy’s Enterprise Hub. The speakers presented their unique perspectives on what it takes to be a biomedical engineering entrepreneur, including the opportunities and challenges presented by this career route.

Engineering better care

At the end of September, the Academy published its Engineering better care report, the product of a joint project between the Academy, the Academy of Medical Sciences, and the Royal College of Physicians.

The work explores how a systems engineering approach could be applied to health and social care. Co-produced by engineers, clinicians, and health and care leaders, it presents a new framework to support healthcare design and improvement.

The framework systematically considers people, systems, design and risk perspectives, and is designed to support the development of healthcare systems that better meet the needs of patients, carers and NHS staff.

Members of the working group are now beginning work with partners to test and implement the approach in practice, and build an evidence base for the effectiveness of this systems approach in health and care.

The Royal College of Physicians is integrating the concepts of the work into its new Quality Improvement Hub that will take forward its vision of the hospital of the future. Discussions are also underway to embed systems experts in Addenbrooke’s Hospital to work on improvement programmes.

A copy of the report can be downloaded at www.raeng.org.uk/engineeringbettercare

Thought leadership
Gender equality in engineering

New research, published in October, shows that women engineers are still underrepresented in senior academic engineering posts.

The Athena Swan Survey looked at experiences surrounding gender equality in engineering, and their intersections with ethnicity and disability. It was a follow-up to the report published in spring 2017.

The research, delivered by the Equality Challenge Unit (ECU) with funding from the Academy and other professional bodies, confirmed ongoing disadvantages for women engineers in academia, with women underrepresented in senior posts and less likely to be invited to apply for promotion.

The research draws on findings from a survey of academics working across science, engineering and technology disciplines with a focus on biosciences and medicine, engineering, and physical sciences.

It found that, across all three disciplines, women experience consistent disadvantages in multiple aspects of their working lives. For engineering, specifically, it showed that:

- Women are underrepresented in senior positions and overrepresented in early-career posts.
- The largest gender gap reported was in engineering, where 7.5% of women had gained their current position via formal promotion compared with 15.6% of men.
- Men were also more likely to say that they had been invited or encouraged to apply for promotion – 55.1% of women compared with 60% of men.

Greenhouse gas removal

In partnership with the Royal Society, the Academy has been invited by the Department for Business, Energy and Industrial Strategy to evaluate potential methods for greenhouse gas removal in the UK.

Current global warming models demonstrate that the UK cannot meet the targets set out in the Paris agreement without the help of negative emissions technologies that remove greenhouse gases from the atmosphere. The government recognised this need in its Clean Growth Strategy published on 12 October.

While the Academy primarily supports the reduction in carbon emissions, it may be too late to rely on this alone. Using expertise across both organisations, the science and engineering of negative emissions technologies will be assessed for their potential for large-scale deployment, and the associated environmental, economic and social issues will be investigated and documented. Accurate lifecycle assessments of the carbon footprint associated with the process, complementary techniques and the effect of public perception will be key factors considered.

Roundup

New funding for education programmes

Two of the Academy's supporters have committed funding to its education programmes.

Boeing UK has renewed its support of the Academy’s Connecting STEM Teachers programme for a further year. The organisation supports five teacher coordinators across the UK, who reach 575 schools. Boeing has also supported development of Mission to Mars, a new STEM teaching and learning resource that is now available on the Academy’s website.

The Connecting STEM Teachers programme has a total of 45 teacher co-ordinators across the UK, who reach 575 schools.

The Motorola Solutions Foundation has agreed to support a series of teaching and learning resources for further education students and practitioners.

The resources will feature case studies based around the work of professional technicians and engineers from sectors where there is an acute lack of diversity. The resources will include interactive exercises and simulations for students, and will feature a biography of a professional engineer or technician from an underrepresented group, including details of their career progression.

The Academy is most grateful to the foundation for its continuing support of the Academy’s work in further education.

Leave a lasting legacy

Thank you to all Fellows who have generously pledged a bequest to the Academy. Legacy gifts help the Academy to bring together the most successful and talented engineers from across the profession to put engineering at the heart of a sustainable and prosperous society, improving lives and opportunities. For a confidential discussion about legacy giving, please contact Fiona Stewart, Head of Philanthropy, on 020 7766 0852 or fiona.stewart@raeng.org.uk
Driving change

Professor Richard Williams OBE FREng, Vice President of Fellowship Engagement, provides an update on the Academy’s Fellowship activities.

In October, it was a pleasure to welcome new Fellows to the induction day before the annual New Fellows’ Dinner. Through a series of short thumbnail accounts, several Fellows told their extraordinary personal stories of innovation and leadership in engineering. This was just a small sample of our Fellowship, and underscored to all those present the latent potential to drive change that exists in our Academy. A question on everyone’s lips was ‘how can we further catalyse this powerhouse of intellect, wisdom and expertise within the Academy to support the medium- and long-term economy of the UK?’

There are two immediate responses to this. One is for Fellows to seek to participate in the activities of the new Engineering Policy Centre that the Academy is now developing to launch in 2018. With the vista of the augmented industrial strategy within the complex national and international environments we operate within, there is a real opportunity to use our expertise to influence and drive strategic change and foster challenging debate. Another response is to get involved in activities connected to the Academy, through committees or direct action and participation in mentoring or enterprise.

In the meantime, a range of events around the UK can be found below and several others will appear in the near future. I look forward to seeing you there. Do make a note of the Fellows’ Day at the Academy on 8 February 2018, and later in the year the spring East Midlands Lecture (17 May) and the joint lecture and social event with the Royal Society of Edinburgh (1 May).

I continue to welcome your ideas, observations and advice, and can be contacted at vicepresident@raeng.org.uk

Forthcoming events

This is a selection of Academy events. For a complete list, visit www.raeng.org.uk/events

8 February 2018
Fellows’ day
Venue: Prince Philip House
Time: 3.00pm to 8.00pm

6 March 2018
View from the top
Venue: Prince Philip House
Time: 6.30pm to 9.00pm

1 May 2018
RSE and RAEng annual joint lecture - 25th Anniversary

Venue: Royal Society of Edinburgh
Time: 6.00pm to 7.00pm

31 May 2018
Enterprise Hub Showcase
Venue: Prince Philip House
Time: 5.00pm to 8.00pm

27 June 2018
Awards Dinner
Venue: The Pavilion at the Tower of London
Time: 6.30pm to 10.30pm

Media roundup

On 5 September, the Academy’s AGM was marked on BBC Radio 4’s Today programme, which interviewed new Fellows Dr Eben Upton CBE FREng and Dr Caroline Hargrove FREng about diversity in the engineering profession. Other national media coverage in September included further mentions of the biofuels report in the Guardian, an item on Research Fellow Dr Alasdair Clark on the Mail Online and a profile of MacRobert Award finalist Vision RT in the Daily Express.

October included coverage of the Made Smarter report, which the Academy contributed to, with a column in the Daily Telegraph from new Fellow Professor Juergen Maier FREng. Trade press also reported on the Academy’s Engineering Better Care report, the Creating cultures where all engineers thrive report, and the Launchpad Competition.

News of Fellows

Chris Allam has been appointed UK Managing Director of MBDA

Leslie Barclay OBE has been awarded the James R James lifetime achievement award from the Institution of Engineering and Technology

Ursula Burns has been appointed a Director of Uber

Suranga Chandratillake has been made a member of the UK government’s Council for Science and Technology

Nicholas Donofrio has been appointed Chair of Quantexa

Professor Roger Falconer has been appointed Vice-President of the International Association for Coastal Reservoir Research, and has been made an Honorary Member of the International Association for Hydro-Environment Engineering and Research

Ian Firth has been made an Honorary Fellow of the Royal Institute of British Architects

Professor Dame Julia Higgins DBE FRS has been appointed President of the Institute of Physics

Dervilla Mitchell CBE received Building magazine’s Woman of the Year 2017 award

Sir David McMurtry CBE RDI FRS has been awarded an Honorary Doctorate from the University of Huddersfield

Dr David Potter CBE has been appointed Honorary Chair of Planet Computers Ltd

Professor Mark Tooley has been appointed President of the Institute of Physics and Engineering in Medicine

Faith Wainwright MBE has been appointed President of the Institution of Structural Engineers

Dr Sarah Williamson was shortlisted for Building magazine’s Woman of the Year 2017 award

Academy Chief Executive Philip Greenish CBE was awarded an Honorary Degree from the University of Huddersfield
2018 prizes and medals call for nominations

The following 2018 Awards will open for nominations in January:

Rooke Award – for the public promotion of engineering by an individual, small team or project.

Silver Medal – for an outstanding personal contribution to UK engineering by an early- to mid-career engineer resulting in market exploitation.

RAEng Engineers Trust Young Engineer of the Year / Sir George Macfarlane Medal – for early-career UK engineers who have demonstrated excellence. Supported by the Worshipful Company of Engineers.

Sir Frank Whittle Medal – for outstanding and sustained achievement in any engineering discipline.

For more information please call the awards team on 020 7766 0607 or email awards@raeng.org.uk

To make a nomination, please visit www.raeng.org.uk/grants-and-prizes/prizes-and-medals

Closing date: Monday 15 February 2018

2018 Royal Academy of Engineering MacRobert Award

Applications for the MacRobert Award 2018, supported by the Worshipful Company of Engineers, are now open.

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

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

For further information, please visit www.raeng.org.uk/prizes/macrobert or email macrobert@raeng.org.uk

Closing date: 31 January 2018

David Clarke Fellowships

The Energy Technologies Institute (ETI) and the Engineering and Physical Sciences Research Council have announced three new postdoctoral fellowships that will support researchers investigating new energy projects. The fellowships were named in honour of Dr David Clarke FREng, ETI’s former CEO, who died in February 2017.

Hire space at Prince Philip House

Rooms in Prince Philip House are available for Fellows to hire for events, and there are currently special offers for Fellows wishing to book rooms.

Fellows and colleagues can receive 50% discount on room-hire packages until January 2018. Quote ‘Fellows’ offer’. A 25% discount per booking will be applied to any two meeting room reservations made between January and the end of March 2018. Quote ‘New Year offer’.

Prince Philip House has 16 accessible meeting and event spaces of various sizes, which can be set up in different styles according to requirements. There are several small meeting rooms, and the largest space, which accommodates up to 170 people, has a state-of-the-art LCD projector. Six meeting rooms in the Taylor Centre have full AV and conferencing facilities.

For more information on the rooms available, or to book, please contact Katie Jason-Morgan at Harbour & Jones at katie@princephiliphouse.com or call 0207 7966 0625.

Legacy donation

The Academy has received a generous legacy from Mr Philip Gray FREng, who passed away in April this year. Mr Gray, who was elected a Fellow in 1984, requested that his legacy support the Academy’s work in education. By helping grow the Academy’s programmes in schools and colleges, Mr Gray’s legacy will make a valuable contribution to building future generations of engineering talent.

Publications received

The following titles have been donated to the Academy and can be found in the Fellows’ Library:

Wonders beyond numbers by Johnny Ball
Simply brilliant by William C. Taylor
The existential pleasures of engineering by Samuel C Florman

Obituaries

Professor Peter John Lawrenson FREng FRS died on 27 October 2017, aged 84. He was formerly Emeritus Professor in the Department of Electrical Engineering at the University of Leeds.

Professor John (Jack) Court Levy OBE FREng died on 27 October 2017, aged 91. He was formerly Managing Director of Levytator Ltd, and Emeritus Professor of Mechanical Engineering and Head of Department at City, University of London.

Mr Thomas Tait Candlish FREng has died. He was formerly Managing Director of Geo Wimpey Plc.

Professor Peter John Deasley FREng died on 9 November 2017, aged 74. He was formerly Director of Cranfield Innovative Manufacturing Research Centre.

Sir Michael Latham DL HonFREng died on 2 November 2017, aged 74. He was formerly a Member of Parliament.

Dr Robert George Perceval Voss OBE FREng has died. He was formerly Associate Director, Science, and Head of Science Department at Rutherford Appleton Laboratory.

Dr James Anthony Charles FREng died on 13 November 2017, aged 91. He was formerly Emeritus Reader in Process Metallurgy at the University of Cambridge.