



Engineers recognised at annual Awards Dinner

The winner of the MacRobert Award 2017, the UK's longest running and most prestigious prize for innovation in engineering, was announced at this year's annual Awards Dinner on 29 June at The Landmark London. The winner, Raspberry Pi, was honoured with a gold medal and the team members share a cash prize of £50,000. First presented in 1969, the MacRobert Award identifies outstanding innovation with proven commercial success and tangible social benefit.

HRH The Duke of Kent and Academy President Professor Dame Ann Dowling OM DBE FREng FRS presented the prize to the winning team: Dr Eben Upton CBE, CEO; James Adams, COO; Pete Lomas, Director of Engineering, Norcott Technologies; Dom Cobley, Senior Principal Software Engineer; Gordon Hollingworth, Director of Engineering; and Liz Upton, Director of Communications.

Finalists AlignRT, surface-guided radiotherapy pioneers, and Darktrace, cyber security machine learning experts, were joined on stage by guest speaker Dame Mary Archer DBE and presented with finalist certificates.

Raspberry Pi has become the best selling British computer and is transforming how people engage with computing by inspiring young people to learn coding and computer science. Sales of the low-cost credit-card-sized computers are used to fund outreach activities, including a worldwide network of after-school computing clubs, and a teacher training academy that has helped to reach 100,000 students since 2014. Raspberry Pi has also transformed the way engineers design control systems in industry, with over half of Raspberry Pis now sold to industry.

Dr Dame Sue Ion DBE FREng FRS, chair of the MacRobert Award judging panel, said "Raspberry Pi has also inspired multiple generations to get into coding: children are learning about coding for the first time, often alongside their parents and grandparents. Communities in the developing world are being empowered by the Raspberry Pi and its modern day computing-on-a-budget."

Throughout the evening a number of other Academy awards were presented that celebrate and recognise engineers who have made a remarkable contribution over the course of their careers. The President's Medal was awarded to Ian Shott CBE FREng in recognition of his many contributions to the work of the Academy, which have culminated in the successful establishment of the Enterprise Hub. Roma Agrawal, structural engineer and Associate Director at AECOM, received the Rooke Award for her contribution to the public promotion of engineering through talks and television appearances. Over the last six years, Roma has reached over 10,000 people at hundreds of events in the UK and abroad. The Major Project Award was presented to a team from Arup, for work on Glasgow's SSE Hydro Arena.

The Silver Medals, which recognise outstanding personal contributions to engineering in the early stage of awardees' careers, were presented to Billy Boyle, CEO of Owlstone Medical; Professor Constantin Coussios, Professor of Biomedical Engineering at the University of Oxford; Dr David Silver, Principal Research Scientist at DeepMind; and Rob Bishop and Dr Zehan Wang, Co-founders of Magic Pony Technology, which was acquired by Twitter in 2016.

The RAEng Engineers Trust Young Engineers of the Year awards, established with the support of the Worshipful Company of Engineers, were presented to Dr Ruth Misener, Frank O'Leary, Anna Polzajski, Chris Shaw and Dr Jenni Sidey. Dr Ruth Misener also won the Sir George Macfarlane Medal for demonstrating excellence in the early stage of her career for her work in developing innovative approaches to process systems engineering challenges using the latest computer science techniques.

The Academy's awards evening was made possible by the generous support of headline sponsor BP and silver sponsors BAE Systems, the Electric Power Research Institute, GKN, Jaguar Land Rover, Lockheed Martin and Rolls Royce. The MacRobert Award is supported by The Worshipful Company of Engineers.

▲ Top: The winner of the MacRobert Award 2017, the Raspberry Pi team with HRH The Duke of Kent and Professor Dame Ann Dowling OM DBE FREng FRS

President's column



Meetings and visitors

In her capacity as President, Dame Ann has met:

Lord Sainsbury HonFRS HonFREng,
Chancellor of the University of Cambridge
and Nigel Thomas, Executive Director,
Gatsby Charitable Foundation
John Alty, Director General, Trade Policy,
Department for International Trade
Presidents of the four UK national
academies
Professor Sir Jim McDonald FREng FRSE,
Principal, University of Strathclyde

Her engagements included:

House of Lords Science and Technology
Committee to give evidence on the
industrial strategy Green Paper
Royal Academy of Engineering and
EngineeringUK steering group meeting
Dinner with The Rt Hon Alan Milburn,
Chancellor, and Professor Andrew
Atherton, Professor of Enterprise and
Deputy Vice-Chancellor, Lancaster
University
Royal Commission for the Exhibition of
1851 Presidential Dinner
Delivered the Sir Richard Olver Engineering
Lecture, City, University of London
High-level stakeholder working group on
the UK's exit from the EU, universities,
research and innovation
Visit to MacRobert Trust
Professor Haroon Ahmed FREng book
launch
Department for Business, Energy and
Industrial Strategy roundtable on
investing in science, research and
innovation
Council for Science and Technology
Order of Merit Chapel Service and lunch
Dinner with Sir Mark Walport FRS
HonFRSE and the presidents of the
four national academies
Guest editor of *Woman's Hour*

She was interviewed by:

Pamela Gordon for the BBC
James Ashton for *The Times*

In May, it was a privilege to attend my first Order of Merit meeting and chapel service at St James's Palace. This special gathering is held every two years for all those who have received the order. This year, the meeting with the Queen and HRH Prince Philip The Duke of Edinburgh was somewhat poignant because it coincided with the announcement that Prince Philip would be retiring from public duties later in the year. Prince Philip was instrumental in establishing the Fellowship of Engineering in the 1970s, which of course later became the Royal Academy of Engineering, and as Senior Fellow has since continued to support engineering and to celebrate its contribution to society.

These values underpin the Academy's annual Awards Dinner, where we recognise and reward some of the very best engineers and engineering in the UK today. Each year, I have so much admiration for the talent and innovation that the awards celebrate, from engineers at the start of their careers and successful young entrepreneurs to engineering leaders who have made remarkable contributions to the profession.

The highlight of the evening was the presentation of the MacRobert Award, the premier prize for innovation in UK engineering. The award seeks to demonstrate the importance of engineering and the contribution of engineers to society and national prosperity. All three finalists' innovations have real impact on some of society's most pressing challenges. This year's winner, Raspberry Pi, has brought computer programming back into schools. Its \$35 microcomputer has redefined how millions of people across the world are engaging with coding and has inspired a wide range of applications. It has revolutionised the way engineers design control systems in industry. Congratulations to all of our award winners and finalists.

On 23 June, the first International Women in Engineering Day (INWED) focused its attention on raising awareness of the achievements of women in engineering. Organisations from across the world hosted events to encourage more girls to consider engineering careers and celebrated the engineering role models inspiring the next generation. I was delighted to be invited by the Women's Engineering Society (WES) to give the keynote speech at an event to celebrate the top 50 women in engineering under 35, selected through a competition WES had run in association with the *Daily Telegraph*. It was an honour to be in the company of so many talented and creative young women who are truly transforming the face of engineering. A few days later, I was able to continue this theme as guest

editor of *Woman's Hour* on BBC Radio 4. I was extremely pleased to be able to use this programme to showcase the work of some wonderful women engineers.

As mentioned in my column in the previous Newsletter, the Academy led the engineering profession's response to the government's Green Paper on industrial strategy (see page 3), releasing a report entitled *Engineering an economy that works for all*. As the announcement of the general election coincided with the report's release, the Academy also presented its key recommendations as a five-point manifesto for harnessing the full capacity, capability and potential of UK engineering. This included focusing on education and skills, supporting innovation and prioritising infrastructure.

As the Academy and professional engineering institutions continued to work on sharing and further exploring the report's findings, we were pleased to welcome Greg Clark MP to a roundtable hosted at the Academy shortly after it was published. He discussed the report's findings with senior representatives from the profession and welcomed the messages that it highlighted, particularly the need to boost the number of engineers with the right skills to drive productivity.

The findings have also been disseminated via a number of other channels. I spoke about industrial strategy and the profession's response to the Green Paper when I gave the inaugural Sir Richard Olver Engineering Lecture at City, University of London, at the end of March, discussing how enhancing collaboration between industry and academia could help to reinforce the industrial strategy. I also drew on the report when I participated in a Foundation for Science and Technology debate on 'What constitutes an effective industrial strategy for the UK?'. I was also able to promote the report's recommendations in an op-ed in the *Daily Telegraph* and when I was interviewed by *The Times*. Since the election, the report is being followed up with a focused engagement programme with relevant ministers and civil servants, and its recommendations will continue to be key messages in our communications. A long term industrial strategy is critical to sustaining engineering's vital contribution to the economy and society.

Addressing the engineering skills gap and ensuring that our profession continues to innovate remain priorities, and it is up to all of us to push these efforts forward.



Africa Prize winner

Godwin Benson, a 27-year-old Nigerian systems engineer, has won the Africa Prize for Engineering Innovation for his online platform, Tuteria.

The platform links students to qualified tutors in their area, who are within their budget. Users can choose the skill they want to learn, from a range of academic subjects or activities such as learning to play the piano or to make clothes. The platform has a rating system, and students book and pay for the lessons through an online system.

Benson was announced as the winner at an awards ceremony in Nairobi, Kenya, on 23 May. He was awarded a prize of £25,000, while the three runners-up each received a prize of £10,000. The four finalists delivered presentations about their innovations before judges and a live audience voted for the most promising.

The three runners-up were: Andre Nel from South Africa for the GreenTower Microgrid system, which reduces the energy used to heat water by 90%; Hindu Nabulumba from Uganda for the Yaaka Digital Learning Network, which teachers and students can use to share academic



knowledge and materials; and Kelvin Gacheru from Kenya for the Mobi-Water system, which allows water tank users to monitor and control the water in their tanks remotely using a mobile phone.

The Africa Prize for Engineering Innovation encourages talented

sub-Saharan African engineers, from all disciplines, to develop local solutions to challenges in their communities.

▲ Africa Prize for Engineering Innovation winner, Godwin Benson, is congratulated by judges Sheena Raikundalia, Rebecca Enonchong and Dr Moses Musaazi

Industrial strategy

On 24 April, the engineering profession, led by the Royal Academy of Engineering, published its response to the Green Paper on industrial strategy. The report calls on government to ensure that any proposals build on existing successful policies and avoid short-termism and siloed policymaking. It suggests a focus on a long-term vision that harnesses the UK's international reputation for engineering excellence and forges a new global identity for Britain as a top destination for inward investment and global talent.

The report, *Engineering an economy that works for all*, represents a collaboration of all 38 professional engineering organisations representing over 450,000 engineers, and benefited from an unprecedented level of engagement by the engineering community. The findings of the report are based on evidence and opinion gathered through a series of 10 workshops across the UK and a survey of the profession that received nearly 1,300 responses.

The response emphasises the importance of long-term, cross-party collaboration, and argued that UK industry, academia, government and investors must work together in partnership to achieve sustainable growth.

Specific recommendations include that the government puts greater emphasis on developing the skills of the UK workforce, as well as addressing the shortage of teachers in STEM subjects in both primary and secondary schools. It recommends a focus on promoting STEM subjects and engineering careers to under-represented groups to fully unlock the talent potential in the UK.

On research and innovation it recommends that the government boost R&D investment, and drive world-class, secure and resilient digital connectivity, including the promotion of digital skills and the development of a digital strategy. The report also discusses the need to improve energy efficiency and

resource productivity, with a long-term, integrated, energy strategy.

Following the announcement of the general election, the Academy worked with colleagues across the professional engineering institutions to distill the report into five key priorities for the next government, in order to harness the full capacity, capability and potential of the UK's engineering talent. The five priorities are: define and clearly articulate a bold, global and ambitious vision for the UK; focus the education and skills system on fully unlocking UK talent and potential; support innovation; spread the benefits of engineering, in terms of economic growth and social advancement, across the UK; and prioritise world-class supporting infrastructure. These goals will require a consistent, long-term, whole-systems approach, extending beyond a single parliamentary term.

To read the report in full, please visit www.raeng.org.uk/industrialstrategy

Innovation and entrepreneurship

In the spotlight: Victoria Hamilton

Victoria Hamilton has been awarded an Enterprise Fellowship for her Recoil Knee Pads innovation, securing £50,000 and a support package that includes mentoring from an Academy Fellow. Victoria will be mentored by serial entrepreneur Ian Ritchie CBE FREng FRSE, who will be helping her to grow her startup.

Each year, knee replacement surgery costs the NHS almost half a billion pounds. For some, knee damage is the inevitable result of old age. However, for those in manual trades there is a five-times greater risk of developing a knee condition than a white-collar worker.



▲ Victoria Hamilton displays her Recoil Knee Pads

Victoria initially developed Recoil Knee Pads to address the problems that her tradesman father was having with his knees.

Victoria's design aims to reduce the risk of knee damage for manual trades

professionals through a patent pending double layer pressure reduction system. An initial study by the University of Strathclyde has found a 20% improvement on pressure reduction when using Recoil, compared to existing gel and foam solutions currently available on the market.

Enterprise Fellowships provide funding and support to outstanding entrepreneurial early career engineers and researchers to enable them to develop a startup or spin-out business from their technological idea. Recoil Kneepads launched 500 products in June 2016 through its own website, Amazon and Toolstop.

For further information about the Fellowships and how to apply, please visit enterprisehub.raeng.org.uk/blog/schemeoraward/enterprise-fellowships-2/

GCRF Africa Catalyst



In April, 40 stakeholders from the Global Challenges Research Fund (GCRF) Africa Catalyst programme were invited to an Academy-hosted two-day conference in Addis Ababa. The stakeholders represented 17 countries and included African grant holders, UK partners and other interested parties.

The conference was led by Dr Ahmed Hamdy from the African Union Scientific Technical Research Commission and Yewande Akinola from the Global EMIT Project, who are both part of the programme's steering group. Academy Fellows David Thomlinson FREng and Professor Paul Jowitt CBE FREng FRSE also sit on the steering group.

The Academy launched the GCRF Africa Catalyst in September 2016, with the overarching aim of helping ensure that

there is sufficient, and appropriately skilled, local engineering capacity to participate in and drive development in sub-Saharan Africa.

Between January and June 2017, fifteen wide-ranging pilot projects, each comprising an African-UK partnership, were run. Those projects have focused on areas ranging from building and enhancing professional engineering institutions to small-scale programmes supporting female engineers.

GCRF Africa Catalyst is currently open for applications. For more information on how to apply, please visit www.raeng.org.uk/africa-catalyst

▲ Stakeholders from the GCRF Africa Catalyst programme gathered in Addis Ababa in April

Armourers and Brasiers Company Prize

On 3 April, Professor Mohan Edirisinghe FREng, Bonfield Chair of Biomaterials in University College London's Department of Mechanical Engineering, was announced as the second winner of the Armourers and Brasiers Company Prize.

Professor Edirisinghe has spent his 25-year career developing new methods of manufacturing advanced materials, in particular those used in healthcare. As medical devices have become smaller, he has developed novel techniques for producing materials at the micro- and nano-scale with features, such as bubbles and particles, that are many times smaller than the width of a human hair. His patented technology has enabled the manufacture of whole new drug delivery systems, such as layered capsules loaded with drugs.

The biennial prize is awarded to an individual based in the UK for excellence in materials engineering demonstrated by the successful application of novel materials science and technology in practical engineering systems. A cash prize of £2,000 is awarded to the winner.

The prize was established with kind support from the Worshipful Company of Armourers and Brasiers.

Ingenious grants awarded

In March, the Academy awarded 17 grants under its public engagement programme *Ingenious*. The projects will provide engineers with practical experience of public engagement and engage public audiences creatively with engineering.

The latest projects include an interactive science show developed for deaf or hard of hearing audiences. Based on the book *The Knowledge*, the show explores how engineering would enable society to restart following a fictional apocalypse. In another project, engineers at the universities of Strathclyde and Edinburgh will deliver a roadshow exploring the world of sludge, demonstrating how materials, such as custard, magma and cement, present unique engineering challenges because of their unpredictability.

Taking place across the UK during 2017 and 2018, the projects will provide opportunities for members of the public to meet professional engineers and learn about the exciting, creative work that they undertake.



Ingenious is funded by the Department for Business, Energy and Industrial Strategy. A full list of projects funded by the scheme can be found at www.raeng.org.uk/ingenious

▲ A 2016 *Ingenious* project that gave participants the chance to work with engineers to design and build an electro-acoustic guitar

Cheltenham Science Festival

The Academy sponsored two events at this year's Cheltenham Science Festival, which took place at the beginning of June.

For *Mysteries of The Mind - The Machine Mind*, science writer and broadcaster Dallas Campbell joined robotics and artificial intelligence expert Murray Shanahan and digital anthropologist Beth Singler to investigate the machine mind. The discussion explored how intelligence can be engineered, what is known about robot thought processes, and how similar they might be to our own.

Magical Elements was a magic show, in which materials engineer Professor Mark Miodownik FREng demonstrated the extraordinary properties of the ingredients that make 21st-century technology work, and what can be done to ensure that these materials do not run out.

In addition, the Academy funded the MakerShack space at the festival, through the *Ingenious* programme. It brought



▲ A visitor to the MakerShack learns how to programme an Ohbot, a programmable robot head © stillmovingmedia.co.uk

engineers from both industry and academia, scientists and makers together to inspire the public to explore the material world and the joy of making by means of interactive workshops and drop-in activities incorporating engineering, materials, art and technology.

Engineering a Better World showcase

On 5 April, the *Engineering a Better World* Competition Showcase saw teams of students from 18 UK universities pitch their innovations to solve global challenges at an exhibition-style event. It was judged by Dr John Lazar CBE FREng, Dr Jennie Dodson, UKCDS, Doug Harper, Engineers Without Borders, Rachel Litster, Restless Development, Professor Roger Benson FREng, Petter Matthews, Engineers Against Poverty, Dr Daniel Plant, Imperial College London, and Dr Hayaatun Sillem, Royal Academy of Engineering.

The five winning teams from Bournemouth University, University of Bristol, Heriot-Watt University, University of Hull, and University of Sheffield, will attend the Global Grand Challenges Summit 2017 in Washington DC. They will represent the UK in the Student Business Competition on 18 July 2017, competing against teams from the US and China.

Ahead of competing in Washington DC, the teams attended a Business Bootcamp on 20 May, led by Barbara Houseman, a leading voice coach who has worked with Daniel Radcliffe and Jude Law. and Marcus Extavour, Director of the \$20 million Carbon XPRIZE. The teams also participated in specialist online coaching from Innovation Node - Los Angeles, a business planning syllabus offered by a collaboration between University of Southern California, University of California, Los Angeles, and Caltech.

The Global Grand Challenges Summit 2017, jointly organised by the US, UK and Chinese academies of engineering, will take place on 19 to 20 July and will feature speakers including: Dr Rajiv Shah, President of the Rockefeller Foundation. Dame Sally Davies, Chief Medical Officer to the UK. Dean Kamen, inventor, entrepreneur and Founder of FIRST Robotics. and Molly Stevens FREng, Professor of Biomedical Materials and Regenerative Medicine at Imperial College London.

Academy funds seven new Research Fellows to pursue excellence in engineering research

The Academy has announced the seven engineering researchers who have been awarded five years' funding in the latest round of the Research Fellowships scheme.

The academics, whose work spans disciplines from transport to medical technology, are due to take up their posts at universities across the country in autumn 2017.

The funding is awarded to researchers who have demonstrated excellence in the early stages of their academic careers, and provides the engineers with freedom to concentrate on their

research by reducing their teaching and administrative duties. Research Fellows also receive mentoring from an experienced Academy Fellow, providing valuable advice and creating links with industry that will enable the researchers to establish themselves as future leaders in their fields.

The full list of Research Fellows is as follows:

- Dr Yoann Altmann - Heriot-Watt University
Bayesian computational methods for efficient low-energy imaging and sensing.
- Dr Siming Chen - University College London
Integrated III-V quantum dot photonic circuits on silicon platforms.
- Dr Mark Chiew - University of Oxford
Characterising the brain's spatio-temporal dynamics by integrating EEG and fMRI.
- Dr Adnan Mehonic - University College London
Next generation adaptive electronics for neuromorphic engineering.
- Dr Milos Nedeljkovic - University of Southampton
On-chip systems for mid-infrared sensing
- Dr Joseph Sherwood - Imperial College London
Interactions between fluid dynamics and biological function in microvascular disease.
- Dr Neil Vaughan - Bournemouth University
Virtual reality training: development of frameworks for haptic skill assessment, material modelling and adaptation.

People and talent

Learning to be an Engineer



▲ Students learn to think like an engineer

A recent Academy report, *Learning to be an Engineer*, explores the ways in which schools can create better and more engaging learning opportunities for would-be engineers. It follows an earlier piece of research, *Thinking like an Engineer: Implications for the education system*, which reframed engineering as a series of 'engineering habits of mind' (EHoM) - the thinking characteristics, skills and attributes typically demonstrated by engineers.

Learning to be an Engineer explores how EHoM can be integrated in the real world of busy schools and colleges to engage the next generation of engineers. The overarching hypothesis was that,

while it is necessary to continue to value disciplinary knowledge and practical skills, it is also important to think about the dispositions engineers need to acquire.

The report identifies key barriers that must be tackled to inspire young people throughout their education and improve the supply of engineering skills. It also highlights practical strategies for developing teaching and learning approaches that encourage a passion for engineering in young people.

The report, with results from three pilot schemes, can be downloaded from www.raeng.org.uk/publications/reports/learning-to-be-an-engineer

Enterprise Hub showcase



▲ Jack Hooper, creator of doppel, a wearable technology that helps users stay calm or alert, demonstrates his product at the Hub Showcase

On 23 May, the Enterprise Hub's Annual Showcase took place at Prince Phillip House. The event provided an opportunity for Enterprise Hub members to pitch their ventures to an audience, hoping to secure investments, clients or collaborations.

The showcase previously introduced only new Enterprise Hub members, but this year it was used to introduce Hub alumni: teams who have worked with the Hub for the last 12 months that are looking for investors, clients or collaborators.

The 12 Hub members pitched their ideas to almost 150 guests, investors, entrepreneurs, mentors and representatives from the corporate community, as well as promoting their work with exhibits of their groundbreaking innovations.

International Women in Engineering Day



▲ Aline Saraiva Okello, Hydrologist and Developer of HarvestRainWater app is one of the role models featured in the video

On 23 June, the Academy sponsored the very first International Women in Engineering Day (INWED), under the patronage of UNESCO. INWED, which was established in 2014 as a national day by the Women's Engineering Society, celebrates the achievements of women from all backgrounds in engineering on an international scale. It encourages more girls to consider a career in the field.

To mark the celebrations, the Academy launched a video profiling five women engineers under the age of 35 from Mozambique, Uganda, Palestine, Germany and the UK. All five role models have been actively involved with the Academy

through its international, Queen Elizabeth Prize for Engineering, Enterprise Hub and other activities, and have followed varied routes into their careers in STEM. The video also highlights the important role that both men and women can play to help improve diversity and inclusion in the sector.

The video can be viewed at bit.ly/2sMmyd4

For more information on INWED, please visit www.inwed.org.uk

View from the top: Engineering the future

On 27 March, Warren East CBE FEng, CEO of Rolls-Royce, gave the first of this year's *View from the top* lecture series. Over 130 guests attended the lecture on the topic of *Engineering the future*.

The event focused on the challenges and opportunities facing engineering in the next 20 years, as Warren reflected on his personal experiences during his successful career in engineering.

He shared with the audience that, ever since he was a teenager, he had recognised that engineering was "the natural engine of our economy" and had wanted to be part of it. He went on to discuss the key principles that he had learnt throughout his career and reflected on engineering in the UK.

The lecture attracted a number of students who were engaged in the Q&A session and who kept the conversation flowing throughout the networking reception.

STEM 4 Britain

On 13 March, the Academy supported the annual STEM 4 Britain competition at Portcullis House. The competition is a unique event in which early career STEM researchers have the opportunity to present their research to members of the Houses of Parliament.

From the 200 applications that were received, the top 60 engineering researchers from various institutes across the UK were shortlisted for their work in a range of engineering disciplines, and were chosen to exhibit their work. To explain the purpose and findings of their work, participants presented posters and engaged with the judges, all of whom were Academy Fellows.

Miguel Xavier, a PhD student at the University of Southampton, received the Gold Award for engineering for his work on techniques for isolating stem cells from human bone marrow. Luke Boldock from the University of Sheffield received the Silver Award and Harriet Parnell from the University of Nottingham received the Bronze Award.

QEPrize Global Engineering Ambassadors Network

The Queen Elizabeth Prize for Engineering's (QEPrize) Global Engineering Ambassador Network has grown significantly and would welcome potential new ambassadors.

As part of its commitment to raising the profile of engineering, the network brings together young and early career engineers from both businesses and academic institutions to act as engineering champions. They speak to teachers, parents, schoolchildren, politicians and journalists about their jobs and why engineering is such a rewarding profession.

The ambassadors focus on explaining to young people that engineering can be a career for anyone regardless of background. The network provides members with the chance to exchange ideas with peers across the world, to



▲ QEPrize ambassadors, (clockwise from top left) Brian Turyabagye, Joanne Beale, Paulo Gomes, Najwa Jawahar, John Collins, Yasmin Ali

attend events such as the QEPrize winner announcement and prize-giving ceremony, and to learn from leading global engineering figures, including QEPrize winners.

QEPrize engineering ambassadors also have opportunities to promote themselves and their work by participating in engineering engagement activities such as blog articles, interviews and promotional films.

For more information about the QEPrize Global Engineering Ambassador Network or to learn about joining the network, please visit www.qeprize.org/ambassadors

The QEPrize has also recently received further funding. In May 2017, Hitachi Ltd. in Tokyo, Japan, joined as its latest corporate donor, underlining the international profile and impact of the prize.

How to hack your home



A series of live shows, *How to hack your home*, presented by electrical engineer Professor Danielle George MBE has been touring the UK, supported by the

Academy. The robot-filled show was inspired by the 2014 Royal Institution Christmas lectures *Sparks will fly: How to hack your home*, which were broadcast on BBC Four.

The first event took place in Edinburgh in December 2016, and other locations included Manchester in February 2017 and Cardiff in March 2017. Every location hosted an afternoon show for school groups and an evening show for members of the public, attracting up to 250 people at each. The events were produced by the Royal Institution and supported by the Royal Academy of Engineering.

Using live demonstrations and experiments, Professor George explained

how to take control of the devices that people use every day and adapt and transform them to do extraordinary things. Audiences were encouraged to take part in different activities on stage, which included playing music using chocolate and vegetables.

Professor George is Professor of Radio Frequency Engineering at the University of Manchester. She has won a number of prestigious awards for her contribution to engineering through public engagement, including the Academy's Rooke Award for initiative in promoting engineering to the public.

◀ Professor Danielle George MBE has given a series of lectures on controlling and transforming everyday devices

Academy diversity and inclusion action plan

The Academy has put an internal action plan in place that aims to progress and track diversity and inclusion (D&I) throughout the organisation. The D&I action plan is set within the context of the Academy's strategic challenges and its equality, D&I policy, as well as the D&I programme's strategic aims.

Academy directors hold overall responsibility for the action plan's successful delivery and implementation, and each Academy team will contribute by developing its own departmental action plan. To facilitate this, a series of workshops is being rolled-out during the summer to help identify key actions. In preparation, Academy teams will be exploring the eight different areas of activity as outlined in the *D&I Progression Framework*.

As well as using the framework to plan internally, the Academy will in 2017 participate with other professional bodies in a collective benchmarking exercise that aims to gather examples of good practice.

The *D&I Progression Framework* was created in partnership with the Science Council to progress D&I across engineering and science professional bodies. The framework can be downloaded from www.raeng.org.uk/engdiversity

Arup supports historical study

A study into the origins and establishment of the Academy is being launched, led by distinguished historian and author Dr Peter Collins and supported by Arup.

The study will draw on extensive archival sources and will cover the years leading up to the founding of the Fellowship of Engineering in 1976. The project will be the first full-scale account of these years and will form a valuable resource for Fellows and others interested in the events and personalities that shaped the Academy's beginnings. A publication date will be announced in due course.

Dr Collins' 2011 lecture on the Academy's origins can be viewed at www.raeng.tv/Media/2011/The-pre-history-of-the-Fellowship-of-Engineering

New education funding

The Academy's regional educational programme in Barrow-in-Furness has recently attracted significant new funding from DONG Energy, the Furness Economic Development Forum through the Coastal Communities Fund, and The Ogden Trust.

This new funding has allowed for a full-time local consultant to strengthen delivery of the programme, which encourages schools to enhance and enrich their STEM curricula for students aged five to 19.

Aiming for Awesome

To celebrate the centenary of the RAF in 2018, the Academy is working in partnership with the RAF youth outreach team to develop enhanced learning and teaching resources and educational posters.

Called *Aiming for Awesome*, the resources will target children at the end of Key Stage 2 (primary) and the start of Key Stage 3 (secondary), and will be linked to the curriculum for both stages across the UK.

The resources will be connected to the RAF's work over the last 100 years and are being developed in association with RAF engineers. A resource and associated activity is being developed for each decade of the last century, linking to a significant piece of engineering that happened during that time.

The focus of the programme will be on engaging businesses with schools and colleges to effectively prepare young people for the world of work.

The new funding has also provided a number of fully funded four-week summer internships in the local energy industry for Year 12 students from the local college.

Since 2008, the project has provided over 56,000 STEM learning opportunities for the young people of Barrow-in-Furness.

Research Chair: Awardee profile

Professor Christoph Bruecker has been awarded the BAE Systems / Sir Richard Olver and Royal Academy of Engineering Chair in Aeronautical Engineering at City, University of London. His five-year research project to develop tiny hair-like sensors for use on the surface of aircraft is set to improve the control and sustainability of future aviation.

His research will bring together hundreds of tiny transparent 'micro-pillars' with optical fibres on an aerodynamic surface, providing a way to measure airflow around surfaces in much more detail and with more precision than the relatively few sensors currently found on aircraft. By using an elastic material for the



▲ Professor Christoph Bruecker is the new BAE Systems Sir Richard Olver and Royal Academy of Engineering Chair in Aeronautical Engineering at City, University of London

micro-pillars, the sensors can also flex in response to the airflow, allowing them to be used for flight control, adapting

to changing external conditions and providing finer control of an aircraft.

Using optical fibre technology also means that, unlike current sensors, the micro-pillars would not generate electromagnetic waves, allowing them to maintain control even in harsh environments.

The five-year Research Chair posts are co-sponsored by industry to support exceptional academics in UK universities who are undertaking use-inspired research with industrial partners.

Deadlines for the next round of the scheme close on 4 September. For further information, please visit www.raeng.org.uk/researchchairs or contact lucy.wheeler@raeng.org.uk

Engineering Leaders Scholarships event

On 31 March, the annual selection event for the Engineering Leaders Scholarships (ELS) (formerly the Engineering Leadership Advanced Awards) was held at Prince Phillip House.

Seventy of the UK's brightest engineering undergraduates undertook a series of activities and interviews to determine which 35 would become this year's Engineering Leadership Scholars. They will be the 22nd cohort of scholars, and include undergraduates from universities across the UK.

The 35 new scholars will embark on a three-year programme of career development activities, annual networking weekends, and access to advice and mentorship from Academy Fellows, Sainsbury Management Fellows (SMFs) and ELS alumni.

Fellows interested in acting as a mentor to the scholars should contact Jacqueline Clay, programme manager, at jacqueline.clay@raeng.org.uk



▲ Seventy of the UK's brightest engineering undergraduates undertook activities in a bid to become one of this year's 35 Engineering Leadership Scholars

Mission to Mars

The Academy has launched a new resource box, *Mission to Mars*, which is being distributed to STEM teachers in 450 UK secondary schools.

The resource explores how engineers will make it possible to live on other planets and is split into three sections that can be taught separately or form a narrative for a whole day session. Students will learn about designing an aerodynamic nose cone, how to create heat shields to protect spacecraft on re-entry and how to grow food in Martian soil.

The resource will be distributed along with training and support materials, and is available to download for free from

the website at www.raeng.org.uk/education/schools/teaching-and-learning-resources

Athena Survey of Science, Engineering and Technology

In April, the *Athena Survey of Science, Engineering and Technology (ASSET) 2016* was published by the Equality Challenge Unit. ASSET is a periodic survey of higher education institutions that reports on experiences of gender equality in STEMM (science, technology, engineering, mathematics and medicine) academia. The Academy is one of the funding and steering group partners for ASSET 2016 along with the Royal Society,

the Royal Society of Biology and the Academy of Medical Sciences.

The 2016 survey goes further than in previous years, investigating intersectionality between gender and other diversity characteristics (ethnicity, sexual orientation, age and disability). It reports some notable differences in experience between populations such as those with or without caring responsibilities or those from different ethnic groups. Later in the year, further discipline-specific survey reports, including one for engineering, will be published.

The report and infographics that illustrate the key results are available at www.ecu.ac.uk/publications/asset-2016

Technology and society

Big Bang Fair 2017

In March, the Academy had a successful stand at the Big Bang Fair at the NEC, Birmingham. Over 80,000 people attended the event, and it is estimated that the Academy's *Thinking Like an Engineer* stand attracted nearly 8,000 visitors over the four days.

Visitors took part in interactive activities including designing their own Mars rover buggy, an engineering careers quiz and designing the best paper aeroplane.

Academy staff were joined by Enterprise Fellow Dr Alexander Enoch, founder of Robotical Ltd and creator of Marty the 3D-printed programmable robot.



Visitors queued up for the opportunity to programme Marty to move, dance and play football.

A team from the University of Cambridge also joined the stand to showcase graphene ink, which can be used as a

low-cost, high-speed method for printing electronics, such as a paper-thin piano. The team are developing the technology further, hoping to use it for newspapers and intelligent packaging.

▲ Visitors to the Academy's stand at the Big Bang Fair gather for a demonstration of Marty the robot

Voice of the Future 2017

In March, six early career engineers from Academy programmes joined Voice of the Future, where they had the opportunity to question leading policymakers.

Among those questioned by panellists were Jo Johnson, Minister of State for

Universities and Science, Sir Mark Walport, Government Chief Scientific Adviser, Chi Onwurah, Shadow Industrial Strategy Minister, and members of the House of Commons Science and Technology Committee.

Academy panellists asked a range of questions, such as how the difference

between science and engineering timescales and political and funding cycles could be addressed.

All attendees agreed that the event was informative, and that the value of evidence and how it can influence the direction and delivery of government policy had been made clear.

Energy and natural resources

Biofuels report

The Academy has produced a study on liquid biofuels for use in UK transport, at the request of the Department for Business, Energy and Industrial Strategy and the Department for Transport.

With a particular focus on the carbon footprints of different biofuels, the project reviewed the available literature and conducted an international stakeholder consultation to assess the environmental, economic and social issues related to biofuel production and use.

Gauging the sustainability of liquid biofuels is a complex undertaking. The report provides policymakers with an in-depth description of the key considerations and uncertainties involved.

Ultimately the report recommends a risk-based approach to promoting those feedstocks and biofuels that present a low risk of high greenhouse gas emissions and other sustainability impacts while disincentivising high-risk alternatives. It also highlights the importance of considering biofuels as part of much wider systems, including energy, agriculture and forestry.

The report will be available to download from the Academy website in July.

Academy roundup

Thank you to Fellows

During the 2015-16 financial year the Academy secured £5.1 million in

new funding, which was used for its programmes and towards the creation of the Taylor Centre. These funds came from individual Fellows, corporations, trusts and foundations, as well as from the government.

None of these funds would have been secured without the active involvement

of Fellows, whether in making introductions to potential funders, providing oversight and expertise for programmes, or helping to shape and develop the case for support.

The Academy is very grateful to Fellows for the continuing invaluable assistance and advice that they provide.

Media roundup

The engineering profession's response to the industrial strategy Green Paper received coverage in *The Times* at the end of April, and an opinion piece from the President on the subject appeared in the *Daily Telegraph* at the beginning of May. The President was also quoted in a *Guardian* article on the Budget, and was the focus of an article in *The Times* in June, which emphasised the need for investment in skills and innovation.

The Academy's *Learning to be an engineer* report featured on BBC News online in March and was covered in engineering trade press, while news of the launch event itself reached over 200,000 people on social media.

Ahead of the 2017 awards season, coverage of last year's award winners continued. The MacRobert Award 2016 winners Blatchford featured in an *Evening Standard* article about addressing the engineering skills gap, along with a quote from Chair of the MacRobert Award judging panel Dr Dame Sue Ion DBE FREng FRS. The MacRobert Award judges also selected their favourite fictional engineering innovations in a *Huffington Post* article to raise awareness of the award ahead of the announcement of the 2017 finalists, for which media engagement is well underway.

The launch of the Taylor Centre in February featured in many articles in engineering trade press, and was covered in an episode of the Sky News technology show *Swipe*, which was also shared online across Facebook and YouTube.

Legacy support

An updated version of *Build a better world*, the Academy's legacy information brochure is now available from the Development department or can be downloaded from the Academy's website at www.raeng.org.uk/get-involved/ways-to-give

The brochure contains details of how legacy giving has helped the Academy further its mission over the years.

Fellows who would like to have a confidential, informal discussion about legacy giving are invited to contact Samantha Bagchi, Director of Development, on 020 7766 0681 or samantha.bagchi@raeng.org.uk

Welcoming new Fellows



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

In the coming weeks, we will be welcoming the new Fellows into the Academy. I want to thank the current Fellows for all of their hard work in identifying and reviewing proposals for nominees, which is a fundamental and core responsibility of the Fellowship.

As we celebrate the arrival of new Fellows, we should also consider what remains to be done. The incoming Fellows always talk to me about the honour they feel in joining the Academy, and of their desire to support its future activity. Several new Fellows have also mentioned that they appreciate being supported by existing Fellows in getting to know the Academy better. So, as the cycle of new Fellows turns, may I encourage you to proactively seek out and connect with a new member to explore mutual interests. I hope that serendipity and the wider social events of the Academy across the UK will support these new connections in the year ahead, along with a more dynamic online presence.

I should be interested to hear about how your experience of meeting new Fellows progresses, and how the Academy might support this endeavour more effectively in the future.

On a personal level, I would be interested to connect with Fellows who share an interest in fine art, paintings of contemporary engineering subjects, and sculptural engineered landscapes. If that is of interest to you, please do let me know via the details below.

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

News of Fellows

Professor Colin Bailey has been appointed President and Principal of Queen Mary University of London

Sir Tim Berners-Lee OM KBE FRS has been awarded with the Association for Computing Machinery's AM Turing Award

Dr Peter Bonfield OBE has been appointed Deputy President of the Institution of Engineering and Technology (IET)

Dr David Braben OBE has been appointed Vice President of children's charity SpecialEffect

Professor Nigel Brandon OBE has been appointed Dean of the Faculty of Engineering at Imperial College London

Past President **Lord Browne of Madingley FRS** has been appointed Chairman of the Courtauld Institute

Jane Bryant has been appointed a trustee of the IET

Professor Jonathon Chambers has been appointed as the first International Honorary Dean of the College of Automation at Harbin Engineering University (HEU), China

Professor Roland Clift CBE has been awarded the Institution of Chemical Engineers' George E Davis medal

Professor Phil Coates has been awarded the International Polymer Processing Society's JL White Innovation Award for 2017

Dr Carolyn Griffiths has been elected President of the Institution of Mechanical Engineers

Professor Andy Hopper CBE FRS has been appointed Treasurer of the Royal Society

Sir Jony Ive KBE has been appointed Chancellor of the Royal College of Art

Jonathan Lyle CB has been appointed to the board of the Compound Semiconductor Applications Catapult

Professor Gordon Masterton OBE FRSE has been elected Junior Warden of the Worshipful Company of Engineers

Dervilla Mitchell CBE has been appointed Chair of UK, Middle East and Africa at Arup

Professor Anne Neville OBE FRS has been awarded an honorary doctorate in engineering from Heriot-Watt University.

Sir John Parker GBE has been named Chairman of Laing O'Rourke

Ian Ritchie CBE FRSE has been appointed chairman of Tern plc

Paul Stein has been appointed CTO at Rolls-Royce

Nick Winser CBE has been appointed President of the IET

HM The Queen's Birthday Honours

Congratulations to the nine Academy Fellows who were recognised by HM The Queen in this year's Birthday Honours list.

Order of the Bath Knight Commander (KCB)

Vice Admiral Simon Robert Lister CB OBE

Order of the Companions of Honour

Dame Vera Stephanie Shirley DBE FREng, entrepreneur and philanthropist, for services to the IT industry and philanthropy.

Knighthoods

Professor Mir Saeed Zahedi OBE FREng, Technical Director, Chas A Blatchford & Sons, for services to engineering and innovation.

Companions of the Order of the Bath (CB)

Jonathan Henry Lyle FREng, Chief Executive, Defence Science and Technology Laboratory, for services to defence.

Dames Commander of the Order of the British Empire (DBE)

Professor Xiangqian (Jane) Jiang FREng, Director, UK Engineering and Physical Sciences Research Council Future Advanced Metrology Hub, University of Huddersfield, for services to engineering and manufacturing.

Commanders of the Order of the British Empire (CBE)

Professor Haro Bedelian OBE FREng, for services to engineering and international trade.

Professor Serena Best FREng, Professor of Materials Science, University of Cambridge, for services to biomaterials engineering.

Dr Andrew C Harter FREng, Founder and CEO, RealVNC Ltd, for services to engineering.

Robert Keiller FREng, Chairman, Scottish Enterprise, for services to business entrepreneurship.

Officers of the Order of the British Empire (OBE)

Rakesh Sharma FREng, Chief Executive, Ultra Electronics, for services to defence capability.

Reece Foundation grant for North East Graduate Enterprise Fellowships

The Academy has secured funding from the Reece Foundation for one Enterprise Fellowship for the North East of England over three years. Any graduate from the North East with an innovative engineering idea will be eligible to apply. The first Reece Enterprise Fellow will be appointed in late 2017 and will commence their Fellowship from April 2018.

The Academy is grateful to the Reece Foundation for its support, which has created regional opportunities for outstanding entrepreneurs. The Academy will be playing a role in supporting the foundation's main objective of increasing long-term and sustainable prosperity in the North East, primarily through the promotion of engineering and manufacturing.

Full details about the Fellowship, including the selection criteria, can be found at www.enterprisehub.raeng.org.uk

Forthcoming events

4 September 2017

Research Forum

Venue: Prince Philip House

Time: 10.00am to 4.30pm

5 September 2017

AGM

Venue: Prince Philip House

Time: 4.30pm to 8.00pm

14 September 2017

Fellows' visit to the National Physical Laboratory

Venue: National Physical Laboratory, Teddington

Time: 10.30am to 2.30pm

4 October 2017

Autumn Lecture

Venue: Prince Philip House

Time: 6.30pm to 9.00pm

5 October 2017

Fellows' visit to the National Traffic Operations Centre

Venue: National Traffic Operations Centre, Birmingham

Time: 10.30am to 1.30pm

10 October 2017

View from the top

Venue: Prince Philip House

Time: 6.30pm to 9.00pm

18 October 2017

New Fellows' briefing

Venue: Prince Philip House

Time: 12.30pm to 5.00pm

18 October 2017

New Fellows' dinner

Venue: Drapers' Hall

Time: 6.30pm to 10.45pm



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Obituaries

Professor David Vernon Morgan

FREng died on 12 June 2017, aged 76. He was formerly a Research Professor in microelectronics at Cardiff School of Engineering.

Professor Frederick Brian Pickering

FREng died on 27 February 2017, aged 89. He was formerly Emeritus Professor in metallurgy at Sheffield Hallam University.

Mr Thomas Sharples OBE FREng

died on 31 January 2017, aged 85. He was formerly Divisional Technical Director for British Aerospace Defence.

Mr James Barrie Scuffham FREng

died on 10 May 2017, aged 82. He was formerly Executive Director at Davy Corporation, and a Visiting Professor at the University of Newcastle.

Dr Robert Michael Thorogood FREng

died on 17 March 2017, aged 79. He was retired.

Professor Peter Neil Temple Wells

CBE FREng FRS died on 22 April 2016, aged 80. He was formerly Distinguished Research Professor at Cardiff University.

Professor John Clifford West CBE

FREng died on 26 October 2016, aged 94. He was formerly Vice-Chancellor of the University of Bradford.