ROYAL ACADEMY OF **ENGINEERING**

Creators of GPS win the Queen Elizabeth Prize for Engineering

On 12 February, the 2019 Queen Elizabeth Prize for Engineering (QEPrize) was awarded to the four engineers responsible for creating GPS – the first truly global, satellite-based positioning system – at a ceremony held at Prince Philip House. The announcement was made by Lord Browne of Madingley FREng FRS, Chairman of the QEPrize Foundation, in the presence of HRH The Princess Royal, QEPrize Global Engineering Ambassadors, representatives from donor companies and school students.

The four winners, Dr Bradford Parkinson, Professor James Spilker, Hugo Fruehauf and Richard Schwartz, were awarded the £1 million prize, which celebrates global engineering innovations. Their pioneering work has given free, immediate access to position and timing information to over four billion people around the world. HRH The Princess Royal congratulated the winners after the announcement, speaking to them about their groundbreaking work before meeting the other guests at an afternoon reception. They will be formally honoured at a ceremony later this year, where they will also receive an iconic trophy designed by 2019 Create the Trophy competition winner, Jack Jiang from Hong Kong (see page 4).

Primary and secondary school students, aged between 9 and 13 also attended the event, as one of the prize's aims is to inspire the next generation of engineers.

GPS's applications range from navigation and disaster relief to climate monitoring systems, banking, transport, agriculture, and industry. It uses a constellation of at least 24 orbiting satellites, ground stations and receiving devices. Each satellite broadcasts a radio signal containing its location and the time from an extremely accurate onboard atomic clock. GPS receivers need signals from at least four satellites to determine their position; they measure the time delay in each signal to calculate the distance to each satellite, then use that information to pinpoint the receiver's location on earth.

As the chief architect, Dr Parkinson is often called the 'father of GPS' after he successfully built upon several separate systems to create the current GPS design. His insistence that GPS should be intuitive and inexpensive made navigation accessible to billions.

Dr Parkinson recruited Professor Spilker to design the signal that the satellites broadcast. Professor Spilker's team also developed and built the first receiver to process GPS satellite signals. GPS receivers rely on accurate timing information, broadcasted from satellites, to determine their position on earth. Hugo

▲ (L-R) Hugo Fruehauf, Professor James Spilker, HRH The Princess Royal, Dr Bradford Parkinson, Lord Browne and Richard Schwartz

Fruehauf, then the chief engineer at Rockwell Industries, led the development of a miniaturised, radiation-hardened atomic clock that became the GPS 'clock of choice'. Its accuracy is the backbone of communications systems, power grids, financial and trade networks, and other critical infrastructure.

For GPS to be affordable, each satellite had to be longlasting. Richard Schwartz, the programme manager at Rockwell during the development of the satellites, was tasked with ensuring a three-year lifespan. His design was resistant to intense radiation and lasted over nine years.

Professor Sir Christopher Snowden FREng FRS, Chair of the QEPrize Judging Panel, said: "The global positioning system epitomises what the QEPrize stands for; starting with an almost impossible challenge, GPS is now universally accessible and benefits billions of people around the world each day. Over time, its varied applications have profoundly transformed how society operates, and its impact will only continue to grow. This is exactly the type of groundbreaking engineering achievement that inspires young people to become tomorrow's engineers."

Lord Browne said that the winners' "revolutionary work epitomises the excellence in engineering that the QEPrize both recognises and celebrates, and we hope that it continues to inspire the next generation of engineers to take up the challenges of the future".

The QEPrize announcement received extensive worldwide media coverage, raising awareness of the prize across the world. The announcement, and the work of the 2019 laureates, was featured across the BBC, and in a wide variety of other media including the *Daily Telegraph*, *The Times*, CBC, *Forbes*, Mail Online, *Financial Times*, and *The Economist*.

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President's column

The Academy has had a busy start to 2018, with a host of announcements, launches and events. The new year has also heralded a new era of collaboration; a welcome move as more partnership working with the wider profession is needed if we are to unite and align our efforts to increase the skills pipeline and demonstrate the role that engineering plays in society.

On 14 January, the Academy's year kicked-off with a reception for the presidents of the professional engineering institutions (PEIs). It was a real pleasure to welcome so many of my colleagues to the Academy. In changing times, the people and organisations that make up the professional landscape will provide the necessary resilience to keep engineering in its rightful place in national life. This evening was a marvellous opportunity to share our experiences and our commitment to working together.

Along with the presidents of the other National Academies, I also met with Chris Skidmore MP, Minister for Universities and Science, and attended a UK Research and Innovation board dinner discussion. At both events, meeting the government's target for an investment of 2.4% GDP on research and development was a major item of discussion. Research and innovation and the supply of skilled people were also on the agenda at a high-level meeting on exiting the EU that I attended with Minister Skidmore and Robin Walker MP, Parliamentary Under Secretary of State at the Department for Exiting the European Union. Across government departments there is real engagement to ensure that UK research and innovation can continue to flourish.

Engagement with government was a focus of discussions later in January when the Academy held an inaugural reception for the National Engineering Policy Centre. Attended by representatives from PEIs, as well as senior policymakers, the event was an opportunity to discuss how existing relationships can be strengthened to enhance the profession's influence in government and deliver increased impact from evidence-based policy. Engineering can address a wide range of the complex societal challenges that the government currently faces, and the centre has an important role to play in ensuring that engineering expertise is fully brought to bear on these issues.

The first collaborative output of the centre was Professor John Perkins CBE FREng's follow up to his 2013 review of engineering skills, published at the end of January. *Engineering skills for the future – the 2013 Perkins review revisited* highlighted that there remain numerous barriers to addressing the annual shortfall of 59,000 engineers and technicians in the UK workforce, including narrow post-16 education options, teacher shortages and an overly restrictive Apprenticeship Levy. For the industrial strategy to achieve its aims, government must review and address these challenges to nurture and grow a skilled engineering workforce that can improve productivity and economic growth.

The Academy continues its own focus on building up the pipeline of engineering talent. After a very successful first year, season three of *This is Engineering* was launched in January, featuring young engineers from industries ranging from robotic farming to sustainable cosmetics. Recent research has shown that the campaign is having an impact: a survey of GCSE and A-level students following the first year of the campaign revealed that consideration of engineering as a career option has almost doubled among those who have seen the films, and the increase is even more significant among female and BAME students. It's great to see that this work is having such an effect and the campaign has even more ambitious plans for the coming year.

The announcement of the fourth QEPrize in February was a wonderful opportunity to inspire future talent with the important role that engineering plays. It was awarded to the four engineers who created GPS, an innovation that has truly transformed life in the 21st century. The award also gives younger generations an opportunity to get involved. This year's Create the Trophy competition, which invites young people around the world to design the QEPrize trophy, had a record number of entries from more than 50 countries.

I was pleased to welcome many of you and your guests to Fellows' Day at Prince Philip House on 4 February. This annual event is an ideal opportunity for Fellows to hear an update about Academy activities and to meet up with other Fellows and staff. We also heard from some of the exceptional researchers and innovators the Academy supports and about some of the work Fellows are doing for the Academy. I am continually impressed by and grateful for the amount of time and expertise that Fellows dedicate to the Academy. It is integral to our work.

Meetings and visitors

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

Chris Skidmore, Minister for Universities and Science, with the other National Academy Presidents

Professor Lynn Gladden, Executive Chair, EPSRC, and Kedar Pandya, Associate Director, EPSRC, with Dr Hayaatun Sillem and Dr Andrew Clark

She attended the following events and meetings:

President's Reception for the engineering profession

UKRI Board dinner with other National Academy Presidents

QEPrize judges' dinner

QEPrize winner announcement event

QEPrize Trustee Board meeting

The Department for Business, Energy and Industrial Strategy High Level Stakeholders Working Group on EU Exit

National Engineering Policy Centre inaugural reception

Fellows' Day at the Academy

Chaired the Academy Trustee Board

Chaired the Academy Nominations Committee

Chaired the Academy Remuneration Committee

The City and Guilds 140th anniversary celebration event

Pitch@Palace Africa

Blavatnik Awards for Young Scientists

Council for Science and Technology

Austrian Academy of Sciences Research Board

January 2019: a milestone for the National Engineering Policy Centre

On 28 January, the Academy hosted the National Engineering Policy Centre's winter plenary and inaugural reception.

The National Engineering Policy Centre is a partnership between the 38 different engineering organisations, representing 450,000 engineers. It will allow partners to work collaboratively on issues that affect, or should be informed by, the whole profession, while respecting the distinct expertise of each institution.

At the plenary, Fellows from the centre's working group, chief executives and senior staff from the professional engineering institutions met to explore potential areas of work and make recommendations on the direction for the centre's programmes and operations. Dr Nick Starkey, the Academy's Director of Policy, gave an opening address before participants engaged in interactive sessions on emerging workstreams for the centre. These included: work on the safety and ethics of autonomous systems; a profession statement for the upcoming governmental spending review; and an initial scoping of the challenges that a national engineering and technology strategy could address. Guest speaker Rebecca Endean, Director of Strategy at UK Research and Innovation (UKRI), offered insights into UKRI's approach to expanding its impact and reach across geographies, sectors and scalable programmes.

In the evening, over 70 guests from the profession, government and industry heard speeches from John Manzoni, Chief

▲ (l-r) Dr David Cleevely, Bernadette Kelly, Dame Ann Dowling,John Manzoni and Sana Kharegani

Executive of the Civil Service; Bernadette Kelly, Permanent Secretary of the Department for Transport; Sana Kharegani, Head of the Office for AI; and Dr David Cleevely CBE FREng, Founding Director of the Centre for Science and Policy at the University of Cambridge.

In her talk, Bernadette Kelly said: "2018 saw industry and government work together more closely than ever to put engineering firmly in the spotlight for the Year of Engineering ... It's encouraging to see that same spirit of collaboration at the heart of this new policy centre."

▲ Participants at the centre's plenary explored areas of potential work and direction for the National Engineering Policy Centre

Policy Fellowships programme

The Academy is developing a Policy Fellowships programme to support the centre's aim of strengthening habits of engagement and collaboration between government and the engineering profession.

Policy Fellows will be senior civil servants with policy challenges that would benefit from a diverse range of engineering input. The fellowships will provide a bespoke set of interactions between Policy Fellows and engineering experts, including seminars, one-to-one meetings and site visits. In the first instance, the centre will focus on matching Policy Fellows to the wealth of expertise and experience in the Academy's Fellowship and network of awardees, before drawing in others across and beyond the profession.

A small-scale pilot of the programme will run between March and May this year, which will include civil servants from the Department for Transport, Home Office, Department for Digital, Culture, Media and Sport, and the National Infrastructure Commission. A key part of this programme focuses on building closer relationships with policymakers and growing the awareness and appetite for engineering expertise in government.

How to engage with policy activities

There are many opportunities for Fellows to engage with policy activities, including contributing expertise to consultation responses, joining a study working group, speaking at events on behalf of the National Engineering Policy Centre, or supporting foresight activities. For more information, please email Marine Shah, Senior Manager Policy Centre, at **marine.shah@raeng.org.uk**

Thought leadership

Trusted data-sharing report

On 4 December, the Academy launched an interactive online publication, *Towards trusted data sharing: guidance and case studies*.

The publication explores emerging approaches to controlled data sharing between organisations. It includes a checklist to guide organisations that want to share data and collaborate with others to develop solutions. It also includes 10 case studies that provide examples of how groups of organisations and people have come together to share personal and non-personal data within and across sectors, including manufacturing and logistics, energy, infrastructure, aerospace, smart cities, transport, health, and consumer applications. These approaches help to break down data silos and enable access to data and associated data services that add value. They need to address commercial, legal, regulatory, ethical and technological challenges, and require new workforce skills.

▲ The online interactive report uses case studies to showcase data sharing activities that add value

Dr Mike Short CBE FREng, Chief Scientific Adviser for International Trade, chaired the launch event, which included a panel discussion involving Professor Jim Norton FREng, Chair of the project's working group; Mark Enzer, Chair of the Digital Framework Task Group; Dr Liane Smith FREng, Director of Larkton; and Peter Wells, Head of Policy at the Open Data Institute. A question and answer session raised issues around leadership, understanding flows of value, standards, and the importance of good information management.

Thought leadership dinners

On 6 February, a group of experts gathered at the Academy to discuss the current impact of misinformation and manipulation of information on the internet.

The discussion covered how it might evolve and what role technology and regulation can play in helping society manage the risks. The event, part of series of events convening experts from business, government and academia, featured guest of honour Sarah Connolly, Director for Security and Online Harm at the Department of Culture, Media and Sport.

Closing the engineering gender pay gap

The Academy is developing a profession-wide plan to close the engineering gender pay gap in partnership with the WISE Campaign.

A thorough analysis of the pay gap across engineering organisations and between individual engineers, as well as an investigation into the causes of the gap, will inform the plan. In addition to working with employers, the Academy will also partner with the Women's Engineering Society during 2019, its centenary year, to deliver a survey into the experience of women engineers in the 21st century.

▲ Attendees at the Academy's annual D&I event in November, which focused on data-driven culture change

These results will be integrated into the development of the action plan to ensure that it considers the views of both engineering employers and engineers. The Academy will bring engineering employers together to collaborate and agree key actions most likely to have a positive impact on increasing and progressing women to more senior engineering roles.

The Academy is keen that as many engineering employers as possible participate in the delivery of the action plan. If you are an engineering employer and would like to find out more about, or get involved in the development of plans to close the gap, please email **diversityteam@raeng.org.uk**

Graduate Engineering Engagement Programme

Between September and December 2018, four Graduate Engineering Engagement Programme (GEEP) events were held.

The Academy, BuroHappold, Aston University and BAE Systems hosted events with 184 student attendees. Of these, 28% were female, 91% were from ethnic minority backgrounds, and 80% were from post-92 universities or socioeconomically disadvantaged backgrounds.

The events are followed up by Standards for Educational Opportunity (SEO) giving individual support to students applying for graduate and internship roles. For the first time this year, students who secure internships will be offered mentoring from the Academy's Engineering Leaders Scholarships programme and QEPrize Ambassadors.

GEEP aims to increase the transition of engineering graduates from diverse backgrounds into engineering employment. It is led by the Academy and delivered in partnership with SEO and 16 engineering employers.

For more information, visit **www.raeng.org.uk/GEEP**
To find out more or get involved, email **diversityteam@raeng.org.uk**

▲ Participants at a GEEP event © SEO London

Inclusive recruitment workshop

On 4 March, the Academy hosted an inclusive recruitment workshop with Business in the Community.

Thirty-six employers attended the event, which aimed to develop knowledge and understanding of how employers can ensure that their recruitment and selection processes are as inclusive and free from bias as possible.

The content of the workshop was based on the inclusive recruitment toolkit that members of the Diversity and Inclusion Leadership Group developed. The toolkit can be found at **www.raeng.org.uk/inclusive-recruitment**

Fellows' visit to Royal Holloway, University of London

On 13 March, Professor David Howard FREng hosted a Fellows' visit that included a tour of Royal Holloway, University of London.

The tour included the Picture Gallery, which holds original Victorian art collected by Thomas and Jane Holloway. The Fellows also had an exclusive tour of the Shilling Building, the home of the university's new electronic engineering department.

The visit included an introduction to the philosophy behind the college's teaching and the work of Beatrice Shilling, the pioneering engineer the building was named after. Following the tours, Fellows and department staff contributed to an in-depth discussion about the future of engineering.

The future of engineering event in Edinburgh

On 4 March, the University of Edinburgh's School of Engineering hosted *Emerging technologies: the future of engineering*, a panel discussion in partnership with the Academy.

The discussion was part of the university's events programme to celebrate the 150th anniversary of its Regius Chair of Engineering. Professor Mark Miodownik MBE FREng chaired a panel comprised of current Chairs in Emerging Technologies including: Professor Susan Rosser, University of Edinburgh; Professor Brian Geradot, Heriot-Watt University; and Professor Colin McInnes MBE FREng FRSE, University of Glasgow. Their technologies ranged from space to engineering cells for combined diagnostics and therapeutics.

An audience of 160 Fellows, students and members of the public listened to the panel discuss what the future might hold when their emerging technologies become mature. The talk was followed by a Q&A session and dinner at Playfair Library Hall for past and present awardees to celebrate the scheme's 10th anniversary.

Professor Jason Reese FREng FRSE, Regius Professor of Engineering at the University of Edinburgh, was due to take part in the panel but was unfortunately taken ill during the day. The Academy was saddened to hear of his subsequent untimely death on 8 March.

Policy roundup

Professor Dame Ann Dowling OM DBE FREng FRS gave oral evidence to the House of Commons Science and Technology Select Committee as part of its inquiry into the balance and effectiveness of research and innovation funding. The Academy also submitted evidence to the committee's *Brexit, Science and Innovation: Preparations for 'No-Deal'* inquiry.

A joint response with a total of seven organisations contributing as part of the new National Engineering Policy Centre was also submitted to the Science and Technology Select Committee's inquiry on *Technologies for clean growth.* The response focused on the need to take a systems approach to meeting the UK's climate targets, which are currently at risk of being missed. This would include heat, transport, demand management and policy measures. It also noted the need to understand the international context and opportunities. Following the submission, Malcolm Brinded CBE FREng gave oral evidence to the committee in January.

D&I inside the Academy

The Academy has been working on several internal diversity and inclusion (D&I) projects.

In November, the Academy's Trustee Board agreed to support a campaign to encourage all Fellows to self-declare their diversity data in spring 2019. Fellows can do this by logging into the 'my account' area of the website.

On 3 December, the Academy celebrated International Day for People with Disabilities by publishing a series of internal blogs by employees who discussed their experience with various disabilities. The Academy has also published a Building Accessibility Statement that promotes the inclusive features of Prince Philip House.

Throughout February, the Academy teamed up with InterEngineering to deliver a social media campaign in celebration of LGBT History Month, accessible at **www.raeng.org.uk/LGBTHM2019**

On 11 April, the Academy is also holding an inclusive selection workshop for employees, which will increase understanding of how attraction and selection processes can be made more inclusive and achieve a more diverse range of Fellows, awardees and prize winners.

Public engagement

Meet the 2019 Create the Trophy winner

Jack Jiang, aged 16, from Hong Kong won the QEPrize's 2019 Create the Trophy competition with his design inspired by sustainable engineering.

The competition, open to those aged between 14 and 24, saw record engagement from over 50 countries around the world. The 10 finalists were reviewed by an expert panel of judges, led by Ian Blatchford, Director and Chief Executive of the Science Museum Group. Joining him on the panel were Roma Agrawal MBE, a structural engineer at AECOM; Rebeca Ramos, a designer at Heatherwick Studio; and Zoe Laughlin, Co-Founder and Director of the Institute of Making. Jack's trophy impressed the judges with its complexity and balance, combining traditional trophy shapes with elements of modern wind turbines.

Jack is currently studying for his GCSEs and is interested in architectural engineering. He said "It's an absolute pleasure to be able to design the trophy for the Queen Elizabeth Prize for Engineering. It was an incredible opportunity and I am extremely honoured to be part of this prestigious prize. Being one of the youngest entrants selected for the top 10 shows that creativity and the ability to design is not limited by age. I hope this inspires more young people to enter into the world of engineering."

▲ Jack's design was inspired by sustainable engineering

Jack was announced as the winner in the presence of HRH The Princess Royal during an event held at the Academy on 12 February. He won a state-of-the-art laptop and his design will be 3D printed into the final trophy and awarded to the winners of the 2019 QEPrize later in the year.

Look back at the Year of Engineering

▲ Students interacting with the robot orchestra

2018 was the government-sponsored Year of Engineering, a 12-month campaign to tackle the engineering skills gap and promote diversity in the profession.

The Academy was a key partner in the campaign, and launched its *This is Engineering* campaign to coincide with the Year. The Academy reached young people with activities including a stand at *New Scientist* Live, a robot orchestra at the Academy and a screening of the Marvel film *Black Panther* at the Science Museum to celebrate International Women in Engineering Day.

To reach policymakers, the Academy also launched a 10-point action plan in Parliament, in collaboration with Engineering UK, to respond to the significant skills shortage in engineering. In November, the Institution of Civil Engineers, the Year of Engineering and the Academy organised a national celebration of engineering service at Westminster Abbey, attended by Dame Ann Dowling, Chris Grayling MP and Nusrat Ghani MP, together with over 1,800 engineering professionals and guests.

By aligning outreach efforts right across the profession, the Year of Engineering and *This is Engineering* have helped to achieve measurable improvements in public perceptions of engineering. The legacy of the Year will be taken forward in new work to support engineering across government departments.

This is Engineering's new season

▲ Sophie works on high-speed planes at BAE Systems and Jahangir is a broadcast engineer at the BBC

On 30 January, *This is Engineering* launched a new season of films featuring four young engineers working in a range of industries from robotic farming to sustainable cosmetics.

The four new engineers are Halvard, a robotics engineer who creates robots to revolutionise farming; Jahangir, who works for the BBC as a broadcast engineer; Olivia, a chemical engineer at Lush (see *Ingenia* 75, 'How I got here'); and Sophie, an engineer at BAE Systems, working on the high-speed planes of the future.

This is Engineering was created in response to significant demand for engineering talent in the UK and narrow public perceptions of engineering and engineers. The campaign launched in January 2018 and the first two series of films have been viewed more than 30 million times by teenagers on social media. A survey of GCSE and A level students that followed the first year of the campaign revealed that consideration of engineering as a career option has now almost doubled among those who have seen the films, and the increase is even more significant among female and black, Asian and minority ethnic students.

To watch the new videos, visit **www.thisisengineering.org.uk** or follow **@ThisisEng** on Twitter.

Projects to engage the public with engineering

In January, the Academy awarded 27 grants from its public engagement programme *Ingenious*.

The programme funds projects that help engineers engage public audiences with creative engineering content, and build their engagement skills. They will reach diverse and underrepresented audiences across the UK, providing opportunities for members of the public to meet professional engineers and learn about the exciting, creative work that they do.

The 2019 projects include a photo-electric light orchestra that will see school children in north Wales engineer musical instruments. Another music-based project will connect engineers, carnival artists, designers and sound system experts to develop activities to communicate to the public the science, technology, engineering, arts and maths that goes into producing Caribbean cultural festivals. In Bristol, the 'Get-Smarter' project will introduce primary school students to the exciting new world of the Internet of Things and teach them how to use it to solve real-world problems.

Now in its 13th year, the *Ingenious* scheme has funded over 200 projects and provided opportunities for more than 5,000 engineers to take part in public engagement activities that have reached more than 2.5 million members of the public.

To find out more about *Ingenious*, visit **www.raeng.org.uk/ingenious**

▲ Previous *Ingenious* projects have included CHaOS Roadshows (top), which used hands-on experiments to engage young people with science and gives undergraduate and graduate students the opportunity to develop engineering communication skills. Fire Organ: Seeing Sound (bottom) brought together musicians, artists and engineers to design, prototype and build a fire organ

Research and innovation

Global Grand Challenges Summit 2019: first speakers announced

The Academy has announced the first speakers for the Global Grand Challenges Summit 2019, which will take place in London, hosted by the Academy, between 16 and 18 September.

The event will convene world leaders with the next generation of engineers to build collaborative solutions for our future world. The summit is based around the theme of *Engineering in an unpredictable world*, with subthemes of 'Can we sustain 10 billion people?' and 'Will AI and other transformational technologies change humanity for the better?'.

Confirmed speakers so far include Anna Rosling Rönnlund, Co-Founder, Gapminder Foundation; Professor Juergen Maier CBE FREng, Chief Executive, Siemens UK; Rob Meyerson, Senior Vice-President, Blue Origin; Wang Jian, Chairman of Technology, Alibaba; Professor Luciano Floridi, Professor of Philosophy and Ethics of Information and Director of the Digital Ethics Lab, Oxford Internet Institute; Professor Dame Wendy Hall DBE FREng FRS, Regius Professor of Computer Science, University of Southampton; and William Tunstall-Pedoe, entrepreneur and co-creator of Amazon Alexa and Echo.

The Academy would value involvement from Fellows in the summit as attendees, speakers, mentors, and to provide insight and coaching through the student activities. To find out more, contact **martina.carlucci@raeng.org.uk**

Celebrating failure: my biggest business mistake and how it helped me succeed

On 14 February, the Enterprise Hub hosted an event about failure, discussing how making mistakes can help entrepreneurs to succeed.

The event was chaired by Suranga Chandratillake OBE FREng, General Partner at Balderton Capital, at Balderton's offices. It brought together technology entrepreneurs from various stages in their career to learn from and quiz three successful founders: Pip Jamieson, CEO of The Dots, a networking and hiring platform for creatives; Dr Eric Mayes, CEO of medtech company EndoMag, a 2015 MacRobert Award finalist; and Professor Florin Udrea FREng, Chief Technology Officer and Founder of Cambridge CMOS Sensors Ltd and Cambridge Microelectronics Ltd.

The discussion included topics such as how to handle crisis communications, how to motivate a team when things aren't going well, and the importance of looking after mental health. One of the most important takeaways from the event for all participants was to approach failure constructively, respond quickly and learn from mistakes.

▲ Suranga Chandratillake OBE FREng

Academy co-hosts UK-India workshop on rebuilding Kerala for a resilient future

On 6 and 7 January, Professor Muhammed Basheer FREng led a UK delegation and co-chaired a workshop on rebuilding a resilient Kerala after the floods in Trivandrum, India.

The workshop convened senior experts to bring insights from across disciplines and sectors into Kerala State's reconstruction efforts after devastating floods hit in the summer of 2018. Through the workshop, key stakeholders from both countries jointly identified short-term, medium-term and long-term goals for: resilient reconstruction of critical and civil infrastructure; capability development to cope with future floods; and integrated land use planning. Ensuring that the next generation of engineers is equipped to deal with these aspects was high on the agenda.

The workshop was co-hosted by the government of the state of Kerala and the Academy under the Newton-Bhabha Fund, which supports UK-India bilateral science and innovation collaboration. Following the event, the State Government has asked UK experts to give strategic advice on its reconstruction policies and programmes.

Following the workshop, Professor Basheer said: "Engineers have a pivotal role to play ... This is a crucial time of the post-flood reconstruction process and it is important to have stakeholders from across government, industry and academia share a common understanding and jointly develop a plan to collaborate for the common good."

▲ Sri S Vijayanand, former chief secretary of the government of Kerala, gave the inaugural address

Four engineering researchers awarded grants to advance national security

In December, four early-career researchers were awarded UK Intelligence Community Postdoctoral Research Fellowships.

The four awardees and their projects are: Dr Jerone Andrews from University College London, who is developing a system that can detect anomalies in images of faces; Dr Raoul Guiazon from the University of Leeds, whose project will focus on detecting unusual behaviour in Internet of Things networks; Dr David Harris from the University of Exeter, who is working on virtual reality training for counter-terrorism policing; and Dr Tim Helps from the University of Bristol, who is creating insect-inspired robots for remote missions.

(l-r) Dr Jerone Andrews, Dr Raoul Guiazon, Dr David Harris and Dr Tim Helps

The fellowships are offered by the government Office for Science and administered by the Academy, and provide a vital link between academia and the intelligence community. Each awardee receives funding for at least two years of their project and mentorship from an Academy Fellow as well as an advisor from the intelligence community.

LIF residential training

Ai Karwati and Arintiara Ramadhyastasari from Indonesia during a pitching practice session with their mentor

Over the past three months, the Leaders in Innovation Fellowships (LIF) programme has hosted intensive entrepreneurship training and mentoring in London.

The training involved 211 innovators, representing 15 countries spanning four continents. Participants learned how to commercialise their research and bring their technologies to market. The innovators included Enzo Romero, whose startup, Giving a Hand, makes personalised hand and finger prosthesis for low-income amputees in Peru and Latin America through a microfinance business model. Hassan Mohamed from Malaysia has created a floating solar farm and Celestin Soubrier's transport app 'Jetty' is making public transport safer and more efficient in Mexico City.

The innovators have returned to their home countries where they will continue to develop their innovations over the coming months with a support programme of in-country events and mentorship.

The Academy and in-country partner organisations select participants based on the excellence and potential of their innovation, the social and economic benefits it will bring, and their potential as entrepreneurs. The LIF training programme equips participants with a combination of business and technical skills and personal 'soft' skills, to best equip them to make the transition from researcher, academic or engineer to realising their entrepreneurial potential.

The LIF Online Community was also launched at the beginning of this year, which will bring together alumni, provide continued access to training and resources, and facilitate collaboration between members of the global entrepreneurship community.

Ten engineering innovators recognised by the Enterprise Hub

On 5 February, the Enterprise Hub welcomed its fifth cohort of entrepreneurs to the SME Leaders programme.

The 10 entrepreneurs were selected for their exceptional engineering innovations and their ambitious plans to scale their companies. They include Paul Jackson of Femtogenix, a drug discovery company working to develop the latest generation of chemotherapies, and Waraporn Supmak of Oxford Vision and Sensor Technology, which designs and supplies machine vision systems. Two Enterprise Fellowship alumni have also joined the programme: James Roberts of mOm Incubators and Oluwaseyi Sosanya of Gravity Sketch, both of whom the Hub has supported since the beginning of their startup journeys.

The SME Leaders programme is designed to upskill leaders of tech and engineering SMEs to support them through the tricky process of scaling-up. The focus of the programme is to develop the leadership skills of the participants through a series of training workshops, leadership coaching, and mentoring. Participants are also able to take a leadership course of their choice outside the Academy with a £10,000 grant. Visit **www.enterprisehub.raeng.org.uk** for more information.

Oluwaseyi Sosanya, Co-Founder of Gravity Sketch, during a speed mentoring session with Academy Fellow Dr Liane Smith FREng at the induction day

Swedish academy visits London

On 8 February, the Academy hosted the Royal Swedish Academy of Engineering Sciences (IVA) for a high-level roundtable discussion on creating sustainable and healthy cities of the future.

The discussion, chaired by Dr Mike Short CBE FREng, covered how the academies worked and their respective relationships to government. It focused on the relationship between the built environment and engineering, and the need for both to inform each other through interdisciplinarity, systems approaches and people-centric design.

IVA's trip focused on understanding the management of tomorrow's multicultural, multi-ethnic, high density, smart cities. It included trips to several UK architecture and planning firms, as well as the Mayor of London's office and GSMA , the mobile operator's trade body. The Academy was represented by Fellows with expertise across infrastructure, planning, built environment and smart cities alongside guests from Arup and the Design Council.

Dr Paul Shearing: emerging battery technologies

Dr Paul Shearing is an Academy Chair in Emerging Technology, studying emerging battery technologies for next-generation energy storage.

The Academy has played an important role in his career, from a 'Headstart' course he attended as an A-level student that helped him to decide to study engineering, to a Research Fellowship, before being awarded a Chair in Emerging Technologies. In 2016, he was one of the Academy's Young Engineers of the Year.

His work explores the development of electrochemical technologies such as batteries and fuel cells, with a particular focus on the development of advanced materials characterisation techniques to optimise materials for cost, energy and power density, and safety. Paul's work has also covered battery failure; following high-profile battery failures, his team has developed new tools and techniques to understand and image the dynamic processes of catastrophic failure as they happen, providing insight into batteries that operate in demanding applications, such as on the International Space Station.

The lithium ion battery industry produces billions of cells per year, set to increase dramatically with the increasing adoption of electric vehicles. Paul has worked with a range of companies to develop tools that are providing scientific insight and guiding the optimisation of new materials and devices.

Paul's work contributes to the grand challenge of energy storage, which will play an increasingly important role in our lives, from micro-batteries that power medical implants and wearable technologies, to much larger applications for vehicle electrification and grid-scale energy storage.

The Chair in Emerging Technologies scheme is a highly prestigious award given to global research visionaries who will lead major research, translation and innovation programmes around key emerging technologies, to facilitate technology commercialisation and the creation of significant UK economic and social benefit. It is a 10-year award to the value of £2,780,000.

For more information about the scheme, visit **www.raeng.org.uk/ciet**

Frontiers of Development symposium

Between 11 and 13 March, the third Frontiers of Development symposium took place at the Wellcome Genome Campus, near Cambridge. It was the final event in the symposia's inclusivity and wellbeing series, focusing on *Inclusivity and wellbeing in the first 2,000 days of life.*

The symposium was chaired by Sir Ian Diamond FRSE, Chair of Department for International Development Research Advisory Group and Professor Anthony Costello, Director of the UCL Institute for Global Health. Experts from a wide range of disciplines, ranging from paediatricians and nutritionists to economists and environmental engineers, came together to discuss how future generations can survive and thrive in a transformed environment.

Keynotes from Cyril Engmann, Global Programme Leader for PATH's Program: Maternal, Newborn, Child Health and Nutrition, and Mercy Musomi, Executive Director of Girl Child Network, highlighted the significance of health equity and gender equality in child development. At the end of the symposium, participants could bid for seed funding to build on collaborative partnerships established at the event.

In addition to the core symposium sessions, Professor Lord Robert Mair CBE FREng FRS welcomed participants to a formal dinner at Jesus College, University of Cambridge, alongside Fellows from the four national academies.

▲ The third symposium took place at the Wellcome Genome Campus

Frontiers of Development symposia are delivered in collaboration with the British Academy, Academy of Medical Sciences and the Royal Society to offer multidisciplinary events that bring together the best early- and mid-career researchers and practitioners around the most pressing development challenges.

For more information about the programme, please visit **www.raeng.org.uk/FoD**

Research Chairs announcement

Five exceptional academics have been awarded Research Chairs or Senior Research Fellowships to undertake use-inspired research that meets the needs of industrial partners. These five-year positions cover a broad spectrum of engineering research, from healthcare AI to coating technologies.

Full list of awardees:

- Dr Sotirios Tsaftaris, University of Edinburgh, Cannon Medical Research/Royal Academy of Engineering Senior Research Fellow in healthcare AI
- Dr Priti Patel, University College London, BBOXX/Royal Academy of Engineering Senior Research Fellow in smart solar solutions for all (S34ALL)
- Professor Ping Xiao, University of Manchester, Rolls-Royce/Royal Academy of Engineering Research Chair in advanced coating technology
- Professor Roger Lewis, University of Sheffield, RSSB/Royal Academy of Engineering Research Chair in wheel/rail interface low adhesion management
- Professor Mikel Lujan, University of Manchester, ARM/Royal Academy of Engineering Research Chair in low power IoT and edge computing: taming heterogenous system-on-chips

The next round of applications is due to close in September 2019.

For more information, please visit **www.raeng.org.uk/researchchairs**

Leeds research day

On 30 January, the University of Leeds and the Academy held their third annual event celebrating the best of engineering research.

Ten engineers, from the university, the Institution of Civil Engineers, Yorkshire Water, Jacobs and AECOM, gave presentations linked by the theme *Engineering our future*. Dr Richard Bourne discussed his Academy-funded Industrial Fellowship at Astra Zenica and how it led to an EPSRC project on coupling machine learning algorithms with a cyber-physical reactor platform. Former Leverhulme Trust Senior Research Fellow Dr Raul Fuentes showed the world's first asphalt 3D printing drone, which can be used to fix cracks in the road before they become potholes. The event concluded with an evening lecture from Michael Wright, Regional Director of AECOM, on the design and installation of the award-winning British Antarctic Survey base Halley VI.

Pitch@Palace Africa

On 7 March, Muzalema Mwanza, the founder of Safe Motherhood Alliance, a Zambia-based social enterprise that develops simple, low-cost disposable baby delivery kits, was announced as the winner of Pitch@Palace Africa 3.0 at St James's Palace.

The kits developed by Safe Motherhood Alliance contain tools for midwives in Zambia delivering babies in under-resourced clinics or at home births. Each kit includes basic items such as a scalpel, sanitary pads, a hygienic sheet and cotton swabs, a list often given to prospective mothers to provide themselves when they arrive at hospitals to give birth. Inspired by Mwanza's own experience of giving birth to her first child, Safe Motherhood Alliance now produces thousands of kits each month, selling them through 20 clinics directly to expectant mothers and midwives in an effort to reduce infections among newborns.

Pitch@Palace Africa is a collaboration between the Royal Academy of Engineering's Africa Prize for Engineering Innovation and Pitch@Palace, an initiative founded by HRH The Duke of York in 2014 as a platform to amplify and accelerate the work of entrepreneurs. The event saw the 16 engineering entrepreneurs shortlisted for the 2019 Africa Prize pitch their innovations directly to an influential audience from the worlds of entrepreneurship, technology, media and investment.

Following the audience vote, Chelmis Thiong'o from Kenya came second with her innovation Sign-IO, a smart-glove that tracks and translates sign language movements into speech in real time. In third place was Anne Rweyora from Uganda with Smart Havens Africa, a social enterprise that aims to end housing poverty through the development of sustainable, eco-friendly affordable housing for women.

▲ (l-r) HRH The Duke of York with Muzalema Mwanza, winner of Pitch@Palace Africa, and Chelmis Thiong'o and Anne Rweyora who came second and third

The winner of Pitch@Palace Africa 3.0 has been invited to take part in Pitch@Palace Global in December 2019, which will bring together entrepreneurs from Pitch@Palace events in countries across the globe.

All shortlisted entrepreneurs for the Africa Prize receive eight months of bespoke business mentoring, training, and networking opportunities, to enable them to turn their prototypes into profitable businesses with genuine economic and social impact. In June, the Africa Prize finalists will present their pitches at an event held in Kampala, Uganda, with the winner receiving £25,000 and three runners-up each awarded £10,000.

Find out more at **www.raeng.org.uk/africaprize**

Education and skills

Are we connected? STEM teaching and learning resource

This spring, the Academy launches its latest teaching and learning STEM resource, *Are we connected?*

The resource explores engineering through the technology we use to communicate and connect, such as mobile phones, GPS, AI technology, encryption and cybersecurity. Supported by BAE Systems, the activities from this resource are being used as part of its national roadshow, which is set to reach a record 420 schools and 90,000 students aged 9 to 13 through the year.

Teacher coordinators from the Academy's flagship education programme, Connecting STEM Teachers, will also train teachers and distribute the resource throughout their regional network of schools.

In total, students from a further 900 schools will learn about curriculum topics such as electromagnetic spectrums, algorithms and textual computer programming language through teamworking and problem-solving challenges that promote 'engineering habits of mind'.

All of the Academy's teaching and learning STEM resources, including *Are we connected?,* are available to download from the Academy's website at: **http://stemresources.raeng.org.uk**

▲ The new resource explores technology that we use to connect, such as mobile phones, GPS and AI

Continuing professional development event at WMG

On 6 February, the latest in a series of Academy continuing professional development (CPD) sessions for further education engineering lecturers was held at WMG (formerly known as the Warwick Manufacturing Group), the University of Warwick.

The sessions aim to upskill lecturers through exposure to current industrial practice. This includes training to use the Academy's teaching and learning resources, which feature case studies of professional engineers from underrepresented groups in the profession.

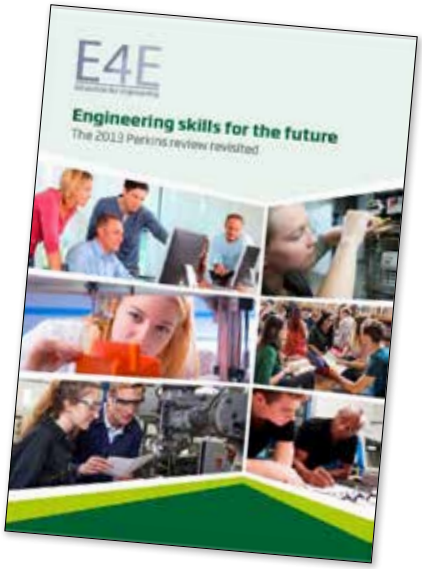
The sessions play a valuable role in building closer relations between business, research establishments and colleges. They are also an opportunity to share best practice and update lecturers on Academy-led efforts to improve D&I in engineering.

Lecturers from colleges across the UK attended the session. It included a talk about opportunities for professional technicians at WMG and a tour of WMG's facilities, including its work on battery technology and autonomous vehicles. The Academy is grateful to the late Lord Kumar Bhattacharyya CBE FREng FRS and his team for their assistance in organising and hosting the event. Further CPD sessions are due be held over the coming months at BP, the Royal Mint, Ricardo and Rolls-Royce.

Engineering skills for the future: The 2013 Perkins review revisited

On 30 January 2019, *Engineering skills for the future: The 2013 Perkins review revisited* was launched at the House of Lords.

The review, a collaborative effort chaired by Professor John Perkins CBE FREng and contributors from the Education 4 Engineering (E4E) skills policy group, is an update to the original *Perkins Review of Engineering Skills* published in 2013 for the (then) Department of Business, Innovation and Skills. The new review examines the progress made since 2013 in delivering engineering and skills education, from the academic foundations through to higher education and eventually upskilling the workforce. It also discusses key issues such as the lack of female participation in STEM subjects, and the advent of digital skills and need for integration in engineering education.



A series of recommendations for government, the engineering community and academic institutions are also included.

Speakers included Dr Hayaatun Sillem, CEO of the Academy, Professor Juergen Maier CBE FREng, CEO of Siemens and Baroness Lorely Burt of Solihull. The speakers discussed the rise in digital skills for the future and engineering an education system that works for all. Season three of the *This is Engineering* campaign was screened for the first time at the event.

Following the launch, on 14 February a meeting of the E4E skills policy group was held. It focused on next steps after the Perkins release, the outlook for university technical colleges and an update on the digital skills work within the Academy.

Children's ward receives Academy resource kits

Young patients at a hospital are using one of the Academy's STEM resource packs as part of their in-hospital education. The children's ward at the Royal National Orthopaedic Hospital in Stanmore, Watford, has been carrying out activities from *Engineering in the movies*.

The idea was the brainwave of Annabelle, aged nine, who felt stuck on the ward with nothing to occupy herself with. She wanted to help imaginative minds and decided to introduce STEM packs to engage others in engineering activities as part of their education while in hospital.

In March, Annabelle also ran a 'Discover STEM' event for a local children's club during British Science Week.

▲ Annabelle with the STEM resource packs

Training today's teachers

On 21 January, the Academy launched *Engineering the future: training today's teachers to develop tomorrow's engineers*, commissioned by E4E.

Primary school teachers typically lack the confidence to teach engineering-related themes to their students and are unfamiliar with the breadth of career opportunities engineering offers. The study showed that teachers could use 'engineering habits of mind' to understand the interdisciplinary connections between subjects and help them to plan computing, design and technology, and science lessons, raising the number of opportunities for primary learners to engage with engineering.

The launch was attended by the authors from the University of Winchester, trainee teachers and professional engineering institution representatives.

The report can be downloaded from **www.raeng.org.uk/trainingtodaysteachers**

STEM Ambassadors training

On 1 February, the Academy held its first STEM Ambassadors workshop to train Research Fellows to become registered STEM Ambassadors.

During the one-day workshop, Research Fellows received training through practical hands-on activities and learned how to connect with schools and young students. They used the Academy-developed resource toolkit *Engineering materials for a greener planet*, which includes a full set of activities, materials and equipment to learn how to redesign energy supply by building a solar boat. They also received an induction about the STEM Ambassador programme from STEM Learning.

It is hoped that Research Fellows will inspire more people by engaging with children in their local schools, inspiring them to choose STEM subjects.

The Academy will run the workshop annually to support Research Fellows.

STEM for Britain

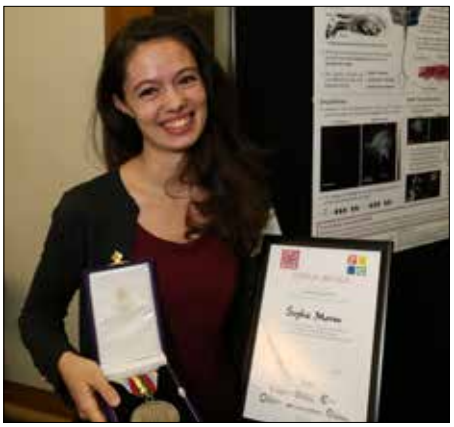
On 13 March, STEM for Britain, an annual national competition that is open to early-career researchers in science, technology, engineering and maths, took place at Portcullis House, Westminster.

At the event, presenters discussed their research with expert judges and MPs. The day was divided into two sessions with 90 posters presented in each; chemistry, mathematics and physics, and biosciences and engineering.

The judging panel, chaired by Professor Mary Ryan FREng, selected three outstanding poster presentations. The £2,000 Gold Prize award was won by Sophie Morse (right) from the Noninvasive Surgery and Biopsy Laboratory at Imperial College London for her research on using ultrasound and micro bubbles to transport blood to the brain. Sophie was also awarded the prestigious Westminster Medal, which is presented to the overall winner of all five sessions.

The event was a great success and well attended by MPs and representatives from major learned societies.

A special thank you goes to members of the judging panel who gave up their time to review abstracts and judge the posters: Professor Mary Ryan FREng, Professor Jeff Magee FREng, Professor Mark Sandler FREng, Professor Robert Wood FREng, Professor Constantinos Soutis FREng, Professor Colin Garner FREng, Professor Bashir Al-Hashimi CBE FREng, Dr Paul Shearing, Professor Ravi Silva FREng, Dr Donal Cronin FREng, Professor Albert Rodger FREng FRSE and Professor Brian Falzon.



Academy roundup

Ideas for Fellowship engagement wanted

Naomi Climer CBE FREng, Vice-President of Fellowship Engagement, provides an update on the Academy's Fellowship activities.

The ability of the Academy to deliver its public purpose depends on significant Fellow engagement. The good news is that the Academy should also be able to deliver stimulation, fulfilment and enjoyment to our Fellows when they give their time, energy and expertise. Since becoming Vice-President for Fellowship Engagement, I've been talking to Fellows and Academy staff, and to my predecessor Professor Richard Williams OBE FREng FRSE, to understand what we need to ensure a continued dynamic, engaged body of Fellows. I'm open to your ideas!

I enjoyed meeting many of you at Fellows' Day on 4 February. For those who were unable to attend, I hope you will be able to join us at one of our other events, including:

- East Midlands lecture – Nottingham, Thursday 2 May 2019
- Royal Society of Edinburgh/ Academy joint lecture – Wednesday 5 June
- Emeritus lunch – Prince Philip House, Thursday 13 June
- Awards Dinner – Banqueting House, Whitehall, Thursday 11 July
- Summer reception - Prince Philip House, Wednesday 17 July
- AGM – Prince Philip House, Monday 30 September
- New Fellows Dinner - Thursday 7 November

For more details on any of these events, please see page 16 or visit ***www.raeng.org.uk/events***

It would be good to have more regional events, so I'd welcome suggestions on this – especially from Fellows willing to organise an event in their region.

We will be circulating a Fellows' questionnaire during the year to better understand the interests and passions of the Fellowship. We will also be asking Fellows to consider registering more information about their diversity data. This will be optional, but it would be really helpful to have a better understanding of our mix of Fellows as we work to positively impact D&I across the profession.

This is also a good time to consider whether there are any potential new Fellows in your circle, particularly from

▲ Professor Naomi Climer CBE FREng, Vice-President for Fellowship Engagement

smaller companies or areas that may be less well represented at the Academy. There's still plenty of time to get nominations in before September; both staff and volunteers can help guide you through the process.

Finally, many Fellows volunteer their time as members of an Academy committee, but for those of you who are not committee members it's important that you have an opportunity to hear about committee work. As such I have agreed with the Academy's operating committee chairs that in future newsletters this column will be written by a chair to provide insight into committee activity.

I welcome thoughts, advice and insights, and can be contacted at **vicepresident@raeng.org.uk**

Fellows' day

On 4 February, over 140 Fellows, their partners and guests attended the annual Fellows' day at the Academy.

It was an informal and social occasion that gave Fellows an opportunity to hear the latest updates on the Academy's work and find out how they can get further involved.

In addition to an exhibition showcasing the Academy's work, Fellows found out more about *This is Engineering*, as well as D&I activities.

Dame Ann's speech focused mainly on collaboration, both national and international, which has been a consistent theme of her term as President and vital to every area of the Academy's work. She spoke about the National Engineering Policy Centre, which was created in partnership with the professional engineering bodies to enhance the influence of engineering expertise in the design and delivery of policy.

Other speakers included Professor Gordon Masterton OBE FREng FRSE who talked about the MacRobert Award, which celebrates its 50th anniversary this year. Dr John Lazar CBE

▲ Dr John Lazar with Dame Ann Dowling

FREng gave an overview of the forthcoming Global Grand Challenges Summit and was joined by Dr Cindy Smith, a Royal Academy of Engineering/Scottish Water Senior Research Fellow in Biofiltration by Biological Design, whose presentation on engineering biology for sustainable drinking water treatment was closely linked to one of the summit's subthemes. Naomi Climer CBE FREng, the new Vice-President for Fellowship Engagement, also said a few words on her priorities for her term of office.

Media roundup

Academy CEO Dr Hayaatun Sillem was interviewed by several media outlets about D&I in the engineering profession, including Bloomberg TV and Raconteur. She also spoke to BBC News about findings and recommendations from the recent *Engineering Skills for the Future* report.

Findings from the Academy's *Tinkering for learning* report were covered by BBC News, including a video for the BBC Family Facebook page, which has been viewed over 58,000 times.

In January, the *Guardian* interviewed Dr Paul Shearing, Royal Academy of Engineering Chair in Emerging Technology, about the future of energy storage. The Africa Prize shortlist continues to receive international coverage with a feature in the *Guardian* and multiple interviews on BBC World Service.

News of the 2019 QEPrize announcement reached an estimated worldwide audience of 2.4 billion people, with coverage featuring prominently across the domestic and international BBC networks, and in publications including *The Times*, *Forbes* and the *Economist*.

Leave a lasting legacy

Thank you to all Fellows who have generously pledged a bequest to the Academy. Legacy gifts help the Academy to bring together the most successful and talented engineers from across the profession to put engineering at the heart of a sustainable and prosperous society, improving lives and opportunities. For a confidential discussion about legacy giving, please contact Samantha Bagchi, Development Director, on 020 7766 0681 or **samantha.bagchi@raeng.org.uk**

Nominations of prospective new Fellows

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

The deadline for making nominations for prospective new Fellows is 1 September 2019. This can be done via the Academy's online system, which is found in the Fellows' secure area of the Academy's website:
www.raeng.org.uk/fellowsarea

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**

2019 Awards Dinner – celebrating 50 years of UK engineering innovation

The Academy's Awards Dinner will be held on 11 July 2019 at Banqueting House in Whitehall, London.

This annual celebration of engineering excellence and achievement is the Academy's flagship event, attracting major figures from across the engineering profession. 2019 marks the 50th anniversary of the MacRobert Award, the UK's longest-running and most prestigious national prize for engineering innovation. During the evening, the winner of the 2019 MacRobert Award will be announced and several other prestigious awards for achievements in engineering will be presented.

The Academy is delighted to announce that its headline sponsor will be Rolls-Royce, the joint winner of the inaugural MacRobert Award in 1969.

Further details of this year's event can be found on the Academy's website at **www.raeng.org.uk/events**

News of Fellows

Dr Alan Belfield has been appointed Chaiman of Arup

Sir Peter Bonfield CBE has been recognised by the *Financial Times* for its Outstanding Directors Exchange 2019

Sir George Buckley has been appointed Chairman of eGym

Ursula Burns has been appointed CEO of VEON

Sir James Dyson OM CBE FRS, Professor Lord Robert Mair CBE FRS and **Professor Molly Stevens** have been elected members of the US National Academy of Engineering

Air Marshal Susan Gray CB OBE has been appointed the RAF's first female three-star officer

Tony Graham has been promoted to Chief Operating Officer at Cammell Laird Shipbuilders

Professor Shu Yuen Ron Hui has been named a Fellow of the US National Academy of Inventors

Professor David Knowles has been appointed CEO of the Royce Institute

Muir Macdonald has been appointed South West regional chair of the Institute of Directors

Professor Juergen Maier has been appointed a governor of Nottingham Trent University

Professor Juergen Maier CBE, Sir David McMurtry CBE RDI FRS and **Professor Keith Ridgway CBE** have been presented with the Manufacturing Technology Association's Outstanding Contribution to UK Industry Award

Professor Gordon Masterton OBE FRSE has been appointed Deputy Lieutenant of Renfrewshire

Professor Richard Parry-Jones CBE has been appointed Chairman of Marshall Motor Holdings

Professor Thomas Rodden has been appointed Chief Scientific Adviser for the Department for Digital, Culture, Media and Sport

Rakesh Sharma OBE has been appointed Non-Executive Chair of Holmes Noble

David Waboso CBE has been appointed a Non-Executive Director at Thames Water

Forthcoming events

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

2 May 2019
East Midlands lecture and dinner
Venue: University of Nottingham

5 June 2019
Royal Society of Edinburgh and Royal Academy of Engineering joint lecture
Venue: University of Glasgow

13 June
Emeritus lunch
Venue: Prince Philip House

11 July 2019
Awards Dinner 2019
Venue: Banqueting House

17 July 2019
The summer reception
Venue: Prince Philip House

16-19 September 2019
Global Grand Challenges Summit 2019
Venue: Queen Elizabeth II Hall, Southbank Centre

30 September 2019
AGM
Venue: Prince Philip House

Publications

Charles V Betts CB FREng has donated *Vanguard to Dreadnought: 30 years of Naval Construction 1983-2013*. It is available to buy from the Royal Institution of Naval Architects.

The Thames Tideway Tunnel by Phil Stride has been donated by the publisher. *Engineering Hitler's Downfall* by Gwilym Roberts CBE FREng has been donated by the author. *Illuminating our world, 150 Years of the Royal Society Te Apārangi* by John Martin has been donated by the Royal Society Te Apārangi.

2018 Annual Fund update

Thank you to all Fellows who have contributed to the 2018 Annual Fund so far.

First launched in 2012, the Annual Fund provides a valuable source of extra support for a range of existing Academy programmes and new initiatives. An update on how funds have been used will appear in the autumn 2019 newsletter.

If you would like a copy of the 2018 Annual Fund brochure please contact the Development Department via **dominic.geyer@raeng.org.uk**

The brochure can also be found on the 'Support us' section of the Academy's website.

HM The Queen's New Year Honours

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

Commander of the Order of the British Empire (CBE)
Professor Juergen Maier FREng for services to UK/German relations
Professor Geoffrey Maitland FREng for services to chemical engineering

Officer of the Order of the British Empire (OBE)
Professor Hugh Griffiths FREng for services to engineering
Professor Sarah Hainsworth FREng for services to engineering and forensic science
Professor Raffaella Ocone FREng for services to engineering.

Follow the Academy on Twitter: **@RAEngNews**

Follow the Academy on Facebook: **www.facebook.com/RAEngineering**

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Obituaries

Professor Dennis Allan FREng died on 4 July 2018, aged 85. He was formerly Chair of EAQA Ltd.

Professor Peter Stewart FREng died on 26 November 2018, aged 90.

Sir Jack Zunz FREng died on 11 December 2018, aged 94. He was formerly Co-Chairman of Ove Arup Partnership.

Mr Charles Morris CBE FREng died on 13 December 2018, aged 92. He was formerly Chief Executive of Sheerness Steel plc.

Sir Michael Atiyah OM HonFREng FRS FRSE died on 11 January 2019, aged 89. He was formerly Director of the Isaac Newton Institute for Mathematical Sciences, Cambridge.

Dr John Alvey CB FREng died on 19 January 2019, aged 93. He was formerly Engineer-in-Chief at British Telecom.

Professor Geoffrey Hewitt FREng FRS died on 18 January 2019, aged 84. He was formerly Emeritus Professor at Imperial College London.

Professor John Henry Gittus FREng died on 22 January 2019, aged 88. He was formerly Regents' Professor at the University of California.

Emeritus Professor John Anthony Hudson FREng died on 13 February 2019, aged 78. He was Emeritus Professor at Imperial College London.

Lord Kumar Bhattacharyya CBE FREng FRS died on 1 March 2019, aged 78. He was formerly Director of Warwick Manufacturing Group.

Mr William John Walters OBE FREng died on 1 March 2019, aged 92. He was formerly Director, External Affairs at British Gas.

Professor Jason Reese FREng FRSE died on 8 March 2019, aged 51. He was Regius Chair of Engineering at the University of Edinburgh.