



Engineering a future outside the EU

In October, the engineering profession published a report that assessed the potential impacts on engineering of the UK leaving the EU.

The report, *Engineering a future outside the EU: securing the best outcome for the UK*, was produced by an alliance of the UK's professional engineering organisations representing over 450,000 engineers, led by the Academy. It drew on wide-ranging consultation with engineers from all corners of the profession, including industry, academia and the public sector.

A key finding is the need to maintain the supply of engineering skills to support the world-class quality and success of UK engineering companies and universities. In academia, engineering has proportionally more staff originating from the rest of the EU, than across all subjects as a whole. The findings also emphasise that uncertainty about the status of EU workers in the UK and further risks to the supply of skilled engineers could result in delays to major infrastructure projects such as Hinkley Point C, which will face recruitment difficulties and increasing costs if demand for labour outstrips supply.

In response, the report calls on government and the engineering community to work together to take decisive action on the engineering skills crisis and advocates straightforward solutions, such as temporary visas for skilled engineers from EU countries with the specialist skills that the UK lacks.

The report also highlights how innovation is critical to the UK's economy and productivity, and how EU support and collaboration has significantly contributed to the UK's globally excellent and highly productive research and innovation base. However, it warns that losing access to EU research and innovation funding programmes would pose a considerable risk to the quality and quantity of UK research and innovation, and in turn to UK GDP. Evidence suggests that EU collaboration with UK researchers has already been put on hold or has been scaled back since the referendum, and if European project funding becomes less available, the UK is likely to become a less attractive destination for the brightest and best students and researchers.

It recommends that the government seeks the closest achievable association with relevant EU research and innovation programmes, and if needed, develop long-term funding streams that complement current funding by encouraging international mobility and collaboration, particularly between industry and academia.

Standards and legislation were identified as an area where it will be important to retain as much influence as possible. The UK has always played a leading role in shaping the EU's single market, investing heavily to ensure commercial advantage. It is vital that this level of influence is maintained.

Throughout the consultation process, one opportunity was pointed to repeatedly: 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.

Commenting on the report, Academy President Professor Dame Ann Dowling OM DBE FREng FRS said: "As government develops its plans for a renewed focus on industrial strategy, we hope it will use this opportunity to build on the UK's existing strengths in engineering research, innovation and industry to grow their contribution to economic and social progress, and to invest in increasing the supply of skilled engineers necessary to sustain this growth.

"The UK engineering community is committed to building on its international reputation, and stands ready to support the government in securing from the negotiations the best possible outcome for the UK."

The report received considerable media coverage (see page 11). A number of meetings with ministers, shadow ministers and officials have been held to discuss the report's messages (see page 2).

To read the report in full, please go to www.raeng.org.uk/UKEngineeringfuture

President's column



Meetings and visitors

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

John Pettigrew, CEO of National Grid
Maxime Carmagnac, Managing Director at Carmignac Gestion
Sir Adrian Smith FRS
Professor John Uff CBE QC
Dr Rupert Lewis, Director of the Government Office for Science
Simon Whitfield, Deputy Director, Data Analytics, at the Government Office for Science
Sarah Healey, Director General at the Department for Exiting the European Union
Liu Zhenya, Chairman of State Grid Corporation of China
The Rt Hon Greg Clark MP, Secretary of State for Business, Energy and Industrial Strategy

She also attended the following events and meetings:

Challenging Engineers: a call to tomorrow's problem solvers - Queen Elizabeth Prize for Engineering event
Institution of Engineering and Technology (IET) President's Address
David Waller's book launch, as a speaker
UK Research and Innovation's Business and Innovation roundtable, as Chair of the meeting
Academy Presidents' meeting with The Rt Hon David Davis MP, Secretary of State for Exiting the European Union
New Fellows' briefing and dinner
D Group roundtable as a speaker
Trinity College Dublin lecture as a speaker
IET Celebration of Peter Jost CBE HonFREng
Royal Academy of Engineering's Hinton Lecture
Council for Science and Technology
Queen Elizabeth Prize for Engineering Trustee Board meeting
Institution of Mechanical Engineers annual dinner
Tours of the University of Huddersfield and Northumbria University

In the autumn newsletter, I highlighted the Academy's role in a project to provide evidence-based advice to government on the potential implications and opportunities presented by the UK's departure from the EU. The work that informed the advice involved all of the professional engineering institutions (PEIs), representing more than 450,000 engineers between them, and was both a first for our profession and unmatched by any similar efforts by other professions.

In mid-October, the results of the exercise were published in a report, *Engineering a future outside the EU*, that I am pleased to say has been well received and widely considered to be a very thorough and well-balanced piece of work.

On the day of publication, I was able to hand a copy of the report to David Davis MP, Secretary of State for Exiting the European Union, in a meeting attended by the Presidents of all the national academies. I have also met Greg Clark MP, Secretary of State for Business, Energy and Industrial Strategy, to share our key findings and recommendations. I was delighted to find him very receptive to our thoughts on industrial strategy, which was highlighted in the report as a major opportunity to take decisive action on the engineering skills crisis and help drive economic development and social progress after the UK leaves the EU.

Further meetings are being arranged with relevant government ministers and officials to ensure that our advice helps to influence and shape negotiations, and I look forward to future positive conversations. Thanks are due to all those Fellows who contributed to the project and who have helped to spread the word.

The important role of engineering in enabling and accelerating growth - including engineering research, innovation and infrastructure - was recognised in Chancellor Philip Hammond's Autumn Statement on 23 November. The creation of a new £23 billion National Productivity Investment Fund, including £2 billion more per year in research and development funding by 2020-21, £390 million for low-emission vehicles and self-driving cars, and over £1 billion investment in 5G and a full fibre network, is positive news and will provide a welcome boost to engineering and to the research community.

For these investments to be a success, however, commensurate investment needs to be made in developing and recruiting enough skilled engineers to fill the jobs created and deliver the promised

innovation and infrastructure projects to a world-leading standard. The profession faces a significant skills challenge, even as it grows.

In the context of the UK's departure from the EU and the government's new productivity investments, our Engineering Talent Project - which aims to close the skills gap - has become all the more relevant. Good progress has been made in the last few months in the development of the project, and as you will read later on in this newsletter, we are working with an advertising agency to create ideas and material that will appeal to a diverse range of young people, while at the same time sharing our recommendations with policymakers and working with industry to identify the main barriers to an inclusive culture in the workplace. The success of the project will rely on its uptake by the whole profession, as one unified voice speaks far louder than many, disparate ones. The critical next step therefore will be to share our plans and materials right across industry and build widespread support for the planned activities. If Fellows feel that they could spread this message and help us to forge new industry partnerships, I would encourage you to get in touch with Daniel Rossall Valentine, Interim Head of the Engineering Talent Project, on daniel.rossall-valentine@raeng.org.uk

Attracting more diverse audiences to engineering was also the subject of a talk I delivered at Trinity College Dublin on 26 October, alongside Engineers Ireland and the Irish Academy of Engineering. The event coincided with the 10th anniversary of the Centre for Women in Science & Engineering Research, which undertakes important work to recruit and retain women in academic science, engineering and technology. It served as a timely reminder of the significant distance we have travelled towards greater gender parity, but also the miles we still have to go and the great gains we could make by working together on such an important issue.

As 2016 draws to a close, I am pleased with the way the Academy has stepped up this year, leading the profession, informing debate and convening expertise to help tackle some significant social challenges, and I am very grateful for all of your input.

I wish you all a Merry Christmas and look forward to seeing many of you in the New Year at the Fellows' Day on 30 January.

New Fellows' briefing and dinner

On 19 October 2016, 51 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, Professor Dame Ann Dowling OM DBE FEng FRS, as well as from Fellows chairing operating committees, about the Academy's work across key engineering challenges. The new Fellows also heard from some of their number, who told their own stories and described their very varied engineering careers.

After the briefing, new Fellows were then officially inducted during a ceremony and dinner held at Drapers' Hall in London.

New Fellows and guests were joined by Senior Fellow, HRH The Duke of Edinburgh, who welcomed them into the Academy, and the President. The new Fellows' response was delivered by Air Marshal Julian Young CB OBE FEng, Chief of Materiel (Air) with the Royal Air Force, who spoke of the important contribution that engineers make to society and the role of the new Fellows in inspiring the next generation.

The 2016 new Fellows include a leading innovator in orthopaedic implant manufacturing, an expert in forensics, a former shepherd who is now a professor of agricultural engineering, and engineers from companies such as Bombardier Aerospace, DBD Group (a nuclear engineering consultancy),



Facebook, High Speed 2 and Jaguar Land Rover.

The new Fellows' dinner 2017 will be held on 18 October at Drapers' Hall, London.

To read more about the new Fellows, please visit www.raeng.org.uk/new-fellows-2016

▲ **Top:** The new Fellows were welcomed to the Academy by HRH The Duke of Edinburgh and the President

▲ **Above:** New Fellows Jane Butler FEng (far left), Dr Alan Belfield FEng (right) and Professor Barbara Lane FEng (far right) at the dinner at Drapers' Hall

New awards scheme

The Academy has launched a new interdisciplinary programme in partnership with the Royal Society and the British Academy called the APEX Awards (Academies Partnership in supporting Excellence in cross-disciplinary (X) research), which is being funded by the Leverhulme Trust.

The programme aims to tackle important research questions and challenges facing society today. It will offer established independent researchers seed funding to pursue interdisciplinary,

innovative research (with a particular emphasis on the boundary between science and engineering and the social sciences and humanities) to address key problems in society. Successful applicants will be expected to work in collaboration with relevant researchers from other disciplines.

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, including teaching replacement, but can also include associated research costs such as consumables, equipment and travel.

People and talent

The deadline for applications is Friday 13 January 2017. Applications can be made through Royal Society's online application portal (e-GAP).

Successful applicants will receive their awards and must commence their research on 1 October 2017.

Further information about the programme can be found at www.raeng.org.uk/apex-awards

Visiting Professors' conference



▲ Attendees at the Visiting Professors conference participate in a workshop.
© Rob Lacey

In November, the Academy hosted its annual Visiting Professors' (VP) conference. This year's theme was *How they do it elsewhere*, and for the first time, the conference brought together VPs with academics from the Academy's international programmes.

The first two days of the conference convened beneficiaries from two of the Academy's international schemes, the Enriching Engineering Education Programme and the Industry Academic

Partnership Programme (IAPP), as well as invited VPs and other relevant stakeholders, to share engineering teaching approaches from the UK and internationally.

Chaired by Professor David Bogle FREng, the meeting allowed attendees to network and help establish partnerships in preparation for upcoming funding opportunities under the Global Challenges Research Fund and a new phase of IAPP funding, which were both showcased at the conference.

The main part of the conference began on the afternoon of the second day with an induction for new VPs and their associated academic champions chaired by Professor Peter Goodhew FREng. This provided them with guidance on how to bring their industry experience into the teaching environment. This was followed by a keynote speech from Professor Keith Clarke CBE HonFREng, a VP at Aston University, on sustainable development goals and the emerging global middle class.

The second day ended with a formal networking dinner for VPs, international academics and relevant stakeholders.

The conference concluded with a day of workshops, panel discussions and presentations around innovative approaches and partnerships to improve engineering education and research, using examples from the UK and across the world.

Fellows' meeting in California

In October, the Academy held its first International Fellows' reception in the US in Palo Alto, California, to discuss how Fellows across the world can engage with the Academy's activities and how the Fellowship can develop globally.

Hosted by Professor Antony Jameson FREng FRS and his wife Charlotte, the reception brought together Fellows and friends of the Academy based in the area with Professor Richard Williams OBE FREng, Academy Vice President, and David Thomlinson FREng, International Secretary.

Her Majesty's Consul General to San Francisco, Andrew Whittaker, spoke about

the great history of collaboration between the two countries, and the potential to work together in areas of joint strength and interest, such as innovation. As Palo Alto is globally renowned as the birthplace of radical innovation, the reception also provided the ideal opportunity to discuss how the UK and California can work together to encourage engineering researchers to be more radical in addressing the global challenges.

Ingenia live!



▲ (L-R) Professor Dino Distefano, Dr Marily Nika and Dr Danny Tarlow

In October, the Academy held its latest *Ingenia Live!* event at Prince Philip House on the theme of *Breaking the code*.

The event focused on the pioneering techniques currently being used by top companies and three industry experts shared their insight into future advances in software engineering.

Professor Dino Distefano, Co-founder and CEO of Monoidics and a software engineer for Facebook, relayed the experience of deploying a static analyser to verify code that uses logical reasoning but works at a velocity consistent with Facebook's fast-paced engineering culture.

Dr Marily Nika, Engineering Program Manager at Google, discussed the impact that technology is having on our lives

and how it will affect the future. She said that the science fiction and technology that up until now has been confined to fantasy films is now becoming a reality.

Dr Danny Tarlow, a researcher in the Machine Learning and Perception Group at Microsoft Research Cambridge, spoke about how current research is focusing on natural language to make everyone a programmer in future.

More than 70 guests attended the event, including a record number of students, whose questions not only led to a lively panel discussion but also kept the speakers occupied throughout the networking reception.

The evening was chaired by Dr Scott Steedman CBE FREng, Editor-in-Chief of *Ingenia* magazine.

Engaging diverse students

As the second year of the Engineering Engagement Programme (EEP) drew to a close, three events took place to promote a career in engineering to more than 150 students from across the UK.

The events, hosted by CH2M, Rolls-Royce and the University of Leicester, aimed to increase students' understanding of engineering careers, provide the opportunity for them to meet employers and help prepare them to apply for engineering jobs.

EEP is a collaborative partnership between the Academy, SEO London and 13 engineering employers. The three-year pilot project is running until March 2018 and was established to increase engagement and support female, ethnic minority and socially disadvantaged engineering students



into employment. During 2015 to 2016, the programme engaged with 157 students, 49 of whom have since found internships, industrial placements and graduate employment in engineering companies.

As well as opening up a wider pool of talent, the programme provides employers with the opportunity to work

collaboratively and share good practice for increasing diversity and inclusion. In doing so, it hopes to help address the ongoing engineering skills crisis.

For more information, please contact diversityteam@raeng.org.uk

▲ Students take part in a speed networking session at the CH2M-hosted event in September

Research Chair: awardee profile

Professor Omar Matar has been awarded a Petronas/RAEng Research Chair in multiphase fluid dynamics at Imperial College London for his work in developing the next generation of predictive tools that can model the flow of crude oil. While initially focused on the oil and gas sector, the new modelling tools will be useful across a range of other sectors including manufacturing, fast-moving consumer goods, and the food and drink industry.

Professor Matar's new predictive tools will enable practitioners to assess the impact of additives, such as chemicals used in crude oil to inhibit wax, to

find an optimum solution that can be tested in the field. This will be particularly beneficial in flow-assurance applications in which crude oil is transported in pipelines over long distances, experiencing potentially large temperature variations.

Professor Matar said: "I am delighted to be supported by the Royal Academy of Engineering and Petronas. I hope that my research will resolve fundamental issues at the heart of the complexity in multiphase flows, which will provide solutions to practitioners across industrial sectors."

The five-year Research Chair posts are co-sponsored by industry to support



▲ Professor Omar Matar, Petronas/RAEng Research Chair

exceptional academics in UK universities, who are undertaking use-inspired research with industrial partners.

For further information about this scheme, please see www.raeng.org.uk/researchchairs or contact lucy.wheeler@raeng.org.uk

New Diversity and Inclusion Committee

Dervilla Mitchell CBE FREng, a Director at Arup, is the new chair of the Academy's recently restructured Diversity and Inclusion (D&I) Committee.

The committee advises on and oversees the work carried out for the D&I programme, with employers, professional engineering institutions and within the Academy. It will meet quarterly and reports annually to the Trustee Board.

Other members of the committee include: Professor Angela Sasse FREng, Professor Anthony Finkelstein CBE FREng, Allan Cook CBE FREng, David Waboso CBE FREng, Elspeth Finch, Professor Nilay Shah FREng, Jonathan Lyle FREng and Philip Greenish CBE.



▲ Dervilla Mitchell CBE FREng

Engineering the future of data



▲ The President with Professor Sir Nigel Shadbolt FREng

In November, the Academy's flagship Hinton Lecture was given by Professor Sir Nigel Shadbolt FREng, Professor of Computer Science at the University of Oxford, Principal of Jesus College, and Chairman and Co-founder of the Open Data Institute.

Entitled *Engineering the future of data*, the lecture explored the exponential rates of advance in computing and how it is transforming the world we live in. Sir Nigel

explained how the computational fabric that underpins our world is connected to every aspect of modern life, from health, education and transport to energy, finance and defence.

Sir Nigel demonstrated that data is a vital infrastructure that needs to be engineered, curated and cared for, and that demands particular skills within society.

The lecture was attended by more than 120 guests including Fellows, representatives from academia and industry, and members of the public, and was chaired by the President.

You can view the 2016 Hinton Lecture at raeng.tv

Connecting STEM Teachers

In October, a training day took place at the Academy for its 40 teacher coordinators as part of the Connecting STEM Teachers programme.

In the morning, the teachers received training from Ruth Farenga, Campaign Project Lead for *People Like Me* – a WISE (Women in Science and Engineering) initiative that aims to engage young women with STEM careers. The training raised awareness of how teachers' unconscious bias could discourage girls from pursuing STEM learning and careers. Training also demonstrated how to use the campaign's resources in the classroom and with parents.

An afternoon training session focused on the Academy's latest learning and teaching resource, *Existence at the Extreme*. Teacher coordinators were encouraged to get hands-on with its activities before distributing it to their networks.

The Academy has produced 660 resource boxes to be used by schools around the country, free of charge. Resources can be downloaded from the Academy's website at www.raeng.org.uk/eenpresources

2017 QEPrize winner to be announced in February



▲ 2015 Queen Elizabeth Prize for Engineering winner, Dr Robert Langer FREng

The winner of the 2017 Queen Elizabeth Prize for Engineering (QEPrize) is to be announced on 1 February 2017 at Prince Philip House. The event, to be held in the presence of HRH The Princess Royal, builds on the huge success of the second prize cycle and reinforces the status of the QEPrize as the world's leading award for engineering.

In February 2015, Dr Robert Langer was revealed as the second winner of the Queen Elizabeth Prize for Engineering. Following the announcement, the QEPrize garnered an unprecedented level of media coverage, reaching over 1.25 billion people worldwide.

Dr Langer, a chemical engineer, was awarded the prize for his pioneering work in developing large-molecule drug delivery systems, which have been used to treat cancers, diabetes and mental illness, helping more than two billion people around the world. Dr Langer received his prize from Her Majesty The Queen in a ceremony at Buckingham Palace on 26 October 2015.

To mark the occasion, the QEPrize launched the *Create the Future* report, which examined international attitudes to engineering in 10 countries. One of the main findings was the emphasis that societies place on engineering and engineers to lead the way in solving 21st-century challenges.

Nominations for the 2017 QEPrize opened in April 2016 at a reception at the Design Museum that was attended by more than 250 QEPrize Ambassadors, donor representatives and stakeholders, and showcased cutting-edge engineering innovations.

As the QEPrize celebrates the engineers responsible for innovations that have had a global impact on humanity, it continues to work with winners, donors and stakeholders to inspire the next generation to take up the challenges of tomorrow and enjoy the rewards of a career in engineering.

Engineering Talent Project

The Academy's Engineering Talent Project (ETP) has appointed an advertising agency to help promote engineering as a career choice for future leaders, and work is now underway to develop a pan-engineering brand and creative platform for the campaign.

The marketing and advertising campaign is one of four key strands of the project. To ensure that the inspirational image portrayed as part of the campaign is matched by the reality of a career in engineering, research is being conducted with engineering organisations to determine workplace culture and employment practice across the sector, as part of another strand of activity.

Preparatory work is also underway to engage policymakers with proposed solutions to some of the barriers to the uptake of engineering in the education system. Themes for policy engagement include STEM teacher capability and capacity in schools, and continued investment in further and higher education.

Continued support from ETP partners is key to delivery of the next phase of the campaign. For more information and to get involved, please contact Daniel Rossall Valentine, Interim Head of ETP, at daniel.rossall-valentine@raeng.org.uk

Frontiers of Engineering for Development

In November, the Academy hosted its first symposium on Frontiers of Engineering for Development as part of the Global Challenges Research Fund (GCRF).

The goal of the two-and-a-half-day symposium was to encourage collaborative work and promote international development and cross-disciplinary thinking among a cohort of more than 60 early- to mid-career rising stars in engineering and international development from across the globe. It also aimed to establish a network of contacts among the next generation of engineering leaders.

The event was co-chaired by Dr Ruth Boumphrey, Head of Research Grants at Lloyd's Register Foundation, and

Professor Jim Hall FREng, Director of the Environmental Change Institute at the University of Oxford.

The programme comprised four themed sessions: low-carbon development, resilient development, connected development and collaborative development. These were interspersed with networking sessions, where participants from academia, industry and non-governmental organisations (NGOs) presented their work to one another.

On the last day, participants were encouraged to apply for seed funding to help kick-start new collaborative projects inspired by the event.

The event and seed funding are part of the Academy's wider activities under GCRF. Symposia on the Frontiers of Engineering for Development will be held twice a year, with one event in the

Innovation and entrepreneurship



▲ Attendees at the Frontiers of Engineering for Development event at one of the networking sessions © Rob Lacey

UK and one in a developing or emerging economy partner country. Attendance is by invitation only, but to nominate someone or find out more, please visit www.raeng.org.uk/frontiers-of-engineering-for-development

In conversation with Blatchford



▲ (L-R) Dr Dame Sue Ion DBE FREng FRS, Nadine Stech and Professor Saeed Zahedi OBE FREng both from Blatchford, and Angela Saini on stage at the event

On 16 November, 2016 MacRobert Award winners Blatchford gave a talk at an event held at Prince Philip House. Professor Saeed Zahedi OBE FREng and his team shared the story behind the successful development of the world's most advanced prosthetic limb. The Linx is the first ever prosthetic limb with integrated robotic control of the knee and foot, a system in which the parts work together like a human leg.

The event was introduced by Dr Dame Sue Ion DBE FREng FRS, Chair of the MacRobert Award judging panel, and chaired by science journalist and broadcaster Angela Saini. Fellows and guests were given the opportunity to question the winners about the

company's major achievements and its future plans and innovations.

The event was kindly supported by the MacRobert Trust and the Worshipful Company of Engineers.

Known for spotting the 'next big thing', every year the MacRobert Award is presented to the engineers behind the UK technology sector'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 2017 MacRobert Award are now open. For further information, please visit www.raeng.org.uk/prizes/macrobot or email macrobot@raeng.org.uk

Closing date: 31 January 2017

Global Entrepreneurship Week events

On 17 November, the Academy hosted an event as part of Global Entrepreneurship Week that asked the question, *Can start-ups drive sustainable development?*

The event held a panel discussion exploring how engineering entrepreneurs in the UK and in developing countries



▲ Speakers at the event included (L-R) Nabeel Goheer from the Commonwealth Secretariat, Débora Colombi from Genotyping Biotecnologia, Enterprise Fellow Dr Toby Basey-Fisher and Alex Borges Sanchez from the Mexican Network of Technology Transfer Office

can help deliver the UN Sustainable Development Goals. The discussion was chaired by Professor Andy Hopper CBE FREng FRS, who was joined by entrepreneurs from the UK, Denmark, Brazil, Colombia and Mexico who recounted the challenges and opportunities they have faced when developing innovations for a better world.

This was followed by a Q&A session with the audience and networking.

Global Entrepreneurship Week is a week-long festival of live events that takes place throughout the country. It celebrates and cultivates entrepreneurship and supports entrepreneurs at every stage of their journey.

Training for future leaders



▲ Attendees at the Engineering Leaders Scholarships event

On 8 and 9 October, the annual training weekend for Engineering Leadership Awardees (ELA) took place at Conference Aston, Birmingham.

More than 90 UK engineering undergraduates who demonstrate leadership potential attended the event, which is aimed at developing a wide range of skills that will contribute

to making them future leaders. The awardees took part in activities focusing on negotiation, marketing, entrepreneurship and leadership.

The annual weekend is also an excellent opportunity for current awardees to benefit from interaction with Academy Fellows, ELA alumni and Sainsbury Management Fellows, who all support the event by running various sessions and are available for networking and advice.

The programme has been renamed Engineering Leaders Scholarships, and in the coming months, Fellows will be needed to review next year's applications and to act as mentors to current and future scholars. To find out more, please contact Jacqueline Clay, University Programme Manager, on jacqueline.clay@raeng.org.uk

Engineering a Better World digital community

A LinkedIn group has been launched to build on the success of the *Engineering a Better World* conference that was hosted by the Academy in September. With a focus on the UN Sustainable Development Goals, the group will bring together engineering and international development communities from across the world.

The group aims to be a valuable resource where people can find out about and share the latest research, opinion, initiatives and events; discuss and debate current issues and potential solutions; seek advice, ideas and funding; and make connections and create partnerships.

To find out more and join the group, please go to www.linkedin.com/groups/8555004

Africa Prize shortlist announced

Applications for the third Africa Prize in Engineering Innovation have closed with a 59% rise in total applications and a 9% increase in female applicants since 2016.

The prize received applications from across the continent, and 16 innovators from Cameroon, Ghana, Kenya, South Africa, Tanzania, Nigeria and Uganda have been selected to participate in training that will help them commercialise their businesses, which are in fields including renewable energy, agri-tech and robotics. Mentoring and support will be given through

an online course and two week-long bespoke training sessions held in the UK and Rwanda.

The Africa Prize aims to stimulate, celebrate and reward innovation and entrepreneurship in sub-Saharan Africa by providing six months of business training and mentoring to shortlisted applicants, before a winner and runners-up are awarded.

The judging panel is chaired by Malcolm Brinded CBE FREng, who was this year joined by John Lazar CBE FREng, with a number of Fellows involved in the review of applications and provision of pro-bono mentorship.



To find out more, please email Meredith Ettridge, International Policy Advisor, on meredith.ettridge@raeng.org.uk or visit www.raeng.org.uk/africaprize

▲ Innovations shortlisted for the 2017 Africa Prize come from the fields of agri-tech, renewable energy and robotics

QEPrize launches design app

The Queen Elizabeth Prize for Engineering has launched an app that enables young designers to create the trophy for the 2017 QEPrize.

The international *Create the Trophy* competition is aimed at young people aged 14 to 24 who can download the 3D modelling app, available on Apple and Android devices, to take part. They can choose from 14 distinctive shapes and five materials to create their design. The trophy will be 3D printed by BAE Systems.

The winner will be rewarded with a laptop computer and will be able to see their

trophy awarded to the winner/s of the 2017 QEPrize by Her Majesty The Queen at Buckingham Palace.

The winning design will be selected by an expert panel of judges, chaired by Ian Blatchford, Director of the Science Museum Group, and including Mark Miodownik FREng, Professor of Materials and Society and Director of the UCL Institute of Making, Roma Agrawal, a structural engineer at Interserve, and Rebeca Ramos, a designer at Heatherwick Studio.

The competition closes on 4 January 2017 and the winner will be announced alongside the winner/s of the 2017 QEPrize in early February.



The QEPrize 3D Design Studio app can be downloaded from qeprize.org/createthetrophyapp/

▲ Young designers can choose from a range of shapes and materials to create their trophy entry

Research open day

In October, the University of Leeds held an engineering research open day, in cooperation with the Academy, that highlighted the best research from a diverse mix of Fellows, professors and researchers from Leeds and neighbouring universities.

The afternoon session featured a series of 10 brief lectures aimed at engineering students, accompanied

by a poster competition; while the evening session was a guest lecture for schoolchildren delivered by Dr Matt Perkins FREng.

Dr Perkins, an expert on the UK space industry, spoke to an enthusiastic audience about opportunities to work in the space industry and even get into space itself.

The day ended with a dinner for Fellows and guests.

The Academy at the party conferences

The opportunities and risks for research, innovation and industry of the UK leaving the EU were centre stage at a series of breakfast roundtable meetings jointly organised by the Royal Academy of Engineering, Academy of Medical Sciences, British Academy and Royal Society at this year's political party conferences.

Reflecting on the theme, *Open for business: a nation of global researchers, innovators and industrialists*, attendees including researchers, entrepreneurs, funders

and business leaders discussed topical issues on research and innovation with parliamentarians at the Conservative, Labour and SNP conferences.

These attendees were joined by Carolyn Fairbairn, Director-General of the CBI, and a number of politicians, including: Jo Johnson MP, Minister for Universities, Science, Research and Innovation; Labour's Gordon Marsden MP, Shadow Higher Education Spokesman, and Daniel Zeichner MP, Shadow Transport Minister; and the SNP's Treasury spokesman Roger Mullin, and Science and Technology Committee member Carol Monaghan MP.

Technology and society

The events proved to be a useful opportunity for attendees to discuss a range of subjects, including the implications of Brexit, the Higher Education and Research Bill progressing through Parliament, and the forthcoming industrial strategy.

While there was considerable consensus that there were challenges ahead, the attendees were united and ready to work with government to find the best outcome for research and innovation.

Fellows' visit to CERN

On 10 November, a group of Academy Fellows took part in an exclusive visit to CERN, the European Organization for Nuclear Research, based near Geneva. CERN is home to the world's largest particle physics laboratory and houses the famous Large Hadron Collider (LHC).

Professor Paul Collier FREng, Head of Beams at CERN, welcomed Fellows to the site and provided an introductory briefing.

Afterwards, Fellows were accompanied on a tour of some of the highlights of the CERN facilities, including visits to the Worldwide LHC Computing Grid, the LHC superconducting magnet assembly hall, the CERN Control Centre and some of the accelerators.



▲ Professor Paul Collier FREng talks to Fellows about the LHC superconducting magnet

A partnership with BP

The Academy has embarked on a partnership with BP that will see the two organisations work together to advance progress against the Academy's strategic objectives.

In a memorandum of understanding, the two organisations have agreed to look for opportunities to work together in five key areas: skills, research, innovation, policy, and diversity and inclusion.

As the first of these opportunities, BP has committed to supporting the



▲ Academy Chief Executive Philip Greenish CBE with David Eyton FREng, BP's Head of Group Technology

Business and manufacturing

Enterprise Hub for the next three years, helping to grow programmes that identify and develop the UK's most promising engineering and technology entrepreneurs. In return for its support, BP will have the opportunity to contribute to Hub programmes and gain insights from the next generation of talented entrepreneurs and their innovative technologies.

Academy roundup

Making the most of being a Fellow

It was a pleasure to be able to welcome and congratulate many of our 51 new Fellows at their induction in October. As well as presentations from staff and Trustees about the Academy, some of the new Fellows shared their stories of personal achievement, ranging from forensic engineering to steps to eradicate horrific fires in cities and townships.

I am sometimes asked about the purpose and value of being a new Fellow and my answer is threefold. Firstly, it demonstrates recognition of personal

achievements. Secondly, election to an Academy that is held in high esteem and that convenes expertise provides a platform to allow every Fellow to extend and amplify their personal influence on engineering and society. For example, Fellows can do this by participating in outward-facing work in policy, mentoring, or one of the many other avenues that the Academy's programmes provide. Thirdly, it is about being a member of a Fellowship that encourages collegiate interaction for mutual advice and support in pursuit of our common interests. The social and personal connections made beyond the formalities of meetings and events are to be encouraged.

I hope that all Fellows will continue to enjoy respect for their achievements and be enthusiastic in our common endeavour to promote and drive the beneficial change that engineers and engineering brings to life.



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

▲ Professor Richard Williams OBE FREng, Vice President for Fellowship Engagement

Fellows' regional events

Over the past months, a number of regional events for Fellows have been held across the country.

Fellows' lunches were held at the University of Leeds on 21 September 2016, hosted by Trustee Professor Elaine Martin OBE FREng, and at Heriot-Watt University, Edinburgh on 1 November 2016, hosted by Vice President Professor Richard Williams OBE FREng.

On 27 October, Fellows and their guests enjoyed a visit to the Caterpillar factory in Desford, Leicestershire, hosted by Tim Green, Global Engineering and Sourcing Manager, and Paul Eames, Product Engineer. The day included an overview of

Caterpillar, a factory tour, live machinery demonstration and lunch at the visitors' centre. The visit was arranged by Professor Phil Bennett FREng, organiser of Academy regional activities for the East Midlands, and Professor Colin Garner FREng.

The annual North East Fellows' dinner took place in Newcastle on 11 October. Richard Maudslay CBE FREng organised the dinner for Fellows in the area, and Vice President Professor Richard Williams OBE FREng and CEO Philip Greenish both attended. The dinner was preceded by a visit to the Reece Group, hosted by John Reece MBE FREng.

To express an interest in organising or hosting any regional activity for Fellows, please contact membership@raeng.org.uk

Media roundup

The Academy's report, *Engineering a future outside the EU*, received widespread coverage when it was published in October. Deputy CEO Dr Hayaatun Sillem appeared on the BBC News television channel and BBC Radio 4's *Today* programme to discuss the report's key messages, which were also covered in the *Financial Times*, *Daily Telegraph*, *CityAM* and a number of specialist publications. The report was also shared widely on social media.

The Academy made submissions to the House of Commons Business, Enterprise and Industrial Strategy Committee that encouraged the government to focus on ensuring that British ideas and innovations can be commercialised in

the UK. These messages were reported by the *Guardian* and *Daily Telegraph*, while articles in both *The Times* and *Financial Times* in September reported on the Academy's submission to the Science and Technology Committee regarding the vulnerabilities of smart-meter technology.

The MacRobert Award continues to receive coverage. Nadine Stech from the 2016 winning Blatchford team was profiled in *The Times* in October. A documentary on BBC Four looked at the construction of the Severn Bridge, which won the very first MacRobert Award, and interviewed Mike Parsons FREng on the subject.

In addition to the new Fellows announced in September, a number of new research

appointments supported by the Academy have featured in the media and continue to generate interest.

2016 Annual Fund

Launched in September, the Academy's 2016 Annual Fund had raised £8,300 as of 21 November. These funds will help build capacity in existing programmes in enterprise, policy and public engagement, and support new initiatives.

The Academy would like to extend its thanks to all those who have contributed so far.

Copies of the Annual Fund brochure can be viewed and/or downloaded from www.raeng.org.uk/get-involved

Governance review

The Academy is undertaking a short review of the new governance structures around the Trustee Board and operations that were implemented from September 2014. The purpose is to report on the effectiveness of the operation of the new governance arrangements in the context of the Academy's wish to ensure transparency, diversity and fitness of purpose for the future of its operations.

Fellows wishing to offer any observations on this topic are invited to contact the chair of the review, Professor Richard Williams OBE FEng, on vicepresident@raeng.org.uk by 9 January 2017. The outcome of the interim review and any recommendations will be made known to Fellows in 2017.

Legacy giving

Copies of *Build a better world*, the Academy's legacy information booklet, can be obtained from the Development department or downloaded from the Academy's website at www.raeng.org.uk/get-involved/ways-to-give

Fellows who would like to have a confidential, informal discussion about legacy giving are invited to contact Clare Flynn Scarcelli, Head of Major Giving, on 020 7766 0652 or clare.flynn@raeng.org.uk

New funding

The Academy's Stoke Engineering Project has received a second grant of £15,000 from the Comino Foundation. Established in 2013, the project now involves 18 schools and last year helped support STEM activities involving 9,300 students and 580 teaching staff.

The Motorola Solutions Foundation has awarded a grant of £38,000 towards a new programme that will provide further education engineering teaching staff with better grounding in diversity issues, equipping them to improve recruitment and retention rates. The programme will involve continuing professional development sessions, teaching resources and opportunities for teaching staff to visit technology employers that are committed to diversity. The Academy is grateful to Graeme Hobbs FEng for his advice in preparing the grant application.

Forthcoming events

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

30 January 2017

Fellows' Day

Venue: Prince Philip House, London

Time: 4.00pm to 9.00pm

3 February 2017

How to hack your home

In association with the Royal Institution

Speaker: Professor Danielle George, University of Manchester

Venue: Quays Theatre, The Lowry, Manchester

Times: Schools show: 1.30pm to 2.30pm.

Families show: 6.30pm to 7.30pm

6 March 2017

RAEng/RSE Annual joint lecture

Speaker: Archie Bethel CBE FEng FRSE, CEO of Babcock International Group plc

Venue: Royal Society of Edinburgh, Scotland

Time: 6.00pm to 10.00pm

13 March 2017

How to hack your home

In association with the Royal Institution

Speaker: Professor Danielle George, University of Manchester

Venue: Reardon Smith Lecture Theatre, National Museum Wales, Cardiff

Times: Schools show: 1.30pm to 2.30pm.

Families show: 6.30pm to 7.30pm

30 March 2017

View from the top

Speaker: Warren East CBE FEng, CEO, Rolls-Royce

Venue: Prince Philip House, London

Time: 6.30pm to 9.00pm

To share any suggestions for events with the Academy, please contact Ivana Mackintosh, Head of Events and Marketing, on ivana.mackintosh@raeng.org.uk

Prince Philip House

Work is continuing to transform the lower ground floor of Prince Philip House into dedicated facilities to support the Enterprise Hub and its activities. The work is scheduled to complete in early 2017 and also involves installation of a new lift and refurbishment of the Academy's catering facilities.

News of Fellows

Professor Les Barclay OBE has been recognised for his outstanding contribution to the work of the Radiocommunication Sector of the International Telecommunication Union

Professor David Butler has been appointed as a Trustee of the Westcountry Rivers Trust board

Baroness Brown DBE has been appointed Chair of the Sir Henry Royce Institute for Advanced Materials at the University of Manchester

Allan Cook CBE has been awarded a Lifetime Achievement Award by the Association for Consultancy and Engineering

Professor Dame Ann Dowling OM DBE has been awarded the James Watt International Gold Medal by the Institution of Mechanical Engineers and Honorary Doctorates from the University of Huddersfield and Northumbria University

Sir James Dyson OM CBE FRS has been awarded Honorary Membership of the Institute of Electrical and Electronics Engineers

Carlos Ghosn KBE has been appointed chairman of Mitsubishi Motors

Professor Hugh Griffiths has been awarded the Dennis J Picard Medal for Radar Technologies and Applications by the Institute of Electrical and Electronics Engineers

Dr Andrew Hosty has been appointed Chief Executive of the Sir Henry Royce Institute

Dr Robert Joyce has been appointed as a special consultant at Grant Thornton accounting network

Professor Terence Langdon has been awarded an Honorary Doctorate from Peter the Great St. Petersburg Polytechnic University in Russia

Professor William Lee has been appointed President of the American Ceramic Society

Professor Roger Owen FRS has been awarded the 2016 Friendship Award by the People's Republic of China, the highest award for foreign experts

Dr Matthew Perkins has been appointed CEO of Oxford University Innovation

David Rooke MBE has been appointed a non-executive Director of HR Wallingford

Professor Roger Sargent has been awarded the Institution of Chemical Engineers' inaugural MM Sharma Award

Professor Christofer Toumazou FRS has been recognised with a Lifetime Achievement Award at the Elektra European Electronics Industry Awards 2016

Progression framework

The Academy and Science Council's joint diversity and inclusion progression framework is now available from diversityteam@raeng.org.uk

The framework was launched in early December. It can be used by professional bodies in science and engineering to assess their progress in diversity and inclusion and guide next steps. It was piloted in the summer to positive feedback, which included the Nuclear Institute's statement that it was an "excellent tool for tracking and moving forward diversity plans".

Call for award nominations

The following 2017 Royal Academy of Engineering Awards will open for nominations in the New Year:

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

RAEng Engineers Trust Young Engineer of the Year / Sir George Macfarlane Medal – awarded to UK engineers who have demonstrated excellence in the early stage of their career.

Colin Campbell Mitchell Award – awarded to an engineer or small team of engineers who have made an outstanding contribution to the advancement of any field of UK engineering.

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

Closing date: Monday 13 February 2017

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

For more information, please call the awards team on 020 766 0648 or email awards@raeng.org.uk

Nominations of prospective new Fellows

The Academy's effectiveness depends on the talent, energy and commitment of its Fellows, and the Fellowship is central to the whole membership process.

The deadline for making nominations is on **1 May 2017**. This can be done via the Academy's online system for nominations, which is found in the Fellows' secure area of the Academy's website www.raeng.org.uk/fellows-area

Fellows will require a username and password to access it. To retrieve a forgotten password, email webmaster@raeng.org.uk

All other queries regarding nominations should be directed to membership@raeng.org.uk

Publications received

Ceramics – Art or Science? by Dr Stan Jones OBE FREng can be read online or downloaded as an e-book at www.ceramicsartorscience.co.uk



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Obituaries

Mr Peter John H Carr FREng died on 30 October 2016, aged 78. He was formerly General Manager at Abu Dhabi Gas Liquefaction Co Ltd.

Mr Reginald Jack Daniel OBE FREng died on 28 September 2016, aged 96. He was formerly Head of the Royal Corps of Naval Constructors, and Director General Ships at the Ministry of Defence. He was a Founder Fellow of the Fellowship of Engineering.

Professor Herbert Alan French OBE FREng died on 7 November 2016, aged 91. He was formerly Head of Special Research Groups, Admiralty Surface Weapons Establishment.

Dr Keith William Arthur Guy FREng died on 1 November 2016, aged 73. He was formerly Chairman and

Managing Partner of Esprit Associates (Europe) Ltd.

Dr Kenneth James Irvine FREng died on 21 September 2016, aged 92. He was formerly Director of Special Steels at British Steel.

Dr Eric Harold Mansfield FREng, died on 20 October 2016, aged 93. He was formerly Chief Scientific Officer for the Ministry of Defence and a Founder Fellow of the Fellowship of Engineering.

Dr Adam M Neville CBE TD FREng FRSE died on 6 October 2016, aged 93. He was formerly a civil engineering consultant and a former Principal and Vice-Chancellor at the University of Dundee.

Dr Anton Eduard Pannenberg FREng died on 11 November 2016, aged 94. He was formerly Vice Chairman of the Board of Management of NV Philips Gloeilampenfabrieken.

Dr (Krishnamurthy) Raj Rajagopal FREng died on 10 November 2016, aged 66. He was formerly Chairman of HHV Pumps Ltd.

Professor Alan Simpson FREng died on 12 October 2016, aged 81. He was formerly Visiting Professor in Aerospace Engineering at the University of Glasgow.

Professor D Brian Spalding FREng FRS died on 27 November 2016, aged 93. He was formerly Managing Director of Concentration, Heat and Momentum Ltd.

Dr Howard Peter John Taylor FREng died on 7 November 2016, aged 76. He was retired.

Professor William Alfred Woods FREng died on 10 November 2016, aged 85. He was formerly Emeritus Professor of Engineering at Queen Mary, University of London.