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Welcome to issue 38 of Partner News. In this issue, we rediscover the lives of prominent women engineers from history that have been added to the Oxford Dictionary of National Biographies in celebration of the upcoming centenary of the Women’s Engineering Society.

Our front cover this issue shows Commander Nath Gray, one of a number of Royal Navy pilots who have had the chance to use a unique £2m flight simulator developed for use in preparation of flight trials on board the UK’s new aircraft carrier, HMS Queen Elizabeth.

Academic Partner The University of Liverpool are celebrating record breaking achievements, their Velocipede Team broke both the male and female hand cycle land speed records at the World Human Powered Speed Challenge in Nevada earlier in the year. Rider Ken Talbot even became the first hand cyclist to go over 50mph!

Our Enterprise Partners are innovative and dynamic SMEs and we are showcasing a range of products they are working on in this issue. Including York Instruments’ MEGSCAN, combining the latest developments in cryogenics and quantum technology to offer a new version of a magnetoecepsalography brain scanner. Turn to page 24 to find out more.

We also report on GCHQ opening their doors to the science comedy series The Infinite Monkey Cage radio show hosted by physicist Brian Cox and comedian Robin Ince. For more information, turn to page 33.

If you have any comments or would like to submit an article, please contact partnernews@theiet.org or tweet us @TheIET using the hashtag #IETPartnerships.

Mark Organ IEng MIET
Head of Membership

Partner News is produced by the IET. For any enquiries, please refer to pages 38-39 for contact details. Edited by Keri Allan, with special thanks to Laura Beard.

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As the centenary of the Women’s Engineering Society (WES) approaches next June, the Oxford Dictionary of National Biography (DNB) has included the lives of some of WES’ prominent early members in its latest update.

The selection was curated by IET Library and Archives Manager Anne Locker.

“Recent research into the role of women in the First World War has helped to uncover the early stories of women in engineering and technology in the UK,” she says.

“The individual lives show the remarkable ingenuity and disregard for convention shown by women who decided to enter a working space which had previously been closed to them. Yet when the war ended, these women faced the prospect of again being excluded from the profession to make way for men returning from the forces.

“The lives included in the latest DNB show how these women negotiated these challenges. It shows the types of careers they were able to make both through established networks, such as the existing professional bodies, and in new fields such as aviation, automotive and electrical engineering.”

The women highlighted in the latest edition include Rachel Parsons, who in 1915 became director of her father’s marine turbine firm in Newcastle, Lady Margaret Moir, who worked as a lathe operator during the war and devised training schemes for women employed in engineering and Laura Willson, a Halifax suffragette who ran a lathe-making business with her husband and took a particular interest in the welfare of women working in munitions.

They’re joined by Margaret Partridge, who spent the war working as a supervisor in a munitions works. She later became a consulting engineer and was responsible for electrification schemes in rural Devon along with Margaret Rowbotham, who had been a superintendent in wartime munitions factories.

Also featured is the aviator Hilda Hewlett, who ran a factory making air frames that employed equal numbers of men and women by 1918, the early female motorist Cleone Benest, and Letitia Chitty, who worked on stress analysis of experimental aircraft, and later, the structure of dams.

Three of the women were graduates of Edinburgh University. Dot Buchanan served a pupillage with the steelwork contractors Dorman Long and in 1927 became the first woman elected a member of the Institution of Civil Engineers (ICE). Anne Gillespie Shaw was a supervisor of women workers for the Metropolitan-Vickers Electrical Company in Manchester and an acknowledged expert in motion study. Molly Fergusson became the first woman partner in an engineering consultancy in 1948.

“The world of engineering did change and adapt,” says Anne. “Women engineers were here to stay.”

The Oxford DNB is the national record of men and women who have shaped British history, worldwide, from prehistory to the year 2014. From July 2018 the dictionary includes biographies of 60,638 individuals, written by over 10,000 contributors.

www.oxforddnb.com
Easily the most exciting, engaging and worthwhile extra-curricular project that I have been involved in during my teaching career.

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- 14 teams attended international events, winning 7 awards
- 93% participants would recommend FIRST LEGO League
- 45 tournaments delivered
- Biggest UK and Ireland final 54 teams attending
- 95% participants said their teamwork skills improved
- 11,930 views of the UK and Ireland final
- 610 teams registered
- 40% female participants
- 51% female participants
- 197% growth from 2016-17 season

**IET Faraday Challenge Days (FCD)**
- 480 schools reached
- 52% of girls involved
- 5,670 students engaged
- 20,131 site registrants to date
- 188,624 unique page views in 2017
- 2,547 IET members are STEM Ambassadors and attended 4,651 events
- 77 Schools Liaison Officers attended 335 events, with over 68,000 attendees

**Education Partners**
- 3,627 Scouts IET Electronics Badges sold in 2018
- Greenpower 11,682 students participating in 2018
- Welcomed 80,000 visitors in 2018
- 2,856 students participated in EiM challenges in the UK in 2017-18.
- 37,500 views of Techno Mum webpages in 2018.
- 18,000 downloads of Techno Mum resources

For more information visit www.theiet.org/education

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Positive news around continuing professional development

By David Aylett, IET CPD Policy Product Owner.

The number of IET members recording and submitting their continuing professional development (CPD) continues to increase – by the end of June 2018 we’d already received more CPD records than in the whole of 2017.

Successful employers have well-trained staff, and ambitious staff are drawn to employers who are supportive of CPD. Therefore, supporting professional development is a win-win situation for employers.

The IET helps those interested in learning more about CPD through in-company Lifeskills courses and also has expert staff available to address companies and members on a variety of CPD-related topics.

Then our Career Manager system allows users to record all their CPD activities and submit them to us directly. From the information submitted to date, we’ve been pleased to learn that members are generally far exceeding the IET’s recommended minimum annual CPD of 30 hours. We expect that this year the average amount of time our members dedicate to CPD over a 12 month period will reach 120 hours.

It’s also great to see that around three quarters of our members have included reflection statements with their CPD records.

This allows us to gauge the real worth of the CPD undertaken, why it was undertaken, what was learned and how it will change the work behaviour of the member in future.

Our next step is to encourage members to also send us their CPD planning reports, which are CPD objectives detailing their plans for the coming 12 months or longer.

If you’re an IET member and you haven’t sent us your 2017 CPD records yet, there’s still time to do so. Simply log into Career Manager at www.theiet.org/careermanager.

For more information on how the IET supports CPD please email us at cpd@theiet.org.

For more information of our Lifeskills courses, please visit www.theiet.org/lifeskills.
Thousands of schools across England are looking for governors. As science, technology, engineering and maths (STEM) remain a focus in the curriculum, schools need people who will ensure that they are meeting the needs of their pupils.

Having governors from STEM fields is vital, as they bring valuable skill sets and can help develop employability and careers guidance in schools.

Governors for Schools matches skilled and committed volunteers with schools looking for governors. Effective governance improves school performance, giving children and young people the chance to realise their full potential.

We created the campaign ‘Governor Stories’ to challenge the governor stereotype and we’re encouraging people of different ages, ethnicities and professional backgrounds to apply for the role and bring their perspective to a governing board.

Nadia, an engineer from Newcastle, features in the campaign. She shared her experience of governance.

“I’m one of three girls in my office. We’ve battled through an education system that’s told us we’re female so we can’t be engineers. I became a governor because I wanted to make sure opportunities were there for everyone, no matter what their situation – especially when it comes to encouraging girls to take on STEM subjects,” she says.

As a governor, you have the opportunity to influence strategy and decisions that can make a real impact on children’s lives. The governing board plans the strategic direction of a school, making decisions around budgets, the curriculum, and staffing structures. Therefore it’s vital that every school has a diverse and committed board to provide challenges, which improves education for children.

Governing boards don’t just need one set of skills. They need people with soft skills such as problem solving and negotiation alongside more technical skills such as project management, HR and finance. You don’t need any prior experience in the education sector – just a good head for business and a desire to make a positive difference to children’s futures.

Volunteering as a governor is also a professional development opportunity. For professionals looking to develop their leadership and management skills in order to progress their career, finding the right opportunity can be difficult. In business, it’s usually those in senior positions that make the top-level strategic decisions. But sitting on a governing board gives you the chance to experience board-level decision-making and leadership earlier on in your career, all while giving back to the community.

Your opinion matters as a governor. You’re there to make sure the senior school leadership is challenged, supported and held to account. Strong governance improves school performance, and a diverse governing board ensures robust debate – which means better decisions, and better outcomes for children.

Schools rely on strong governing boards to help them provide the best education for children — and your skills are in demand says Hannah Stolton, National Team Leader at Governors for Schools.

Volunteer your skills as a governor and apply online at www.governorsforschools.org.uk/volunteers.

For more information, get in touch with Hannah Stolton at Hannah.stolton@governorsforschools.org.uk.
“After graduating, one of my biggest questions was how can I move forward in my career,” says Jaspreet Singh, an engineer at Arup, which specialises in the built environment.

Encouraged by Arup and the example set by his grandfather, who was a registered engineer and IET Fellow, Jaspreet decided to follow the route to professional recognition with the IET.

“I attained my Incorporated Engineer (IEng) status about four months ago. It’s helping me to progress faster,” he says proudly. “Just the letters IEng after my name shows my clients, colleagues and possible employers my knowledge and skills. When I’m speaking to new people, they’re aware they can depend on me to deliver projects and meet deliverable dates.”

For Jaspreet, achieving IEng has opened up further development opportunities. Within the next two years he plans to apply for Chartered Engineer (CEng) status, which will require him to show evidence of other skills, including innovation, creativity, technical and commercial leadership.

New opportunities

“I would love to lead projects, looking at both the financial and engineering aspects,” he says. “You have credit managers and financial advisors who look at profits and losses, but it’s engineers who have to make the numbers work.”

To get started on a pathway to professional recognition, Jaspreet recommends IET members look at the Engineering Council’s UK-SPEC, which outlines the knowledge, experience and skills needed to achieve each professional status.

“Also ask your company to help you reach your competence goals,” he says. “At Arup we have mentors and colleagues who are going through the same process, which means you have a good support structure as you move ahead in your career.”

For members who want to achieve professional recognition but do not have enough support from their company, the IET provides several services that can help. These include mentoring and advice on completing applications.

“It’s better to seek support than to remain confused for several years and end up going for it alone,” Jaspreet says.

Move forward in your career with professional recognition.

Find out more at www.theiet.org/profreg.
Want to recognise an outstanding student?

The IET Prize is open for nominations in April 2019

The IET Prize is global and is awarded annually to outstanding students who are undergoing or have completed a course of study which has been accredited by the IET. Prize winners are nominated by each approved university for having shown distinction in a specified stage of a course leading to the award of their first degree. One nomination is available per IET accredited university.

Nominations for this Prize are by invitation only.

This prestigious Prize consists of a certificate and two years’ free IET membership.

To find out if your university is already part of this scheme please contact:

Jenny Tilley
Awards and Prizes Coordinator
jtilley@theiet.org

For more information, visit www.theiet.org/student-prizes

The Institution of Engineering and Technology (IET) is working to engineer a better world. We inspire, inform and influence the global engineering community, supporting technology innovation to meet the needs of society. The Institution of Engineering and Technology is registered as a Charity in England and Wales (No. 211014) and Scotland (No. SC038698).
Ian Banks, Raytheon UK’s Supply Chain Group Lead, was one of the lucky 100 to take part in the RAF100 Baton Relay, with Raytheon’s specially made baton and high-performance navigation system tracking his trek.

The company co-sponsored the relay, which commemorated 100 years of the Royal Air Force by transporting the baton to 100 locations with RAF connections, both in the UK and around the globe.

Ian has run the London Marathon five times and the Great North Run seven times, but he’d never run a race like this before.

“It was a privilege to play a part in the centenary celebration,” he says. “It was also a perfect complement to my day job, which is all about going the extra mile and achieving results.”

Ian leads a supply chain management team in Broughton that ensures quality control, working closely with the RAF and suppliers who help maintain and upgrade Raytheon-equipped Sentinel reconnaissance aircraft. Raytheon performs systems integration work for the Airborne Stand-Off Reconnaissance, or ASTOR, programme at its operations in North Wales.

He said he never imagined that more than 20 years after joining Raytheon, he’d be invited to participate in one of the nation’s largest military events. He believes the company’s partnership with the RAF and the contributions of his team exemplify the way Raytheon’s advanced aviation surveillance technologies support the armed forces.

“Giving every task 100% is something we all do instinctively at Broughton, because of what the RAF has done and continues to do for this country and our allies,” Banks said.

As technical sponsor of the RAF100 relay, Raytheon manufactured five high-tech, carbon fibre, lightweight batons, fitted with 360-degree cameras, as alternatives to the original RAF100 ceremonial baton.

Ian wore special shoes equipped with a Raytheon high-performance dismounted position and navigation system to track his trek from Broughton to the next carrier in neighbouring Flintshire, North Wales. The navigation system is designed to help users such as armed forces and blue light services operate in GPS-denied environment. It uses anti-jam technology, meaning the user’s position can be detected to a high degree of accuracy.
One of the UK’s leading F-35 Lightning test pilots has spoken of the importance of a unique £2m flight simulator developed for use in preparation of flight trials on board HMS Queen Elizabeth, the UK’s new aircraft carrier.

As a member of the elite team of test pilots who will complete the first F-35 flight trials with HMS Queen Elizabeth, Commander Nath Gray is one of a number of pilots who have had the chance to use the F-35/QEC Integration Simulator facility.

Developed by BAE Systems, the facility replicates both the cockpit of the F-35 and the flying control tower (FLYCO) on board HMS Queen Elizabeth. Providing a complete 360-degree immersive experience for pilots, it's been used to simulate thousands of takeoffs and landings ahead of HMS Queen Elizabeth crossing the Atlantic, to ensure that real-life flight trials are as safe and effective as possible.

The simulator applies highly specialised computational engineering to model the air wake of the ship to replicate the motions that F-35 pilots will feel in real life.

“The facility is unique in providing the most realistic environment and conditions that I’ve ever experienced in a simulator. The flying qualities, aircraft handling, air wakes and way the ship rolls are as real as it gets,” says Nath.

“Being able to experience both the F-35 and Queen Elizabeth Class FLYCO together is crucial in allowing us to successfully take that next step in bringing together a brand-new aircraft carrier with a brand new aircraft in first of class flight trials.”

Over the past two years, pilots and landing signal officers have used the simulator to develop the way the Royal Navy will operate in the future.

BAE Systems engineers are among those conducting the flight trials, which are being undertaken by a team of UK pilots including Nath and Peter ‘Wizzer’ Wilson, BAE Systems Test Pilot and Short Take-Off Vertical Landing (STOVL) lead for the F-35 programme.
The University of Liverpool’s Velocipede Team (ULV Team) broke both the male and female hand cycle land speed records at the World Human Powered Speed Challenge in Nevada, which took place this September.

The challenge takes place every year on State Route 305, a 4,619ft altitude road in Nevada that allows riders an acceleration zone of over four miles, enabling them to reach maximum velocity before being timed over a 200m distance.

In ARION4, the ULV Team’s latest hand powered bike, Paralympian Karen Darke MBE achieved a speed of 46.54mph over the five mile course, over 20mph faster than the previous female world record.

**Record breakers**

Hand cyclist Ken Talbot recorded a speed of 42.37mph over the distance, breaking the British male hand cycle land speed record.

Not content with this record, Ken then achieved a speed of 51.86mph on the five mile course, breaking the male world record and becoming the first hand cyclist to go over 50mph. This is the fourth year running that engineering students from the university have taken part in this challenge.

In a change to previous years, the team designed and built an aerodynamic recumbent bike that uses hand power rather than leg power.

The team employed additive manufacturing techniques, provided by Renishaw, to manufacture the central component of the bike and ensure that it met the light weighting and strength requirements of the bike.

“This record is the culmination of two years hard work by our engineering students,” says Steve Bode, Senior Lecturer at the university’s School of Engineering and the project’s lead academic.

“Their combined passion for engineering and pushing the limits of human potential has resulted in the success of the ARION4 riders.”

For more information about the ARION project and ULV Team, visit www.ulvteam.co.uk.
Tech giant trusts Anglia Ruskin to deliver

Multinational company Thales has chosen Anglia Ruskin University to be a national provider of degree apprenticeships to upskill its workforce.

In September, 14 apprentices at Thales, a global technology giant with markets in aerospace, defence and transportation, began studying Anglia Ruskin University’s BSc Digital and Technology Honours programme.

The course is specifically designed to address skills gaps in areas such as cybersecurity analysis, software engineering and network engineering.

Around one million new recruits are needed in the sector by 2023, with employers currently struggling to find the right people to fill vacancies.

“Degree apprenticeships have the potential to transform the national skills landscape and Anglia Ruskin is at the forefront, with hundreds of apprentices due to start their courses in this academic year,” says Suparna Ghose, Principal Consultant for Strategy and Partnerships at Anglia Ruskin University.

“We are delighted to partner with Thales UK.

“As a top 100 apprentice employer with an award-winning early talent apprenticeship programme, Thales continues to be a pioneering force in changing perceptions about degree apprenticeships within technology and engineering.”

“We proudly invest in apprentices to build high quality and early talent for the business and are delighted to be working with Anglia Ruskin on the delivery of our UK digital programme,” adds Nicola Anderson, Thales UK’s Head of Apprentice Development.

“They blended delivery model and close employer engagement has enabled us to develop an exceptional offering that will help us develop a skilled workforce for the future.”

Standout students awarded for engineering innovation

Students on Solent University’s IET accredited Electronic Engineering and Mechanical Engineering BEng (Hons) courses presented posters and artefacts at the University’s annual Final Year Project Show earlier this year. Along with students from the more practical Engineering Design and Manufacture BSc (Hons) course, they chose their projects in conjunction with academic supervisors, so the work they presented was in an area they enjoy, providing a good showcase for their skills.

Solent is pleased to continue working with the Wessex Region of Technologists and Inventors (WRTI), who judge the poster presentations on design and innovation, and excellence in the application of engineering.

The WRTI sponsors the first prizes, rewarding students who have identified problems or opportunities and shown the guts to work hard and take a few risks in order to deliver a final product.

Solent Futures, part of Solent University, continues to work to offer advice, events and support to help students achieve their ambitions. The WRTI sponsored first prizes for each category of £250, while Solent Futures sponsored Highly Commended prizes of £100.

The WRTI Technology and Innovation Awards First Prize for Design and Innovation Excellence was awarded to Lewis Badley while the Highly Commended Prize for Design and Innovation was awarded to Matthew Hillman.

The WRTI Technology and Innovation Awards First Prize for Excellence in the Application of Engineering was awarded to Ben Coombes, while the Highly Commended Prize for Excellence in the Application of Engineering was awarded to Richard Savidge.
Queen’s receives £500K to improve gender equality within STEM

Despite numerous gender equality initiatives only 12% of the UK’s engineers are women – one of the lowest percentages in Europe – and the proportion of women studying engineering and physics has remained virtually static since 2012.

Academics from Queen’s University Belfast are aiming to address this challenge through interdisciplinary research to understand and address the attitudes that academics working in engineering and physical sciences have towards gender equality initiatives.

Its research project, entitled Inclusion Really Does Matter: Improving Reactions to Gender Equality Initiatives Amongst Academics in Engineering and Physical Sciences, is being funded by an award of £500,000 from the Engineering and Physical Sciences Research Council (EPSRC). It is one of 11 projects that are part of a UK-wide initiative to improve equality, diversity and inclusion within engineering and the physical sciences. Fellow IET Academic Partner, Oxford Brookes, is also working on a project for this initiative (see P15).

Inclusion matters

The Queen’s research project, in collaboration with the University of Glasgow and University of Warwick, aims to continue to improve gender initiatives. It will gain an insight into the potential barriers to gender equality initiatives and build training tools aimed at improving their reception.

“Although gender equality initiatives exist in engineering and physical sciences schools across the UK, there may be ways that they could be more effective,” notes Programme Director, Dr Ioana Latu, from Queen’s School of Psychology. “Our vision is that in order to improve diversity and inclusion within engineering and physical sciences rapidly, we need to understand academics’ attitudes towards gender equality initiatives.

“We hope that by addressing how gender equality initiatives are received on the ground, it will have long-term effects by accelerating diversity and culture change within engineering and physical sciences, ultimately creating a more inclusive environment for women who study and work in STEM fields.”

Queen’s Gender Initiative

The University has established itself as a leading university for promoting good employment practices for its female staff through the Queen’s Gender initiative. It has been involved with the Athena SWAN initiative, which recognises and celebrates good practice in advancing gender equality across UK universities, since its inception, and currently holds an Athena SWAN gold award in psychology.

“Queen’s Gender Initiative is thrilled that our gold-winning School of Psychology in the Faculty of Engineering and Physical Sciences has obtained this EPSRC award. It is recognition that the school is at the forefront of research on gender bias in engineering science,” says Yvonne Galligan, Director of Queen’s Gender Initiative.

“We look forward to supporting this ground-breaking research and implementing its findings. It is vital that we shift the dial on the poor representation of women in engineering. This foundational research will help us, and higher education, to do so.”
Oxford Brookes to address equality in university spinouts

Oxford Brookes University is leading a national project to look at the promotion of equality, diversity and inclusion in university spinout companies.

This project is part of the Inclusion Matters initiative, with the Engineering and Physical Sciences Research Council (EPSRC) funding 11 projects at universities across the UK including fellow IET Academic Partner Queen’s University Belfast (see P14).

The first of its kind, the initiative has been launched as part of the collective approach to promote equality, diversity and inclusion by UK Research and Innovation (UKRI).

Oxford Brookes’ research aims to identify barriers as well as enabling factors that exist for women scientists, engineers and mathematicians in key stages of the spinout process and entrepreneurial activities to commercialise research and innovation.


Too few women

Directing the programme is Professor Simonetta Manfredi, Professor in Equality and Diversity Management at Oxford Brookes Business School and founder of the University’s Centre for Diversity Policy Research and Practice (CDPRP). In March this year she wrote for Times Higher Education (THE) about the need to tackle the under-representation of women researchers at all career stages on the entrepreneurial pathway from research to spinout leadership.

“This project’s vision is to achieve a step change in institutional capabilities to increase the participation of women researchers in STEM (science, technology, engineering and mathematics) disciplines in university spinouts and to mainstream gender in the ecosystem which drives innovation.”

ASPIRE

Oxford Brookes is also collaborating on another of the Inclusion Matters projects, this time led by the University of Lincoln.

The Advanced Strategic Platform for Inclusive Research Environments (ASPIRE) offers an evidence-based approach to deepen efforts in improving equality, diversity and inclusion. The overarching aim of the ASPIRE project is to create a dynamic and interactive web-based platform to increase the inclusiveness of research environments.

The web-based toolkit will be used to harness best practice across the sector, enable measurement and monitoring of the implementation of inclusion initiatives across institutions, link implementation with markers of culture change and provide recommendations for scaling across the sector.

“The Inclusion Matters projects display ambition, creativity and a commitment to addressing the pressing equality and diversity issues facing engineering and the physical sciences,” highlights Dr Alison Wall, EPSRC’s Associate Director, Building Leadership.

“Through new research, innovative approaches and a broadening of activities, they will inform and shape significant cultural change across institutions and share their learning with the whole sector. By furthering equality, diversity and inclusion we want to ensure that researchers from all groups are able to fulfil their talent and ambitions.”
A £1.7m project funded by Innovate UK has developed smart technologies to help driverless vehicles connect and communicate with each other and their surroundings to reduce collisions and traffic jams.

The two-year i-Motors project – managed by digital technology firm Control F1, part of the Intercept IP Group, and the University of Nottingham – produced a mobile platform for data transfer and storage by vehicles from different manufacturers.

The Vehicle Cloud Computing (VCC) system can securely handle big data with near real-time results, vital if lots of vehicles are ‘talking’ to each other and sharing information with traffic control centres and smart city infrastructure.

The VCC can accept data from a variety of external sources and capture data from multiple vehicles to provide the driver and car with timely and accurate updates on road works, congestion, weather conditions and other issues that might affect travel.

The platform also allows vehicles to automatically report and self-diagnose problems to reduce the chance of a roadside breakdown or detect hazardous conditions and warn other nearby vehicles.

Cloud-based, flexible architecture
i-Motors also developed a cost-effective location sensor suite and communication devices capable of transmitting essential data to the cloud in real-time. Its aim is to address the issues of intermittent connectivity and high costs of current location receivers on the market.

“While it is predicted the UK will see huge growth in autonomous and connected vehicle production in the next decade, less consideration has been given to how a cooperative intelligent traffic system could aid traffic management to make road use safer and more productive. This is where i-Motors research is bridging the gap,” explains Nottingham Project Lead, Dr Xiaolin Meng, from the Nottingham Geospatial Institute.

“A totally driverless world requires disruptive, affordable technology to help vehicles interact with traffic control centres, their connected surroundings and other vehicles. Real-time, high-precision positioning and navigation with uninterrupted connectivity is vital to maintain vehicle performance.”

GNSS satellite signals are vulnerable to interference from tall trees and buildings.

“The success of self-aware cars is very much dependent on public acceptance”
Professor Gary Burnett showcasing the simulator used to study trust in driverless vehicles for i-Motors.

and lack of resilience. Under the i-Motors multi-sensor approach, GNSS positioning and navigation is augmented by other sensing devices including accelerometers, barometers, magnetometers, odometers and digital compasses – together with 3D contextual maps and computer vision techniques. Combining these technologies enables intelligence-led, decision-making that counteracts GPS signal gaps.

“With a combination of different sensors and GPS location tracking, the unit we have developed can achieve sub-meter accuracy, even when out of Internet and GPS range and uses low-cost equipment. Our GNSS position system can receive corrections from the national digital infrastructure and make positioning much better,” Xiaolin adds.

**Trusting self-driving technology**

Using a state of the art immersive driving simulator run by the Human Factors research group at the University, the project also tested what might be causing barriers for people to trust driverless vehicles.

Another particularly important contribution from the Human Factors research was to understand the way in which future users of driverless taxis could interact with their occupants.

“The success of self-aware cars is very much dependent on public acceptance of how capable and accurate machines are at taking over the driving, observation and thinking tasks of human drivers. “Our findings intend to demonstrate ways the automotive industry can foster trust in connected and self-driving technologies to boost adoption rates,” says Professor Gary Burnett, Chair in Transport Human Factors at the Faculty of Engineering, University of Nottingham.

While i-Motors has yielded the first-generation prototype sensor which is now being commercialised by Control F1, the research is sequential and ongoing for the research team at Nottingham, which is now sponsored by the Innovate UK RECAPD project to further advance the sensor technology. The Nottingham Geospatial Institute has also signed a memorandum of understanding with Chang’an Group for a long-term collaboration on autonomous vehicle development.

Meanwhile the Human Factors expertise in natural language interfaces has led to a new project with the autonomous driving research team at a major vehicle manufacturer.
Can you remember how you got your first job in engineering? Securing that initial placement can be a real challenge, even for students who have all the right credentials and bring a wealth of business experience with them.

The Open University (OU) offers students the opportunity to achieve an accredited BEng (Hons) or MEng degree and part-time, home-based programmes make it possible for people to fit study around work. For this reason, some students are already employed in engineering roles when they join the OU. However, a substantial number of its students come from unrelated fields and are working towards a career change, or have a newly discovered enthusiasm for engineering. For these people, including the large proportion of female engineering students who are career changers, it seems that the opportunities to gain practical experience are few and far between.

Past students and alumni tell the OU that, even with an accredited qualification, it can be difficult to break into this sector. Without relevant practical experience, it’s even harder for students to be shortlisted for the engineering roles they really want.

Can you help? The OU is keen to hear from employers who are willing to offer placements to students. Ideally, it would like a range of placement types and durations, ranging from internships to a series of one or two-day stints. Each one needs to offer the opportunity of doing useful work, at a level that would be expected of a professional engineer.

Employers have commented that OU students stand out from the crowd because of their well-developed soft skills and extraordinary grit and determination to finish the task. These are highly motivated people who will add value to any project.

Support the engineering experts of tomorrow

If your organisation would like to take part in this scheme, please get in touch by emailing Jan Kowal at STEM-EI-Curriculumsupport@open.ac.uk.
A team of scientists from Nottingham, Exeter and Lancaster universities are working on a project to send worms into space in a bid to discover more about muscle loss during spaceflight.

The Molecular Muscle Experiment will see microscopic worms flown to the International Space Station (ISS) this winter to try to understand what causes astronauts to suffer from muscle loss.

Spaceflight is an extreme environment that causes many negative health changes to the body. Astronauts can lose up to 40% of their muscle after six months in space – the equivalent of ageing up to 40 years in terms of loss of strength. This muscle loss could reduce in-flight performance and threaten astronaut health on longer missions.

“It’s not every day that you hear of the potential health benefits of sending worms into space,” says UK Science Minister Sam Gyimah. “This crucial project, which is also the first of its kind, could lead to better treatment for muscular conditions for people on Earth as well as improving the wellbeing of our astronauts. Our world-leading research sector is consistently pushing the boundaries of existing knowledge for the benefit of all.”

Dr Chris Gaffney, Lecturer in Sports Science at Lancaster Medical School, is a member of the scientific team centrally involved in the project. He has just returned from Switzerland, where he participated in experimental sequence testing in preparation for the launch in Florida.

First UK-led experiment on the International Space Station

“This is the first UK-led experiment on the International Space Station. I’ve loved space since I was very young, so being involved in science onboard the International Space Station is very exciting!”

Dr Gaffney, whose previous research into skeletal muscle involved working...
with elite athletes, hopes this experiment will help find the exact cause of muscle loss while in space.

As well as benefitting spaceflight and scientific exploration of the solar system, he also considers the experiment to have benefits closer to home.

**Understanding muscle atrophy**

Understanding the causes of muscle loss in space and using this knowledge to find effective therapies could also help develop new treatments for muscular dystrophies, help understand ageing muscle loss and even help improve treatments for diabetes.

“If we ever want to go to Mars or undertake long-term exploratory spaceflight, then muscle atrophy is a problem that we must solve. As it stands, it would be unethical to send someone to Mars knowing the potential consequences to their health on their return,” he says.

“The work we’re doing is also very relevant to understanding the ageing process, as spaceflight is considered a model of accelerated ageing. With an ageing population, new insights from this experiment are more relevant than ever.”

The worms being used in the Molecular Muscle Experiment are known as C. elegans. Despite being only 1mm long in adulthood, they share many essential biological characteristics with humans. Previous experiments have shown they display similar biological changes in space to humans, including alterations to muscle and the ability to use energy.

Preparations to send worms into space have been taking place, with the recent visit to Switzerland for testing the latest step in the process.

The worms are in liquid bacterial feed and are sealed in a special gas permeable plastic bag. The plastic bags are then housed in a special incubator. The worms reproduce in space and after growing to adults, in around 6.5 days, they will be frozen until returning to Earth.

“Worms are, perhaps surprisingly, a very good model for human muscle maintenance. At the molecular level, both structurally and metabolically they are highly similar to that of humans and from a space flight specific perspective – they provide a lot of practical advantages. They are very small, quick to grow, cheap and easy to maintain. It makes them good to work with,” highlights Dr Tim Etheridge, Senior Lecturer at the University of Exeter.

“It’s not every day that you hear of the potential health benefits of sending worms into space”
2019 nominations now open!

Our IET Achievement Medals and Apprentice & Technician Awards recognise some of the world’s most outstanding engineers and technologists, acknowledging the talents of exceptional apprentices, technicians and young professionals.

Do you know someone who has demonstrated real brilliance in the field of engineering? They might even be a colleague of yours. Please take the time to tell us about someone who has inspired you and had a major impact in their role or wider society.

We have a variety of categories to recognise people from a range of disciplines, whether at the start of their career or more established.

Visit our website for more information and to submit your nomination today:

www.theiet.org/achievement

Financial support for engineering talent

The IET offers a variety of scholarships and bursaries to support students and apprentices who have a passion for engineering and technology, and who may have overcome challenges or personal obstacles, achieved academic excellence, or entered with vocational qualifications.

Applications will open again for our Diamond Jubilee scholarships and Engineering Horizons bursaries in January 2019, with new eligibility criteria coming soon for our Diamond scheme.

We also offer our members postgraduate scholarships for excellence in research and travel awards, both of which are open to applications from around the world.

For more information and to view the criteria visit:

www.theiet.org/scholarships
OC Robotics’ LaserSnake system has been put to work on the radioactive core of the redundant DRAGON reactor. The long, flexible snake-arm robot was passed through a narrow hole in the 3m thick concrete around the core, slicing through a 400mm diameter vessel attached to the reactor core at Winfrith, Dorset. OC Robotics was called in by the Magnox team decommissioning DRAGON when it became clear that removing the purge gas pre-cooler (PGPC) would be a challenging task. This was because one end joined to the core in the high radiation area behind concrete shielding and several steel plates, while the other extended outside the shielding.

The LaserSnake technology, developed by OC Robotics and TWI with R&D funding from Innovate UK and the Nuclear Decommissioning Authority (NDA), seemed perfect. Controlled from a distance by specialist operators, LaserSnake was able to squeeze through a small access hole, manoeuvre easily inside the confined space and cut multiple layers with its high-powered laser. This allowed the work to be carried out inside the existing radiation shielding of the reactor.

Although LaserSnake had previously been deployed at Sellafield, the thick pipe work, complex layout of the PGPC and limited access meant it was necessary to prepare two mock-ups to allow comprehensive testing and rehearsals to take place before making the cuts.

“In the end, less than three hours of actual cutting time was needed to free the PGPC from the reactor core. “We believe this is the first time that laser-cutting technology has been deployed directly on the core of a nuclear reactor,” says Magnox Senior Project Manager, Andy Philps. “The ability of the LaserSnake to carry out ‘keyhole surgery’ on the reactor core meant that the work could be carried out using existing protective shielding. “This has saved at least £200k and the radiation dose that would have accompanied building additional infrastructure, plus four weeks on the programme’s critical path. It also enabled us to remove this component earlier than originally planned.”

“We believe this is the first time that laser-cutting technology has been deployed directly on the core of a nuclear reactor”
York Instruments’ first product, MEGSCAN, combines the latest developments in cryogenics and quantum technology to offer a new version of a magnetoencephalography (MEG) brain scanner. In just three years the company has grown to more than 40 people and has attracted over $20m of US investment, with an exciting range of biomagnetism products on the horizon.

The multi-disciplinary team links engineers with physicists, electronics experts and software interface designers. Joining the IET as an Enterprise Partner this summer made perfect sense – both to invest in the professional development of its teams and to leverage the expertise of the IET for this rapidly growing business.

A new approach to an old technology
MEGSCAN represents a new approach to an old technology. MEG systems have been used in hospitals since the mid-1990s, mainly to characterise complex epilepsy cases and guarantee accuracy of location for brain surgeries. York Instruments designed its new machine with a focus on expanding the clinical utility for MEG to include new application areas.

The system includes dedicated features that significantly advance the understanding of concussion injuries and has attracted interest from leading US sports organisations such as the National Hockey League.

Clinical application areas of immediate interest are the existing epilepsy market, new markets to support concussion, and positioning MEG as a key part of a multi-modal imaging approach to head traumas and brain cancers.

MEGSCAN is currently available for investigational use only, clinical regulatory approvals are anticipated in early 2019.

It combines state-of-the art quantum sensors, liquid helium-free cryogenics, modern electronics and easy-to-use software. The system sensing design offers greater sensor coverage than ever before and uses a new patented superconductor chip technology called the HyQUID with improved signal to noise due to its ultra-low noise control electronics.

Fabricating HyQUIDs
York Instruments is currently fabricating HyQUIDs at wafer-scale in two separate foundries, one in the US and the other in Sweden. The quantum sensors need to be cooled to four Kelvin in order to pick up the minute magnetic fields emitted by the brain. This system design shows for the first time that MEG sensors can operate successfully in a liquid cryogen-free environment using pulse tube refrigeration technology.

For the user this provides benefits of lower operating costs and increased versatility. A reduced reliance on liquid helium for cooling increases the potential global commercial footprint for the technology.

York Instruments is committed to continuing to invest in both research and clinical applications for MEG.

“Our vision is that MEG stands alongside MRI as a reliable, accurate staple for every neuroimaging department” says Steve Chappell, the company’s Vice President of Technology.

“Engineering a new view on the brain”
This September the staff and directors of Lintott Control Systems were honoured to receive a visit from the Lord Lieutenant of Norfolk, Mr Richard Jewson JP. The visit formally bestowed on Lintott its 2018 Queen’s Award for Enterprise: Innovation.

The award reflects the development of Lintott’s i-Catalyst digital delivery suite. This includes an online design tool that enables both internal and external users to design products in a highly intuitive and automated environment. Engineering schematics, general arrangement drawings, bill of materials, skeleton software and user manuals are all produced automatically.

The application radically reduces the design phase, from tens of days to hours. But it doesn’t stop there – the suite also comprises other aligned and integrated digital tools. This includes production planning software, a collaborative project delivery portal and a new asset management application, which seeks to enhance product operability, up-time and maintenance.

The occasion also marked the official launch of the ‘Lintott Industry Accelerator’ training academy by Mr Chris Rea OBE, Managing Director and Founder of engineering and manufacturing firm AES Engineering.

Lintott is a process solutions designer, manufacturer and integrator of factory-built water and wastewater treatment systems, systems integration and electrical control systems. Launched in the 1970s, the company spent its fledgling years designing, manufacturing and commissioning electrical control systems, predominantly for the steel industry. Since then the business has expanded into other sectors including water, process industries and oil and gas. In 2012, it launched a formalised business reinvention strategy focusing on people power, groundbreaking digitisation, pioneering working practices and a comprehensive corporate social responsibility (CSR) programme.

Since 2015, Lintott has been working with numerous industrial, civic and academic partners in championing the region’s engineering and manufacturing space. Providing quality employment, the sector plays a vital role in the region’s economic and societal wellbeing.

One of its latest initiatives is the launch of its academy, which houses a suite of cutting edge 3D design and additive printing technology. Academic institutions will occupy the facility each week, enabling students to directly experience one of the region’s best-in-class workspaces while enhancing their learning experience.

Lintott is delighted to provide the academy on a cost neutral basis as well as access to its technical systems and personnel. This includes its 10-strong science, technology, engineering and maths (STEM) Ambassador team. Hardware was provided by Norfolk County Council and Hethel Innovation, with Autodesk providing the design software. Process automation equipment has also been supplied by Lintott’s supply chain. Academic partners include East Coast College, the College of West Anglia, City College Norwich, West Suffolk College and the University of East Anglia.
Building a flexible energy enterprise

Energy systems globally are undergoing a huge transformation as four major technology-driven trends converge to disrupt the way we deliver and consume electricity.

- **Decarbonisation** – The urgent need for action on climate change is driving a switch from fossil-fuelled generation to sustainable, low-carbon sources of power such as wind and solar.

- **Decentralisation** – Much of this new generation is coming from small-scale, local sources, rather than large, centralised power stations.

- **Digitalisation** – Advances in technology have made it possible to measure and monitor machine behaviour in real-time and automate how energy is supplied and used.

- **Democratisation** – Consumers are becoming more active system users, generating and storing electricity to determine for themselves when and where their electricity comes from. This trend is set to accelerate as electric vehicle uptake soars.

Here in the UK these changes are well underway. In the last few years coal has vanished almost entirely from the British grid and new records for renewable generation are coming thick and fast. But we need to go further, faster.

A recent assessment by the National Infrastructure Commission (NIC) – setting out a strategy for the UK’s economic infrastructure from 2020 to 2050 – called for 50% of generation to be supplied by renewable power by 2030, with the UK’s electricity supply almost entirely zero carbon by 2050. The NIC assessment suggests that flexibility can reduce total system spending by between £1-7bn per year and enable the UK to integrate renewable generation at the scale required.

Solutions, such as energy storage, demand-side response (DSR) and interconnectors are coming forward and markets are starting to adapt. For businesses, these changes are creating new opportunities to participate and unlock value from their assets – from industrial equipment and batteries, through to on-site generation and Electric Vehicles (EVs).

**New opportunities**

Energy tech firm Open Energi is already highly advanced in managing these distributed energy resources. Its artificial intelligence (AI) powered platform, Dynamic Demand 2.0, constantly evaluates the amount of flexibility in assets and processes, such as industrial heating, water pumping, battery storage and combined heat and power,
United Utilities taps into AI-powered flexibility to cut energy costs by 10%

United Utilities is connecting pumps, motors and biogas CHP engines at eight sites to Open Energi’s Dynamic Demand 2.0, providing 8MW of flexibility to capture benefits from balancing services, peak-time network costs, energy trading and local constraint management, whilst making the most efficient use of their energy.

The move is expected to cut electricity costs at the company’s sites by 10% a year, which will be used to reduce water bills for customers. Open Energi’s ability to deliver total energy optimisation across United Utilities’ sites supports a wider move by the water firm to provide one central energy service. The company has brought all of its energy disciplines together to help it focus on future proofing its energy strategy and providing low carbon, secure energy at least cost.

Dynamic Demand 2.0 underpins this strategy, providing powerful insight into asset performance and an adaptable platform that helps United Utilities to respond quickly and efficiently to changing regulation and take advantage of new market opportunities, whilst also supporting the firm’s sustainability strategy.

Open Energi’s results speak for themselves. Over the last seven years it has performed more than 60m dispatches across almost 4,000 assets at over 400 sites with no deviation of any process outside its control parameters.

Evidencing the safety and reliability of energy tech is critical to building trust in demand flexibility and unlocking the system benefits it can provide. The prize is enormous, with an estimated 6GW of flexibility available from existing assets and processes alone – equivalent to almost two Hinkley Point C power stations.

Open Energi’s experience shows that it already has many of the solutions needed to deliver a zero-carbon energy system – the real challenge is rolling these out at the required scale and speed.

Pumps, motors and biogas CHP engines at United Utilities’ sites are providing vital flexibility to the GB grid.
New fuel cell launched for the commercial UAV market

Commercial UAV fleet operators will benefit from Intelligent Energy’s new 800W fuel cell power module (FCPM), which has been specifically designed to offer considerably longer flight time compared to traditional batteries.

Key benefits of using fuel cells to power UAVs include increased productivity, less downtime owing to quick refuelling and increased payload capability. In addition to the UAV market, the FCPM can also be used for a wide range of other applications such as portable power and robotics.

The new 800W product is 10% more power dense than the company’s 650W FCPM, which was launched in 2017. In real terms, this means UAV operators can carry around 1,500g more mass at the expense of only 100g. This can be used to carry a larger hydrogen cylinder – offering significantly increased flight time – or to increase the payload capacity of a UAV.

Depending on the efficiency of other aircraft components, multicopters optimised around the 800W FCPM could carry 1kg for two hours or 2kg for one hour. Fixed wing aircraft show even greater gains. In addition, Intelligent Energy will work with customers who have the capability to combine two 800W modules to provide 1.6kW of continuous power.

The 800W product will be CE and FCC certified and orders are being taken now, with first shipments planned for January 2019.

The FCPMs use Intelligent Energy’s air-cooled proton-exchange membrane (PEM) fuel cell technology and run on hydrogen and ambient air to produce clean power in a cost effective, robust and lightweight package. They can be integrated into UAV platforms without compromising payload, providing an optimised, operational solution for a wide range of industries.

“The 800W FCPM is a great addition to our product range,” says David Woolhouse, CEO at Intelligent Energy. “There is a growing push towards opening up beyond line of sight operation, which means extended flight time is a must for many fleet operators.”

For more information and to view the FCPM in action, visit www.intelligent-energy.com/our-products/uavs.

Coderus funds project to support innovation in embedded tech

Coderus has helped launch the first ‘The Things Network LoRaWAN gateway’ in Suffolk Coastal.

Teaming up with Comms Unite, which specialises in networking infrastructure, Coderus delivered cutting edge LoRaWAN technology to Adastral Park and the surrounding areas. The gateway is connected to The Things Network, which provides connectivity for the Internet of Things (IoT).

The mobile and embedded software design company funded the project to support and encourage innovation within the field of embedded technology.

LoRaWAN is a low power, wide area networking protocol primarily designed to wirelessly connect low power devices to the Internet. It also connects a myriad of devices across a landscape by providing a low power connection.

Coderus focuses strongly on creating optimised efficient code, so LoRaWAN is the perfect fit with its minimal data rate.

The use cases are many and apply to a wide range of industries – from smart home applications through to industrial and commercial uses.

The company has chosen LoRaWAN as its primary IoT communication technology that will deliver all embedded solutions. One of the benefits of The Things Network LoRaWAN is that anyone can set up their own gateway, compared to SigFox that has a more controlled structure.

For more information visit www.thethingsnetwork.org.
Nothing should stand in the way of an exceptional career in engineering.

The IET Annual Dinner helps student and apprentice engineers fund their education, including those who face financial pressure or personal challenges. They get their careers off to a great start – and our industry doesn’t miss out on their talent.

Join us to celebrate the latest innovations and achievements in engineering, and make sure that a career in engineering remains an achievable goal for everybody. Every £1,000 we raise together will help to support an up-and-coming engineer for a full year.

Book your table now at

www.theiet.org/annualdinner #IETannualdinner

Guest speaker: Baroness Karren Brady CBE

Preferential booking rates for IET Partner organisations
Work less, achieve more

Time is money they say, and no-one understands this better than electrical engineers. To keep customers happy, electricians, contractors, specifiers and panel builders must use their time effectively to limit costs and shorten time to delivery. Speed is a major advantage in the marketplace and engineers should always be on the lookout for new ways to work less but achieve more for their clients. This means cutting down on tasks that add the least customer value. One of these can often be sourcing of basic product information, drawings and data files. While crucial to the job, it delays projects while the engineer and their sales representative scramble to identify basic information amongst a wide range of website, catalogues and tools. When drawing up a quote, too much time spent on sourcing product data or creating simple design information could mean the difference between getting the job or losing business to a quicker competitor.

Entering the portal
Digital delivers the best way for engineers to evolve their businesses and provide competitive customer service. Understanding this, Schneider Electric has come up with a unique digital solution for its customers.

Like most manufacturers, Schneider Electric operates a full-time contact centre where customers can find out product information and pricing details. However, it has now supplemented this with the creation of dedicated web portals for each of its core customer segments – electrical and mechanical consultants, panel builders and electricians, with a further web portal for contractors launching soon. These web portals provide a wealth of information and tools for partnered electrical engineers. Registration is free and, once they have access, users will find all product and pricing information for the products relevant to them in one easy place. From the portal homepage, users will also be alerted to the latest product news and announcements, giving them a heads-up on upcoming solutions before the rest of the industry.

Easy access to all product catalogues and data sheets will substantially reduce the amount of time it takes for engineers to source information and products. The platform’s built-in news function will also help them keep up to date on the latest designs and industry news from Schneider Electric.

Learning is half the battle
The company has also placed learning and development at the heart of its customer web portals. It provides access to a wealth of learning resources including analysis of the latest market trends and access to special events and promotions. Users can get a first look at Schneider Electric’s live and on-demand webinars and product tutorials. To date, the company has run sessions on industry topics including smart electrical distribution and cascading and discrimination. Certain content has been geared towards apprentices, helping companies upskill their youngest staff.

This consistent stream of tailored training will help users upgrade their skills, letting them work faster and be more proficient with Schneider Electric’s solutions. For example, electricians installing a Schneider Electric distribution board for the
first time may be faster as they have already viewed an installation tutorial. They are also more likely to have picked up industry knowledge, helping them make better recommendations to their customers on the best products and solutions to use.

If users wish to further enhance their professional development, registration to one of the customer portals provides an invitation to Schneider Electric’s partner and supplier events. This includes networking evenings between professionals in the same sector, or even guided tours around Schneider Electric’s manufacturing plants.

Running multiple times each year, each session is based on an important industry topic, vetted by the IET and the Chartered Institute of Building Services Engineers (CIBSE). Events are CPD accredited, meaning attendance counts towards employees’ professional development as well as giving them an opportunity to build contacts within the industry.

Each portal will be a living, breathing platform, continuously updated with new content, information and resources. With access to promotions and digital business tools, the programmes help engineers manage their time and strike a balance between client work and administration in the office. Whether starting a new business or maintaining an established one, they will be able to provide a more fluid service at quotation as well as maintain skills and knowledge for the latest, emerging technology trends.

For more information, please contact
www.schneider-electric.co.uk/en/partners
Cundall joins IET Corporate Partner community

Earlier this year Cundall LLP was invited to become an IET Corporate Partner, due to its commitment to professional recognition and continuing professional development (CPD) of its engineers and technicians.

Cundall’s Building Services Partner and IET Fellow Stephen Clough joined IET Chief Executive Nigel Fine in signing the official paperwork at IET London: Savoy Place this July.

“We are delighted that Cundall has signed as a Corporate Partner with the IET. This formal agreement ensures that the company’s engineers and technicians will be properly supported in their endeavours to acquire and maintain the recognised skills, knowledge and attributes needed to deliver results both within their organisation and the engineering and technology industry.

“It shows their commitment to professionalism and the development of their engineers and technicians and I’m looking forward to working closely with them in the future,” says IET Regional Account Manager Jordan Osborn.

The IET actively supports and encourages its Corporate Partner organisations to develop their employees by providing in-house professional registration guidance and has already run a company-based registration scheme (CBRS) for Cundall’s mid-career engineers looking to achieve chartership status.

Stephen Clough said, “Cundall takes the lifelong development of engineering excellence very seriously and are delighted to be working closely with the IET to achieve this.”

Air traffic control hosts bring your daughter to work day

Following reports that only 12% of the UK’s engineering and technology workforce are women, NATS opened its doors to the potential next generation of female engineers this summer.

Around 40 students aged between 13-18 attended the Whiteley and Swarwick NATS sites’ ‘Bring your Daughter to Work Day’, where they got to meet air traffic control engineers and enjoy interactive talks, tours and activities aimed at helping them discover more about a career in engineering.

The event, held in July, was part of NATS’ Early Careers recruitment scheme, which aims to inspire the next generation of female engineers and technicians by raising awareness of STEM-related career paths in the aviation industry.

Similar events are held at other NATS sites throughout the year.

NATS engineers act as a focal point for air traffic control, working 24/7 to deliver and maintain operational systems and equipment. Their day job ranges from designing air traffic control technology to maintaining the UK’s network of radar stations.

Employees were able to invite a daughter, female family member or friend to work for the day and many took advantage of the event to do just this.

“After the great success of this event last year we were really excited to do it again,” says Katie Foster, Head of People Services for NATS.

“It’s important for young women to feel confident taking up a career in science, technology, engineering and maths (STEM) related industries – and this event is our way of helping them do that.

“By engaging with them, we hope NATS can encourage them to think more about their career options and the opportunities available to them.”

NATS believes increasing diversity is vital for several reasons, not least to expand the pool of engineering talent, but also because the aviation industry has some groundbreaking developments on the horizon.

“Growing our talent pipeline is hugely important to our future success, so we hope we gave them an insight into what a future career in STEM can offer and particularly the fantastic opportunities that exist within NATS,” says Katie.
This summer The Infinite Monkey Cage radio show, hosted by physicist Brian Cox and comedian Robin Ince, travelled to GCHQ’s headquarters in Cheltenham to record a special episode of the factual science series.

Brian and Robin were joined on the panel for the show by comedian Katy Brand, GCHQ’s historian Tony Comer and the Deputy Director for Counter Terrorism, Ian.

The 30-minute Radio 4 show, which is also released as an extended length podcast, poses tricky science-based questions to its panel, with surprising and sometimes irreverent results.

The show recently celebrated its 100th episode, and GCHQ is about to enter its 100th year, with 2019 marking its centenary. Recorded in the evening, before an audience of staff, the panel had a light-hearted yet informed debate on topics as diverse as code-breaking, cybersecurity and the ingenuity required to work for an intelligence agency.

Asked to name their favourite codes, Tony named the Magdeburg Code Book captured from a German cruiser during WWI, while Ian plumped for the genetic code.

“Recording a radio show deep inside the headquarters of an intelligence agency was definitely a security challenge, but it was worth it because being part of the audience was a fantastic experience for our staff. Many of them work long hours, counter-terrorist threats from nation states, criminals and terrorists. For one evening, this was definitely a break from the day job,” says Tony.

“Some of the ingenuity that we are renowned for came through during the recording – several staff members in the audience were unable to stop themselves shouting out answers to puzzles being set for the show’s listeners!”

Ian, who has worked at the heart of GCHQ’s counter-terrorism mission for many years, also talked about what it’s like to work at GCHQ during the show.

“Being able to imagine the impossible is still as fundamental to GCHQ today as it was to those working at Bletchley Park in WWII,” he said. “It takes more than individual genius to solve the complex challenges we face; we need diverse individuals collaborating in teams to bring their collective talent and different perspectives together.”

This episode is now available to download as a podcast and from the BBC website.
Sensor research clinches prestigious scholarship for Edinburgh student

The Royal Commission for the Exhibition of 1851 Industrial Fellowship scheme has selected Edinburgh PhD student Euan Ward as one of its top 12 most gifted young research scientists and engineers in the UK.

At an award ceremony in London this autumn, Euan received a prestigious 1851 scholarship due to the cutting edge nature of the sensor research he’s pioneered at Leonardo, an advanced engineering company which designs technology in the UK.

Euan joined Leonardo’s graduate programme in 2016. The advanced radar research work he conducted within that programme formed the background to his PhD project, which is co-funded by Leonardo and started in September 2017. This scholarship will enable him to continue his research into developing a solution that will allow industry to operate modern radars in environments that are already crowded with radio frequency energy.

For example, radar sensors are increasingly being used in driverless cars and remotely piloted vehicles, however the increased volume of users means that this technology can become vulnerable to interference. He is pioneering technology that will safeguard against some of the most hazardous consequences of radio frequency interference, such as a driverless car losing its ability to navigate properly.

Funding from the Commission will enable all 12 finalists to make an impact on their industry and wider society by accelerating the development and commercialisation of new technologies. These fellowships, set up by Prince Albert following the Great Exhibition of 1851, recognise the best research projects that could advance British industry, allowing companies to conduct innovative research that accelerates the creation of exploitable IP.

“I’m very honoured to have been awarded this industrial fellowship, particularly given the outstanding quality of the other projects which have been recognised,” says Euan. “I feel excited about the application of the research findings in industry. I’ve had tremendous support from Leonardo’s engineering community and their deep knowledge of radars has helped me to develop techniques for the commercial market. Without Leonardo’s significant backing and radar expertise, this research would not be possible.”

This year the Leonardo business celebrated its 75th anniversary in Edinburgh, having first opened its doors on 16 June 1943 for the production of gyro gun sights for the Spitfire.
Network Rail’s air operations team has been busy developing its use of drones, or unmanned aerial systems, over the past six months.

This addition to its air ops unit, which already includes its own helicopter, will bolster Network Rail’s capacity to save time and money with the use of aerial images.

Inspecting the railway by air improves performance, reliability and safety with no disruption to activities on site, or to services for passengers. Images taken by the team are available to all Network Rail staff from their desks, improving efficiencies and keeping staff safe.

In the past six months Network Rail has carried out consultations and training and sourced the best equipment to use across its network. It now has 25 drone pilots who have received specialist training.

Network Rail staff use the online aerial image hosting system RouteView to find inspection and survey shots they need to inspect the network. Teams across the business use this when planning projects or maintenance, reducing the need for physical site visits and trackside asset inspections.

Employees will have access to even more images thanks to the drones.

Network Rail has used drones for a variety of purposes so far, including overhead line equipment and structure inspections, 3D mapping and media campaign support, such as unveiling new infrastructure to the public.

It has put in place a framework of approved suppliers to deliver these specialist services, all of which have gone through a robust safety and compliance process. They are the only certified drone operators permitted to provide services within 50m of Network Rail infrastructure.

Some of the contractors also have special permissions from regulator the Civil Aviation Authority that enables them to operate in congested areas like towns and cities that would otherwise be restricted under CAA rules.

Network Rail drones – the vital statistics

- Weight: 7kg max weight allowed – about as heavy as a standard bowling ball.
- Range: permitted to fly up to 500 metres away from pilot – depending on weather conditions.
- Flight: permitted to fly up to 400 feet high – slighter higher than St Paul’s Cathedral.
- Typical flight time before recharge: around 20 minutes.
- Crew: usually minimum of two. One pilot in command, and one observer/camera operator. Other missions may require more crew, such as spotters, engineers and aides.
- Camera: varies on mission and can include high-definition, 4K video imaging and high-resolution stills camera systems.

Drone deployed to inspect overhead line equipment.
**National Grid strengthens partnership with the IET**

This August National Grid joined the IET’s renowned IET Corporate Partnership community at a special signing event. This was attended by National Grid professionals including Chief Electricity Engineer David Wright, Engineering Projects Manager Glenn Elworthy and Switchgear Engineer Joe Taylor. Held at IET London: Savoy Place, they were joined by IET Chief Executive Nigel Fine and Senior Development Manager Jo Deal.

Over the years National Grid and The IET have worked closely, supporting engineers and technicians with their professional registration through a variety of activities from roadshow events through to one-to-one advisory sessions. As a result of this the company has had a high number of people achieve professional registration and is planning further activities in the future.

“National Grid employs the highest quality engineers and is a true British engineering success. Professional registration is fundamental to this,” says David. “We have benefitted greatly from working closely with the IET over the years and I’m particularly proud to commit to continue this great work by signing the partnership agreement.”

**Investing in nuclear professionals**

Wood’s nuclear graduate scheme has received reaccreditation from the IET. Reassessment takes place every three years and is an important process for the business, not least because the IET provides a structured route to professional registration as an Incorporated or Chartered Engineer for employees. It also affords individuals a programme that’s quality assured, ensuring they receive the best support for professional development and career progression.

After a rigorous recruitment process, successful applicants embark on a two-year scheme that comprises placements in host operational delivery units as well as a structured programme of activities and training in both technical and personal development topics.

Graduates are supported by the business for a further two to three years beyond the formal scheme as they continue to develop the competencies they require to become Incorporated or Chartered via the IET. A mentor is also provided for each graduate to provide technical support and advice throughout the programme.

“Our nuclear graduate scheme is well regarded by both graduates and the wider nuclear industry,” says David Boath, Vice President for Nuclear and graduate scheme sponsor at Wood. “We are delighted to receive reaccreditation from the IET and continue to attract high calibre graduates into our business, helping to ensure a sustainable workforce for the future.”

A scientist working at Wood’s nuclear labs in Warrington.
We have life pretty much planned out, especially when it comes to our finances.

But sometimes the unexpected happens and we are faced with a big cost.

Nearly two thirds of people in the UK don’t have enough savings to fall back on if something happened.

And how much we have for fun.

If you or your loved one was unable to work would you have enough saved to tide you over for a while?

Or maybe your child or a parent is taken ill and you need to take time away from work to care for them – can you afford it?

We are here if you need some help. We offer financial support to former and current members and their loved ones.

We are here to help you get back on track.

We support IET members and their dependants whenever they need us. We offer a range of support.

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