The Woman Engineer

WOMEN'S ENGINEERING SOCIETY

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WES JOURNAL GOES DIGITAL

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Dr Katherine Critchley, president of the Women's Engineering Society

Welcome to the Summer 2025 issue

What a fantastic time in the WES year!

We've seen a flurry of events recently, and I hope many of you have had the chance to take part. The sold-out conference was a particular highlight with two amazing days filled with learning, connection and inspiration. I'm always so grateful for the opportunity to attend in-person events and the WES team once again did an outstanding job curating a programme that truly had something for everyone.

A big thank you to our sponsors, whose support makes it possible for us to gather in person. It was a pleasure to meet many of them at their impressive stands – what a vibrant and informative part of the event! Heartfelt thanks also go to everyone who presented and to all who joined us.

It's been wonderful following Ellie Driver's incredible sailing mission. What an inspiring partnership! Ellie even sent a clip for the conference from mid-race, an uplifting moment that truly captured the spirit of perseverance and ambition. It was warmly received by all.

We also recently held a special dinner for the Karen Burt Award alumni; recognising the best newly chartered women engineers from recent years. Each nominee is selected by their professional engineering institution and the award is generously sponsored by our patron, Professor Cyril Hilsum, who is celebrating his 100th birthday this year. It was moving to hear past recipients share how the award has impacted their careers and the paths they've taken since.

I'd also like to highlight the 'Watts in a Home' project, which has been gaining strong support from our members. This initiative celebrates the 100th anniversary of the Electrical Association of Women. A big thank you to our local volunteers who made the Bristol and Newcastle events possible! Please check the WES website for upcoming locations and dates, your involvement is what keeps this project thriving. As a former cluster coordinator, I firmly believe that it's through the local clusters that we grow stronger – supporting and mentoring one another is at the heart of what makes WES so powerful.

And finally, I hope you've all had a fantastic INWED! (Although as I write this, the celebrations are still just ahead.) With the announcement of the WE50 winners and so many inspiring events highlighting the incredible contributions of women in engineering, it's a moment to take real pride in all that we do. Here's to celebrating our achievements and then enjoying a well-earned summer break!

K L Critchley

Dr Katherine Critchley
President of the Women's Engineering Society
www.wes.org.uk

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Welcome to the Summer 2025 issue of The Woman Engineer

The last quarter was an exciting time for Women in Engineering (WES) members. Recognition was in abundance with the Top 50 Women in Engineering (WE50) – see more on page 06. The Annual Conference, held in April was buzzing with engineers coming together to learn, share stories and attend workshops – further details on page 08.

This issue contains interesting and thought-provoking articles provided by WES partners and ambassadors including British Airways, Dr Cristina Steliana Mihailovici, Penny Wilkinson (Head of Communications at ECITB), Sophie Qaisar (Lead Systems Engineer at Leonardo) and Esin Yondem (Lead Software Engineer at Evolito).

Finally, as seen on page 02, The Woman Engineer Journal is going digital from Autumn 2025. This is your journal so it's your choice; print or digital. If you would like to continue receiving a printed journal scan the QR code provided below. As always, I look forward to welcoming your feedback and suggestions for topics, articles and features; **julietl@warnersgroup.co.uk**

Juliet Loiselle FInstR
Managing Editor

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NEW MEMBERS

The Women's Engineering Society (WES) is delighted to welcome these new members:

Alexandra Plompen-Philip
Alicja Kowalska
Amy Richardson
Ana Eva Duque Cardiel
Anna Collins
Anna Cuanalo Mike
Athira Anil Kumar
Aurore Knight
Ban Aljassani
Beatriz Coutinho
Bethan Charles
Candice (Wai Lam) Szeto
Clemence Barrett
Debbie Airey
Elizabeth Ferguson
Ellie Ebrahimi
Emma Bateman
Emma Shah
Emma Thompson
Enas Othman
Eng. Cornelius Mpesi
Eva Jacobs
Ewelina Wajda
Fiona Winters
Funmilayo Offiong
Grace Newman
Ify Anyaegbu
Imogen Coker
Indulekha Valsalkumar
Julia Sutcliffe
Katie Jnauszewska
Lihini Wijesinghe
Lily Singleton
Linda Ivanova
Lydia Byers
Mahitha Adapa
Mairéad Reid
Maria Barbarash
Michelle Hope
Mohini Patel
Molly Bell
Natasha Formby
Nicole Noemi Raimondi
Omolola Ogungbuaro
Piyu Banerjee
Pooja Mattapalli
Priyanka Arul

New Fellows

Jane Brookes
Punitha Kamesh
Rachel Arthur
Rebecca Taylor
Safaa Shakeel
Sapphire Lacey-Wilson
Sehrish Shahnawaz
Sheila Graber
Sophie Parkinson
Sumali Harshani Ihalagama
Susan Shirling
Suzy Martin
Svetlana Voznenko
Tarik Saoufi
Umama Taskia

Top 50 Women in Engineering announced

Many congratulations to all the winners of The Top 50 Women in Engineering 2025.

This year's WE50 winners represent a diverse range of sectors including transport, construction, technology and healthcare. The nominations were made both by individuals and professional institutes and all were put forward because they have excelled in their field. The awards were judged by a panel of independent industry experts led by head judge, Laura Shrieves, VP Engineering at Ultra Marine.

As part of International Women in Engineering Day 2025 on 23 June, we are delighted to announce the winners of the 2025 Top 50 Women in Engineering (WE50) awards. The 2025 WE50 celebrates women who are trailblazers in the world of engineering under the theme 'Together We Engineer'.

This year's WE50 'Together We Engineer' theme showcases the powerful impact made by women engineers. The winners are involved in everything from digital health, decarbonisation and heritage projects to space science, sustainability and accessibility.

The Top 50 Women in Engineering are announced each year on International Women in Engineering Day (INWED). INWED was founded by the Women's Engineering Society and takes place annually on 23 June. This campaign continues to lead the way in providing female engineers around the world with a voice.

The 2025 Top 50 Women in Engineering:
Together We Engineer winners are listed below (in alphabetical order):

1. Yewande Akinola, Technical Director, CBRE
2. Anam Balbolia, Principal Engineer, WSP
3. Julia Barr, Commercial Manager, Mott MacDonald
4. Elena Brake, trainee engineer and student, Fishtek and University of Plymouth
5. Christina Brugger, Product Consultant/Founder, InsightSprint
6. Denise Cardenas Lopez, Senior Director/VicePresident, Strategic Capability and Integrated Delivery Amentum
7. Brigit Coleman-Green, Submarine Delivery Agency; Dreadnought Supply and Support Team
8. Emily D, Software Engineer, GCHQ
9. Honora Driscoll, PhD student, University of Oxford
10. Lauren Eatwell, Head of WindWings, BAR Technologies
11. Marianne Ellis, Director of CARMA CARMA, EPSRC Sustainable Manufacturing Hub, University of Bath
12. Pamela Esin, Associate Director, HDR Inc
13. Anni Feng, Associate Director, Hoare Lea
14. Nour Ghadban, Research Assistant (Biomedical Engineering), University of Glasgow
15. Priyanka Ghosh, Advanced Research Engineer, The Manufacturing Technology Centre
16. Alice Goodwin, Project Engineer – Aircraft Asset Management, Virgin Atlantic
17. Poppy Harrison, Senior Engineer, Committee Co-chair, AtkinsRéalis
18. Rachel Hayden, Senior Civil Engineer, WSP
19. Rachael Hazael, Associate Professor in Applied Materials, Cranfield University
20. Puja Hazlehurst, Head of Product Engineering, Caeli Nova
21. Kareema Hilton, Machining Applications Theme Lead, NMIS
22. Fauzia Idrees, Director of Cyber Security, University of London and Global Council for Responsible AI
23. Melissa Jordan, Principal Project Manager, HDR Inc
24. Imisi Joseph, Senior Data Analyst, JLR
25. Natasha Khan, Nuclear Safety Engineer, Mott MacDonald
26. Jolie Lau, Façade Engineer, Arup
27. Oana Lazar, Embedded Software Engineer, Tessent Embedded Analytics (Siemens Electronic Design Automation)
28. Hannah Livingstone, Materials Engineering degree apprentice, Rolls-Royce
29. Gail M, Solutions Architect, GCHQ
30. Keziah Magit, final year PhD student, University of Nottingham
31. Kathryn Malcolm, Associate Project Manager, Global Engineering AstraZeneca
32. Fay Newham, Associate Engineer, Ramboll
33. Rachel Paley, Senior Consultant, Arup
34. Cambell Plant, Asset Management Consultant, Binnies UK Ltd
35. Vanessa Quansah, Head of Construction Engineering, Lendlease (soon to be Bovis)
36. Tanja Radu, Reader in Environmental Engineering, Loughborough University
37. Ramsha Saleem, Assistant Engineer, WSP
38. Magdalena Sartin, Group VP Engineering, Capital Projects and Operational Excellence, Johnson Matthey
39. Kelly Shungu, Hardware Engineer, Leonardo
40. Barbara Smitten, Associate Director, Cundall
41. Meini Su, Senior Lecturer, The University of Manchester
42. Jo-Anne Tait, Principal Lecturer, Robert Gordon University
43. Ruth Tatanga, Senior Mechanical Engineer, chapmanbdsp
44. Evona The, Strategic Foresight Co-Founder/Innovation Lead, Jaguar Land Rover
45. Anna Terry, Principal Mechanical Engineer, AWE
46. Davina Urquhart, Welding Engineer, AWE PLC (Atomic Weapons Establishment, Aldermaston)
47. Julia Ward, UK Project Development Director, Queequeg
48. Saima Yasin, Professor, University of Engineering & Technology
49. Tasneem Yousif, PhD Researcher and Assistant Lecturer, University of Nottingham
50. Jun Zang, Professor of Coastal and Ocean Engineering and Deputy Head of Department of Architecture and Civil Engineering, University of Bath

Judges

This event wouldn't be possible without the diligent efforts and valuable time provided by our illustrious judging panel.

The judges for the WE50 2025 awards were:

1. Judith Abolle-Okoyeagu, Principal Lecturer and Head of Electronic and Electrical Engineering
2. Danella Bagnall, Technical Director, JLR
3. Tej Bahia, Business Unit Director, Arcadis
4. Faye Banks, Global Head of Transmission and Distribution, Turner & Townsend
5. Ann Dowling, Deputy Vice-Chancellor, University of Cambridge
6. Kate E, Engineering Cyber, GCHQ
7. Kerry Evans, Technical Director (Highways) Eco-Scope
8. Kim Everitt, Transport Systems, Energy Systems Catapult
9. Steve Gill, Engineering and Business Consultant
10. Paulina Godfrey, Senior Director Energy & Environment EMEA, Hilton
11. Kristine Hammond, Project Manager, Amazon
12. Julie McManus, Chief Systems Engineer, Leonardo Electronics
13. Cathy McClay, Managing Director, National Grid DSO
14. Linda Miller, Construction Director, Bechtel Infrastructure
15. Laura Shrieves, Vice President of Engineering, Ultra Maritime
16. Nina Skorupska CBE, Non-Executive Director, Great British Energy

The Women's Engineering Society (WES) Annual Conference 2025

A look inside WES Annual Conference 2025, two full days of innovation, impact and inclusion.

Birmingham's Eastside Rooms were buzzing with energy as engineers from across the UK came together for the sell-out Women's Engineering Society (WES) Annual Conference, held on the 28th and 29th of April. Over two packed days, delegates explored the future of engineering through engaging talks, practical workshops and meaningful networking.

The conference brought together professionals at every career stage, from early talent to senior leaders, to address challenges facing the sector and celebrate the vital role of women in engineering.

Driving change through collaboration

The 2025 programme was shaped around key themes: climate resilience, ethical leadership, inclusive design and emerging technologies. A strong line-up of expert panel sessions set the tone, tackling issues such as the UK's energy transition, engineering ethics in the climate emergency, and inclusive workforce strategies in aerospace and defence.

Industry voices, including the Women's Energy Network Alliance, shared insights into navigating complex transitions while maintaining diversity and innovation at their core.

Practical learning and leadership development

Workshops offered attendees hands-on tools to advance their skills and careers. Senior engineers benefited from leadership sessions led by Ultra Maritime and Thales, while the Institution of Mechanical Engineers (IMechE) ran a career development session focused on progression pathways.

The Royal Academy of Engineering (RAEng) led a compelling workshop on intersectionality in design, demonstrating how inclusive practices can shape better engineering outcomes. Another key session addressed how ethics intersect with technical decision-making, especially in the context of global climate challenges.

Spotlight on industry innovation

Keynote talks and Q&As from leading industry figures added fresh perspectives throughout the event. Highlights included:

- AI in engineering – Alan King (IMechE) offered a balanced overview of AI's potential and risks.
- Infrastructure and inclusion – Kerry Evans (Ecoscope) drew lessons from major construction projects.

- STEM returners – Anouska Carling shared practical strategies for career re-entry.
- Rail modernisation – Geeta Morar (Hitachi Rail) unpacked the UK's complex Four Lines Modernisation Project.

Building community and inspiring growth

Outside of sessions, the conference created space for coffee and conversations allowing attendees to connect, reflect and build their networks.

This spirit of community, combined with forward-thinking content, positioned the conference as not just an event but a movement pushing for systemic change across engineering.

A spokesperson for Amazon UK commented: "Entering our fourth year of partnership with WES, we continue to support initiatives that help build a truly inclusive engineering culture. The annual conference is a unique forum for sharing ideas, building networks and driving systemic change across the sector."

Powered by purpose and partnerships

Sponsors including Amazon UK and AWE played a key role in supporting the event and reinforcing shared values around diversity, innovation and talent development. Their involvement highlighted the importance of industry collaboration in attracting and retaining the next generation of engineers.

Mandy Savage, Executive Director of Engineering at AWE, said: "We are proud to sponsor this year's WES Conference, which brings together some of the UK's most outstanding engineering talent. At AWE, we rely on a diverse and technically skilled workforce to meet the national defence challenges of today and tomorrow. Events like this are critical to attracting and retaining the engineering talent the country needs."

Looking ahead

The conference closed with a creative keynote by Susan Robson MBE, who explored how the arts and engineering intersect – and why imagination is key to tackling global challenges. Her call to action underlined a clear message: while the sector has made meaningful strides, the work toward a more equitable and sustainable future continues.

With a sold-out audience, rich content and a renewed sense of direction, the WES Annual Conference 2025 reaffirmed its position as one of the UK's most influential engineering events.

Interested in joining next year's event?

Visit **www.wes.org.uk** to register your interest in WES 2026 and be part of the change shaping engineering today.

BRITISH AIRWAYS ENGINEERING FAMILY DAYS

BY **DUNCAN HAMILTON**, BRITISH AIRWAYS ENGINEERING

Over the weekend of 31 May and 1 June, British Airways Engineering held two family days for colleagues, their friends and families at their Heathrow Operations Base.

▲ *Crowds at the BA Engineering Family Days (Image courtesy of Rubeun Gracias)*

Some 8,702 BA people, their friends and their families attended the event over the weekend. As well as Concorde, a live 777 and A320neo, visitors enjoyed 55 stands and live exhibits from BA Engineering and the wider BA business, supported by more than 140 colleagues and 60 volunteers. External suppliers and delivery partners brought another 27 stands, supported by more than 100 staff.

The organising team within BA Engineering spent four months ensuring – with their trademark BA Engineering rigour – that every detail was spot on. BA volunteers and hosts gave up their weekends to host visitors, always with a smile on their faces and showing a passion for their subject matter. Included in that number were colleagues from the wider BA business who offered their time and resources to make the day a success. Gratitude goes to all the BA partners who played their part in making the days so memorable.

The Family Days were all about showcasing what we do in BA Engineering, a chance to connect with our colleagues and their families and for our guests to explore our different departments to gain a deeper insight into how we are transforming our organisation.

"To women and students considering STEM, your ideas and passion are essential."

BA Engineering STEM event

More recently we welcomed 2,000 young people from across the UK to an exclusive STEM event – the largest student event that British Airways has ever hosted in-house, to inspire the next generation by showcasing careers in engineering and our apprenticeship and graduate programmes.

Our guests had the opportunity to engage with 40 different exhibitors showcasing their roles in the world of aviation, as well as a career zone with our emerging talent partners including BrightNetwork, Connectr, UCAS, Air League and The Kings Trust. We also had a TED talks area where our BA Engineering apprentices and graduates hosted in-depth talks on their schemes and development opportunities.

The event was held at our Heathrow Operations Base and featured many of the attractions that were on show over the weekend at our two Family Days.

"Challenge stereotypes, seek mentors and believe in your potential."

Describing how our Strategic Resourcing Team enjoyed collaborating with Engineering on this event, Melissa Richardson MBE, Senior Emerging Talent Manager, said: "Seeing the sheer number of students in one room, all excited about our day-to-day world, made me feel so proud.

"The students were enthusiastic and didn't stop smiling all day, with many commenting that it's opened their minds to the amount of STEM careers in aviation. It's been fantastic working with the engineering team, and I want to extend a heartfelt thank you for every volunteer that helped to bring this event to life."

▲ *Vanessa with colleagues at the BA Engineering Family Days (Image courtesy of Rubeun Gracias)*

Diversity and challenges in technical engineering

Vanessa D'Souza is Strategic Change Lead in Engineering at BA Engineering and was one of the main organisers of the Family Days event. She said: "At the start of my career, I never imagined I'd one day help lead change in one of the world's most complex industries. Today, I'm proud to work at British Airways, supporting the brilliant teams in technical, strategic planning, and business development who keep our aircraft flying safely every day.

"I hosted the Cabin Technical stand at our Engineering Family Days and for many attendees it was a unique opportunity to see how STEM translates into real-world solutions. From aircraft systems to maintenance planning, we showcased the diversity and challenge of both technical engineering and engineering support roles – highlighting just how dynamic and rewarding this field can be.

"The feedback was inspiring. Visitors were energised by hands-on demonstrations and left with a clearer understanding of how STEM shapes the world around them. It reminded me how important it is to make these subjects accessible and relatable.

"To women and students considering STEM, your ideas and passion are essential. Whether you're drawn to flight, sustainability, or innovation, there's a place for you in this industry. Challenge stereotypes, seek mentors and believe in your potential. You belong here."

British Airways have student opportunities all-year round, including access to their Speedbird-Z student platform full of online learning modules and the opportunity to talk to mentors; work experience days and placements; and employability workshops and events. (**www.britishairways.connectr.co.uk/inspire**)

Women in Engineering, Emotional Intelligence, Artificial Intelligence and Innovation

BY **DR CRISTINA STELIANA MIHAILOVICI**, DOCTOR IN NAUTICAL SCIENCE AND ENGINEERING, LECTURER, WRITER, RESEARCHER, SENIOR FELLOW HEA STEM AND CLIMATE AND SUSTAINABILITY AMBASSADOR

The role of women in engineering has evolved significantly over the decades, but there are still challenges in achieving true gender equality and equity in the STEM domains.

As a professional with experience in engineering, environmental protection, marine engineering, sustainability, risk analysis and management, I have faced different situations, between the struggles and opposition environments, or the success and recognition of women striving to make a positive impact in these fields.

With advanced technologies, the implementation of artificial intelligence (AI) and the growing emphasis on emotional intelligence (EI) in leadership and innovation, women in engineering should be better positioned and supported to drive transformative change.

Women in engineering: overcoming barriers and driving innovation

Women in engineering and STEM continue to break barriers in very traditionally male-dominated disciplines including marine engineering, environmental engineering and sustainability. Despite progress, issues such as unconscious bias, lack of representation in leadership roles and workplace challenges still block women's full participation and progression. However, many organisations and institutions are actively promoting diversity, equity and inclusion initiatives, ensuring that women have access to mentorship, scholarships and professional development opportunities, but not always to leadership roles.

In marine engineering, women have made notable contributions to ship design, offshore energy, marine law or environmental protection. Their knowledge and expertise have been invaluable in addressing sustainability challenges such as innovating for modern designs and using alternative fuels for reducing carbon emissions from maritime transport, or developing eco-friendly marine technologies. Encouraging more women to enter and remain in these fields requires targeted policies, inclusive work environments and continuous professional support (Garrick et al., 2020[1]; UNESCO, 2021[2]). Additionally, integrating gender-focused strategies in maritime engineering education and policy frameworks can further enhance participation and innovation.

Women engineers have also contributed significantly to the advancement of renewable energy, smart infrastructure and green technologies. From developing energy-efficient buildings to designing sustainable transportation solutions, their involvement in the industry is crucial for driving progress. Governments and organisations must work together in strong partnerships to implement gender-supportive policies that create a more equitable platform for women in engineering, ensuring that their expertise is recognised and used to shape a sustainable future.

The role of AI in engineering and sustainability

Artificial intelligence is reshaping the engineering landscape, automating complex tasks and enabling data-driven decision-making. AI applications in environmental protection and sustainability include predictive modelling for climate change, smart grid optimisation and real-time monitoring of marine ecosystems. As AI becomes more integrated into engineering disciplines, the need for diverse perspectives in its development is crucial (Russell & Norvig, 2020[3]).

Over the past 15 years, I have always taught my engineering students to be 'performant professionals', always being ready to act, to take responsibility and control on how, when and where we will be using AI. I am always encouraging women and girls in studying engineering and take a step forward to innovate and progress in engineering, in all domains. Women in AI-driven engineering roles bring unique insights into ethical considerations, social impact and user-centred design. Ensuring gender-balanced participation in AI research and development helps mitigate biases in algorithms and

> "WOMEN IN ENGINEERING AND SUSTAINABILITY PLAY A CRUCIAL ROLE IN SHAPING THE FUTURE OF TECHNOLOGY AND ENVIRONMENTAL PROTECTION."

promotes a more inclusive technological advancement. Moreover, interdisciplinary approaches combining engineering, sustainability and AI can lead to more innovative solutions to address global challenges such as renewable energy implementation and resource efficiency (West et al., 2019[4]). The intersection of AI, risk analysis and project management in sustainable engineering domains further demonstrate how AI can support long-term environmental strategies and powerful decision-making frameworks.

AI is also being used to enhance predictive maintenance in engineering projects, improve disaster response planning and risk management plans and streamline supply chain logistics. Women engineers driving sustainability initiatives using AI and advanced technologies can use these advancements to develop more resilient, efficient and innovative systems that contribute to global efforts in combating climate change issues. The integration of AI with environmental engineering further highlights the need for more gender diversity in AI development teams, ensuring that sustainable solutions are fairer, effective and performant.

Emotional intelligence in engineering leadership

Emotional intelligence (EI) plays a pivotal role in effective engineering leadership and project management. As a supervisor, mentor and a professional engineer in national and international environments, I have seen how EI enhances team collaboration, problem-solving and resilience in high-stakes frameworks. Women often excel in EI competencies such as empathy, adaptability and conflict resolution, making them strong leaders in engineering and sustainability-focused initiatives (Goleman, 1998[5]).

In marine and environmental engineering, where projects often involve multidisciplinary teams and international collaborations, EI fosters effective communication and decision-making. Engineers with high EI can navigate challenges, inspire innovation and create more inclusive workspaces that value diverse perspectives and creativity. Promoting EI training in engineering education ensures that future leaders are equipped with the skills necessary to manage technological advancements responsibly and ethically (Boyatzis, 2018[6]). Additionally, integrating EI training into project management and risk analysis frameworks can enhance the overall success of engineering projects by fostering adaptive leadership and resilient decision-making for global challenges.

Leadership development programmes should emphasise the importance of EI in engineering, equipping professionals with the necessary skills to manage interpersonal conflicts, motivate diverse teams and foster a culture of innovation. Women engineers, with their strong interpersonal skills and ability to lead with empathy, can drive positive organisational change, promoting sustainable development and ethical decision-making within the engineering industry.

Advancing women in engineering: future directions

To further advance women in engineering, AI and sustainability, educational and professional institutions must implement strategies such as:

- **Encouraging early STEM engagement:** Introducing girls to engineering concepts through direct learning, mentorship programmes and role models (UNESCO, 2021[2]).
- **Fostering inclusive work cultures:** Organisations should create policies that support work-life balance, equal pay and career progression for women in engineering and STEM domains (Hunt et al., 2018[7]).
- **Promoting interdisciplinary research:** Encouraging collaboration between engineering, AI and sustainability fields to develop innovative solutions for global challenges.
- **Enhancing emotional intelligence training:** Integrating EI development into engineering curricula and professional development programmes, to prepare future leaders for ethical and effective decision-making (Salovey & Mayer, 1990[8]).
- **Strengthening policy advocacy and industry networks:** Setting up more industry and academic partnerships and advocacy groups focused on increasing female representation in engineering and AI nationally and internationally. (UN SDG17, UN SDG 5)

- **Using AI for sustainable development:** Encouraging women engineers to contribute to AI-driven solutions for environmental and climate challenges, ensuring ethical and inclusive technological applications.
- **Supporting leadership development for women in engineering:** Setting up mentorship programmes, leadership training and networking opportunities that empower women to take on executive roles in engineering and technology industries.
- **Encouraging representation in policy and decision-making bodies:** Advocating for more women engineers to be involved in government advisory boards, regulatory agencies and industry councils to influence policy and innovation strategies.

Conclusion

Women in engineering and sustainability play a crucial role in shaping the future of technology and environmental protection. By using their expertise, fostering emotional intelligence and embracing AI-driven advancements, they can drive meaningful change in their industries. Ensuring gender equity in STEM fields requires continued advocacy, policy reforms and institutional support to create a more inclusive and innovative engineering landscape.

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Encouraging more women into engineering construction is critical

BY **PENNY WILKINSON**, HEAD OF COMMUNICATIONS AND MARKETING AT THE ECITB

Engineering construction is a specialised industry that underpins the delivery, maintenance and decommissioning of much of the UK's critical infrastructure. It operates across the oil and gas, nuclear and renewables sectors, as well as other process industries such as chemicals, pharmaceuticals, food processing, water and waste treatment.

Engineers in the engineering construction industry (ECI) work on projects that design, test, install, maintain and decommission industrial facilities.

The Engineering Construction Industry Training Board's (ECITB) Labour Forecasting Tool (LFT) predicts that 40,000 extra workers could be needed by 2030.

40,000 EXTRA WORKERS COULD BE NEEDED BY 2030

Meeting net zero goals

To meet the UK's net zero goals and become a clean energy superpower, the industry must increase offshore wind assets, carbon capture and storage facilities, decarbonise major industrial clusters and ramp up hydrogen production plants. There's also demand from projects to decommission within the oil and gas and nuclear power sectors, as well as new nuclear power stations under construction.

If these anticipated projects go ahead and current staffing trends continue, there will be a huge shortage of workers to deliver them.

The LFT reveals that the size of the overall ECI workforce could total more than 135,000 workers in five years' time to meet demand, an increase of 19% on the current number of workers in the industry. This includes mechanical and electrical engineers, process engineers, project managers, pipefitters, welders and instrument and control technicians.

Meeting the skills gap

Increasing diversity and encouraging more women engineers is critical to meet the skills gap looming on the horizon.

But the latest ECITB workforce census revealed that although it had risen from 13.8% in 2021 to 16.9%, the proportion of women in the ECI is substantially lower than that of the wider working population in Britain (47.6%).

The census gathered information on 74,609 workers and offers a comprehensive overview of the ECI workforce, covering distribution across sectors and regions, demographic trends, hiring challenges and business opportunities over the next three years.

While the overall share of women in the workforce has increased over the past three years, there has been little change in some specific roles. Engineering construction remains a heavily gendered industry across many occupations.

The most acute skills shortages are in occupations where men make up the vast majority of the workforce.

Expanding the talent pool is crucial for addressing these shortages, which requires improving women's access to all ECI roles.

Although employers cannot always influence the profile of applicants for certain occupations, they can help ensure that women who enter the industry feel included, thus increasing their likelihood of staying.

Overall gender statistics should not be used as the sole basis for assessing the success of campaigns and policies aimed at increasing the share of women in the industry.

Detailed reporting based on occupations is needed to assess the extent to which gender balance differences evolve over time. Reporting solely on the overall gender split may obscure stagnation or worsening in certain occupations.

Engineering construction offers career opportunities and the chance to engage in projects with global implications that are at the cutting edge of innovation. On the opposite page we hear from women early in their careers about how they got into engineering construction and how they are encouraging other women into the industry.

Valeria Korobka

Valeria Korobka, Project Engineering Manager at SLB, has worked on a range of projects, from designing vessels to clean oil, to decarbonising a paper mill.

She shared her journey into the ECI: "My physics teacher advised that applications were open for an engineering programme being run at a local university. This was the first time I had exposure to engineering as a potential career opportunity.

"The week-long course took me through several engineering problem-solving activities and by the end of the programme I knew I wanted to become an engineer. If I hadn't had this exposure to a potential career in engineering, I may never have chosen the course – showing the true importance of early exposure to career opportunities.

"Travel is a big part of my job – whether it is visiting clients, vendors or project sites. I have had the opportunity to travel to America several times for training and Indonesia for a short-term assignment. I have also travelled all around the UK.

"It is a career where you are encouraged to travel and even relocate as many engineering companies have a global footprint. Sometimes the opportunity will come to you and at other times you will have to seek out the opportunity yourself."

Chinwe Odili

Chinwe Odili is a Senior Structural Engineer in the oil, gas and offshore wind division, and was recently appointed as the UK Innovation Lead for the consulting business at Kent (formerly Atkins Oil & Gas). She also serves as Chair of the ECITB Innov8 Group.

An early careers and leadership network facilitated by the ECITB, Innov8 brings new perspectives and fresh ideas around engineering construction careers and how the industry can attract and retain a new generation of engaged, diverse and dynamic engineers.

Chinwe studied civil engineering at the University of Warwick, obtaining her Bachelor of Engineering before progressing to an MSc in Project Management (Oil & Gas) at the University of Liverpool.

She said: "There are significant challenges in the energy sector. We need to focus on these major issues facing our industry including attraction, retention and the energy transition.

"As individuals we can all relate to potential new entrants and bring fresh ideas to the table on how we can reach and attract them to the industry."

Cailey Miller

Cailey Miller is a mechanical designer working for Nuvia UK in Warrington. Focused primarily on the nuclear industry, the organisation has been involved in some of the most diverse, complex and challenging projects across the globe.

Cailey chose the apprenticeship route into the industry. She said: "The opportunity to work alongside experienced industry professionals and gain practical work experience is such a fantastic stepping stone for anyone wanting to build a career in any industry.

"Developing those key skills while also obtaining professional qualifications on a part-time basis can significantly improve your career prospects, with the added benefit of being debt-free at the end!

"Apprenticeships are important for the future of any industry, as they are beneficial to both the employer and the apprentice. "Apprenticeships give businesses the opportunity to shape and mould the future of their workforce in alignment with the company's ethos and core values."

Cailey was awarded the 2022 ECITB Apprentice of the Year and won the silver medal in the WorldSkillsUK national finals in Mechanical Engineering CAD.

She is a STEM ambassador and visits schools to deliver presentations on STEM, nuclear and apprenticeships to inspire the next generation.

Lauriann Williams

Lauriann Williams is a civil engineer at RB Plant, an engineering and design consultancy in the manufacturing sector. She is also a passionate STEM ambassador and founder of Lauriann's STEM Club.

Based in Bexley, London, the club works with local schools to provide virtual programmes, face-to-face events and extracurricular workshops throughout the year.

She said: "At Lauriann's STEM Club, we want to help narrow the gap between the number of men and the number of women who work within the STEM industries.

"We aim to do this by encouraging young students, particularly those who are female or from minority ethnic backgrounds, to pursue a career in science, technology and engineering.

"We promote diversity in these fields, and we want to present positive role models to help inform, inspire and motivate all students."

www.ecitb.org.uk

INVISIBLE WARFARE

Sophie Qaisar, lead systems engineer at Leonardo, puts the minor irritations we all have with mobile communications firmly in to perspective.

How did your day begin? As the early morning sun came streaming into your bedroom, did you open your eyes and look at your phone? You see your social media notifications, check your news feed and watch yet another cute cat video. You ask your home assistant, 'what's the weather today?' as you decide what to wear. You jump in the car for your daily commute and you put your route to work into the satnav to avoid the traffic hotspots. Our lives in the modern world are reliant on the technology we have around us, making life convenient and entertaining. The backbone supporting many of the services we use every day is the electromagnetic (EM) spectrum. Low frequency EM waves transport information to our phones, our satnavs, our Internet of Things (IoT) devices, our smartwatches, connecting them all and making our experience seamless. If anything were to disrupt our access to the EM spectrum, these services would fail and life would grind to a halt.

Have you ever been to a concert or sports event and found you can't send a WhatsApp message or load an internet page on your smartphone? When there is a large crowd of people all with smartphones, they are all fighting to transport information over the same part of the EM spectrum. Mobile communications protocols are designed to allocate each user to a different frequency, to send packets of information at different times and to use EM wave modulation schemes to enable more users to send information over the narrow part of the EM spectrum that the service provider has been allocated. But sometimes, when there is a large crowd, there are still too many users and the EM spectrum becomes too congested, resulting in a lack of service.

Have you ever seen your satnav location jumping, totally oblivious to your actual movement? This can be common in an urban environment where buildings interfere with the GPS signal. If you experienced this in a less built-up environment, the chances are your GPS was being jammed, either intentionally or unintentionally. The low power EM waves used to transmit a GPS signal can easily be overpowered by nearby signals operating at the same frequency. GPS jammers have become common in the UK, despite their use being illegal, as it allows drivers to prevent tracking systems from working. These tracking systems can stop lorry drivers working too many hours and are used by fleet managers to monitor vehicle use. They can typically jam GPS receivers in a 500m radius, affecting many road users.

Effects on the military

Just as our civilian lives have become dominated by connected electronic devices, so has the modern battlespace, and thus these civil examples of congestion in the EM spectrum and deliberate obstruction are also seen in a military context. The control of the EM spectrum in this context is called electronic warfare (EW).

In our daily lives, denial of access to the EM spectrum is certainly annoying and disruptive but would rarely be viewed as dangerous. But for military personnel, a lack of access to the EM spectrum means no radio to call for support when someone is injured and no radar to provide early warning of an attack. The EM spectrum is vital to ensure that information can be shared in the modern battlespace, which contributes to protecting our military personnel. EW ensures that our military personnel can maintain access to the EM spectrum, whilst also disrupting access to our adversaries.

Listening to signals

EW can be broken down into three main functions: electronic support (ES), electronic defence (ED), and electronic attack (EA). The purpose of ES is to listen to signals in the EM spectrum to determine who is present in the battlespace, where they are located and what their actions are. With so many air platforms, vehicles and personnel all transmitting EM waves, you can imagine

how much information this can provide, simply by listening. An example of ES is providing situational awareness of an air defence system, which uses radar signals to locate an airborne target, generate a track and then guide a missile towards it. Different radar waveforms are used to perform these different functions and so detection of a change in waveform provides information about the actions being performed.

Jamming signals

Based on the situational awareness picture provided by ES, ED will transmit jamming signals to protect the asset and/or personnel. As in the previous example, the air defence system will use a tracking radar to provide a target location to a surface to air missile. By jamming the tracking radar, it prevents a location being passed to the missile and therefore defeats the engagement.

EA is used to proactively degrade an adversary's capability. Using the previous example, EA will transmit jamming signals to reduce the range of the air defence radar used to detect airborne platforms. This defeats the engagement with the air defence system before it can track the platform or launch a missile.

Drone warfare

EW is being used extensively in the Russian invasion of Ukraine, particularly with the drone warfare that has become prevalent on the front line. Drones are being used to deliver lethal payloads that damage military vehicles and infrastructure and kill soldiers. Jamming the communications signals that are used to control the drone prevent this payload from reaching its intended target. As a result, there has been rapid innovation in technologies to counter jamming, and with new technologies quickly becoming obsolete it is a fast-paced iterative process to maintain operational effectiveness.

Developing new technologies

The challenge of assessing new technologies for use in airborne EW products is what I do at Leonardo in our Applied Research Team. We identify technologies that could be applicable to EW, and work with universities and smaller, specialist companies to assess their suitability for our system use cases. We develop these technologies through modelling and simulation, lab-based demonstrations and trials activities to a point where they can be incorporated into a product. We also support academic research through sponsorship of PhDs and mentoring MEng projects in topics of potential interest.

We research both the medium-term and long-term technologies, for platforms such as the Eurofighter Typhoon and the sixth generation fighter jet being developed under the Global Combat Air Programme (GCAP). EW is vital to protecting these aircraft as they are a key battlefield target for our adversaries and platforms like GCAP will be essential to future military operations. Modern radar systems are increasingly more software defined, meaning they frequently adapt their waveforms making it challenging to identify who is emitting the signal and what their intentions are. This behaviour, coupled with an EM spectrum that is congested with both military and civil signals, is challenging for older EW systems to cope with. Our research focuses on these challenges so we can design EW systems which are able to function in the future EM spectrum and keep protecting our Armed Forces.

So perhaps the next time your GPS glitches, or you are unable to post to social media, you might think about how important those invisible waves really are.

THE FUTURE OF FLIGHT:

Sustainable aviation and inclusive engineering

Lead software engineer **Esin Yondem** shares her journey of once dreaming of space exploration, to leading sustainable aviation projects at Evolito and shares her insights on the importance of an inclusive work culture.

I've always loved understanding how things work and had a desire to solve complex problems. Growing up, I dreamed of becoming an astronaut to explore the unknown in space and I would even imagine myself soaring with wings. This passion led me to pursue a career in software engineering where I could combine my fascination for science and maths with aviation and now, I develop software for systems that enable people to fly safely.

Embracing sustainable aviation

Having worked on a huge variety of aircrafts and systems – from fighter jet and turbo prop aircrafts to flight control, mission systems and integrated cockpit avionics – the transition to sustainable aviation is deeply exciting to me. The potential to revolutionise air travel by reducing emissions and promoting sustainable practices is immense. At Evolito (**https://evolito.aero/**)we are at the forefront of this transformation, developing cutting-edge electric propulsion systems that promise a cleaner, greener future for aviation.

As a lead software engineer, I support the development and maturity of our motor controls and battery management system (BMS) for hybrid and electric propulsion systems, driving innovation that will allow new, greener aircraft types to take flight. The software I develop ensures optimal performance and safety of electric aircraft, enabling more reliability, reduced maintenance costs and a significant reduction in carbon emissions.

Leading innovation

An exciting project I have worked on is the design, development and verification of our innovative BMS for an electric vertical take-off and landing (eVTOL) aircraft. This system is set to reduce carbon emissions by 80% compared to conventional flight. In this use case, the modular hybrid electric propulsion system will use high-voltage batteries for the take-off and climb phases and sustainable fuel such as hydrogen in the future for cruising, significantly reducing carbon emissions.

Leading the development of this system has been both challenging and rewarding. We employ model-based design methodologies to generate code, which accelerates development cycles, reduces human error and improves system reliability in safety-critical systems. Leading the programme team through the validation and verification process, we were able to improve the performance of the system sixfold. This rigorous approach allows us to predict how our products will perform in real-world conditions and make necessary adjustments before they are manufactured.

The importance of safety and collaboration

In addition to the BMS, I also lead the software development of Evolito's motor controls within a team of 12 software engineers. Designing for safety is a critical aspect of my work.

Having worked on multiple certification projects throughout my career, I am well-positioned to offer support and advice to the organisation. My motto is 'if you can't prove it works, it doesn't work'. With this in mind, I mentor a member of our verification team who is fairly new in her role. Together, we improved the verification of our BMS by adding 100 tests. This not only enhanced the reliability of our system but also provided valuable learning and growth opportunities.

Delivering safe, aerospace-grade products is hard work and I believe that successful product development is enabled by a supportive, collaborative culture. We believe that fostering a diverse and inclusive environment is essential for innovation and growth.

> "IF YOU CAN'T PROVE IT WORKS, IT DOESN'T WORK."

We have matured to 200 employees, with a 40,000sq ft test and manufacturing facility in less than four years of operating. We have created a workplace that attracts top talent and keeps them engaged and motivated.

Building a supportive culture

From early on, we recruited our senior leadership team from a variety of aerospace backgrounds, including companies like Collins, Safran and Rolls-Royce. The experienced leadership has been instrumental in driving a company that values innovation, collaboration and inclusivity. Recognising the hard work and dedication of our employees is important; our people team organise monthly wellbeing sessions, summer barbecues, of course, pizza lunches (we have come from a start up after all!) and much more.

It's not just endless supply of cheese toasties that make our culture. We foster an inclusive environment where development and growth are supported. For example, some of the team recently joined the Royal Academy of Engineering's (RAE) Inclusive Leadership Programme, which is designed to equip leaders with the skills and knowledge to create inclusive workplaces, focusing on understanding unconscious biases, developing inclusive leadership behaviours and implementing strategies to foster diversity and inclusion within teams. As part of the programme, an internal survey was conducted that showed 93% of employees feel that the company promotes a culture of inclusion and belonging and 96% of employees feel they are able to succeed here. The Royal Academy of Engineering's EDI Engine report 2024 found that teams with inclusive leaders are 17% more likely to report higher performance and businesses can generate up to 19% more revenue.

Inspiring future engineers

When studying computer science and engineering at Middle East Technical University (METU), Turkey, in the early-2000s, the split of male and female engineers was roughly equal. So, it was quite surprising when I started my career in aerospace and found so few female engineers in the sector. Delivering certified aerospace products is difficult and takes a lot of resources, often requiring long hours in high demand environments. This can be particularly challenging to manage when balancing family responsibilities, which may contribute to the lower number of women in the field and requires organisations to adopt initiatives like flexi-working and enhanced parental packages. Having more women in leadership roles sets a powerful example and motivates new female engineers to continue working hard and aspire to higher positions. Although I do acknowledge that the engineering field is still male dominated, I can see that the gap is starting to shrink; each year Evolito brings placement students into the organisation, and in our 2024-2025 intake, two-thirds of our students were female engineers!

A rewarding career

I was fortunate to discover my passion for engineering at an early age. Throughout my career, I have been supported to embrace challenges, find creative solutions and learn from failures. This journey has taught me the value of perseverance and innovation. Engineering is a rewarding career that can make a significant impact on the world. When you see the first flight of an aircraft that you have worked on, it is truly magical and makes all the hard work worthwhile.

▼ *Engineering is a rewarding career that can make a significant impact on the world*

Progress on 'Watts in a Home – Electric Dreams'

BY **HELEN CLOSE**, THE WOMEN'S ENGINEERING SOCIETY HERITAGE MANAGER

Powering progress and empowering engineers: 'Watts in a Home – Electric Dreams' – public engagement with electricity's past, present and future.

As we are halfway through our project 'Watts in a Home – Electric Dreams' I thought I should update members and partners how things are going.

'Watts in a Home – Electric Dreams' is an innovative public engagement project, generously funded by the Royal Academy of Engineering Ingenious Programme. Coordinated by the Women's Engineering Society (WES), specifically by me as the WES Heritage Manager, this initiative celebrates the formation of the Electrical Association for Women (EAW) and takes us on a fascinating journey through the transformative power of electricity in our homes from its early days to its future in sustainable living.

The project's title is inspired by a 1930's play commissioned by the EAW, setting the stage for a narrative that builds upon the legacies of pioneering women like Caroline Haslett and Mabel Matthews. These trailblazers powerfully advocated for 'emancipation from drudgery' through the widespread adoption of electrification, a theme that resonates deeply within the project.

The enduring impact of electricity, especially on women

'Watts in a Home – Electric Dreams' vividly demonstrates electricity's profound historical and societal impact, particularly on the lives of women. The project emphasises electricity's crucial relevance today and its future trajectory towards sustainable living.

A truly unique aspect of this project is its delivery model: it's primarily developed and delivered by women engineers. This intentional approach excels at compelling public engagement and fosters significant professional growth for these engineers. They've seen enhanced self-confidence, improved communication skills and boosted expertise in public outreach. To support this, the project engineers received specialised communication and skills development training from Dr Jan Peters, MBE (former WES President and CEO of Katalytik) and Alex Knight of STEMAZING.

Museums as dynamic learning hubs

A key element of 'Watts in a Home – Electric Dreams' is the strategic use of museums and visitor attractions as vital alternative learning spaces. As I have often emphasised: not all learning happens in the classroom. These informal environments provide accessible and engaging platforms that complement traditional education with hands-on, experiential learning. They offer lifelong learning opportunities for adults and reach diverse audiences, encouraging critical thinking about engineering's crucial role in society.

▲ *'Watts in a Home 2' is a modern, interactive and discussion-provoking theatrical piece by the Angel Exit Threatre Company*

So far, events have been successfully delivered at the National Museum of Computing in Bletchley, the Discovery Museum in Newcastle, and M-Shed Bristol. Future events are planned for Techniquest in Cardiff and the Glasgow Science Centre, with a grand finale event scheduled for ThinkTank in Birmingham.

A multi-faceted engagement experience

The project offers a rich, multi-faceted engagement experience that goes beyond traditional exhibits. It includes:

- a captivating pop-up exhibition;
- hands-on demonstrations and activities showcasing both historical and modern technologies; and
- opportunities for the public to directly interact with today's engineers.

Crucially, the project commissioned Angel Exit Theatre company to produce 'Watts in a Home 2: Then and Now.' This modern, interactive, and discussion-provoking theatrical piece serves as a powerful narrative thread, weaving together the entire experience and prompting audiences to consider the past, present, and future of electricity in our lives.

◀ *Not all learning happens in the classroom (image courtesy Paul Groom Photography)*

Reimagining STEM education through research, inclusion and engineering thinking

BY **DR ABBIE BRAY, DR MICHAELA MOONEY, CONSTANCE LAINÉ, SHANNON KILLEY, DR WILLIAM DUNN** AND THE ORBYTS MANAGEMENT TEAM

Dr Abbie Bray

Dr Michaela Mooney

Constance Lainé

Shannon Killey

Despite decades of efforts to widen participation, STEM remains a space marked by sharp inequalities — especially in physics and engineering. Gender, race and socio-economic background still heavily influence who pursues, persists in, and progresses through technical disciplines. In this context, Orbyts offers a powerful reimagining of what STEM education can be when inclusion and authenticity are placed at its heart.

Their research-with-schools programme partners university researchers with school students to empower students to lead cutting-edge engineering and scientific research. Through these bespoke, long-term engagement projects, students gain hands-on experience with transferable and technical skills including data analysis techniques and coding skills and develop their technical vocabulary. The projects aim to give school students the skills and confidence to pursue STEM career pathways, should they wish to take those routes.

Why engineering needs programmes like this

In engineering, the problem of underrepresentation mirrors that of physics. Fewer than 15% of engineers in the UK are women, and Black and working-class students are significantly underrepresented across engineering pathways [EngineeringUK for The Times]. Reasons for early disengagement from STEM include students having low confidence in their ability to do STEM subjects, a lack of relatable role models, or access to high-quality teaching – all of which impacts a student's feeling of belonging in STEM and the desire to pursue STEM career paths.

Orbyts's structure of regular interventions, relatable science and engineering role models and active ownership of research is proving transformative. Both qualitative and long-term quantitative evaluation shows that it measurably increases the uptake of post-16 STEM subjects, with many schools reporting, for example, a 100% increase in girls taking A-level physics. ▶

What happens in an Orbyts project?

In regular sessions across two school terms, school students work with their project mentor on a novel research project extending their knowledge far beyond school level science and taking ownership of the project. While many projects are physics-based (e.g. modelling exoplanet atmospheres or simulating quantum sensors), there is increasing cross-over with engineering themes:

- **Data analysis and coding,** key skills in engineering are taught through real-world tasks.
- **Machine learning models** developed by students have been applied to materials science and quantum technologies.
- **Projects involving instrumentation, simulations** or sustainable technologies are starting to emerge in collaboration with engineering departments.
- **Students learn how to formulate problems**, iterate on methods and deal with uncertainty — all core to engineering practice. And critically, they see researchers as real people; mentors who are passionate, fallible and invested in their learning.

Impact on STEM identity and retention

The long-term structure of Orbyts allows students to build scientific identities and feel part of the STEM community. Schools report:

- increased confidence and science self-efficacy, especially among girls;
- greater uptake of physics and engineering-related A-levels; and
- higher retention of students from underrepresented backgrounds in post-16 STEM.

From an equity lens, ORBYTS actively prioritises schools in areas of high deprivation or low progression to STEM. Its mentors are also increasingly diverse — dispelling harmful stereotypes about who belongs in science and engineering.

Mentors, not micro managers

Unlike some top-down initiatives, this is built on mutual respect. Mentors are trained in inclusive practice and empowered to listen. For PhD students and early-career researchers, this is a chance to develop leadership, communication, and inclusive supervision skills — all essential for future engineers in academia, industry or policy. One mentor, Shannon Killey, a space physics PhD student at Northumbria University, said: "It has helped me gain invaluable skills and develop as a researcher in more ways than I ever expected. Orbyts has enabled me to gain confidence and ownership in my research, as well as providing opportunities to project manage and improve my public speaking and teaching skills in a proactive yet fun way."

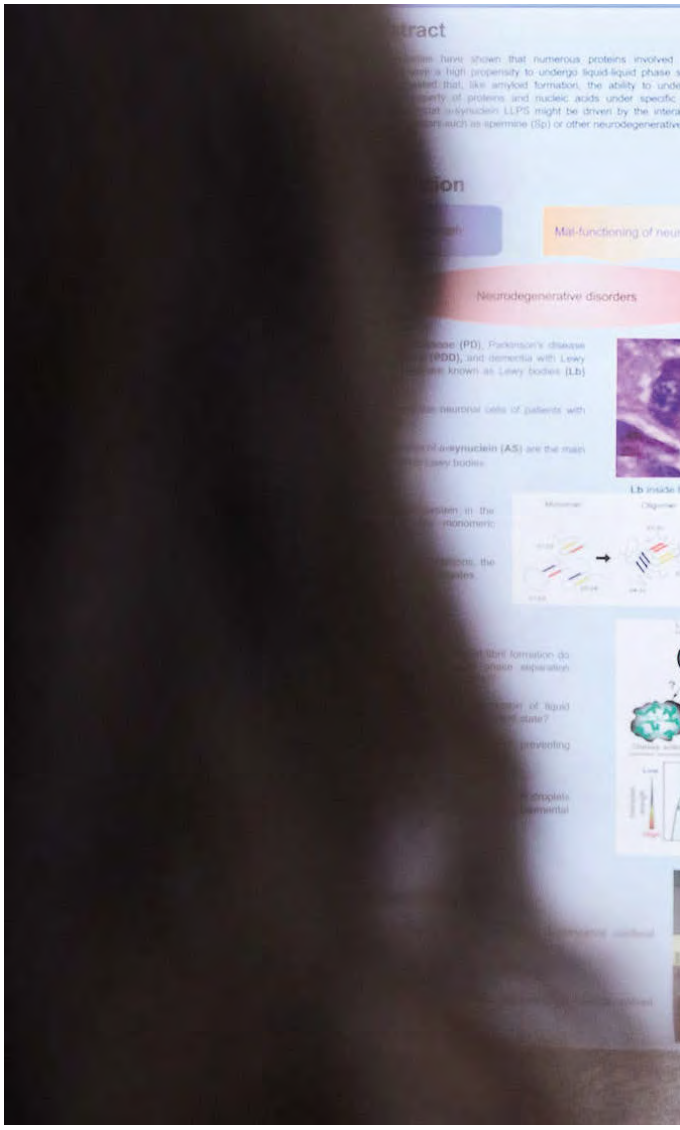
The future of engineering education

Engineering will define the future — from climate resilience, AI and infrastructure to quantum technologies. But if that future is to be sustainable and just, it must be shaped by all of us, not just a narrow slice of society. Orbyts shows how we can get there; by breaking down barriers, sharing power and trusting young people not just to absorb knowledge, but to create it.

It has now been running for more than eight years and has created more than 150 transformational partnerships with 53 schools across England, reaching upwards of 2000 school students from Northumbria, the Midlands, London and the South East. The novelty of this type of research is showcased by the publication of 18 unique research papers including over 300 school student authors of scientific papers, who are amongst the most diverse group in physics, self-identifying from more than 48 ethnicities. Orbyts projects cover a range of science topics, from engineering projects and astrophysics to medical physics and quantum computing.

Engineering the quantum future: quantum dots and qubits

In a recent project at a school in North London, students collaborated with PhD student Constance Lainé to investigate a foundational building block of quantum technologies; the quantum dot. Constance is an engineer with the Engineering and Physical Sciences Research Council Centres for Doctoral Training in Delivering Quantum Technologies at University College London. She is also co-sponsored by industry partner Quantum Motion who are developing a scalable array of qubits based on silicon technology. Using her PhD focus, she designed a project on quantum dots.



Quantum dots are tiny semiconductor structures—sometimes called 'artificial atoms' — that can confine individual electrons in a small region of space. When voltage is applied to a gate electrode above a semiconductor (such as silicon), a potential well can form where an electron becomes trapped. This setup, achievable within modified metal-oxide-semiconductor field-effect transistor (MOSFET) devices, enables precise control over the quantum states of electrons.

In this project, students learned how electrostatics, doping and voltage tuning can manipulate these dots. When an electron tunnels

into or out of the quantum dot, the current through the device exhibits characteristic 'Coulomb peaks.' These peaks allow researchers to infer how many electrons occupy the dot — effectively reading out the state of the qubit. Unlike classical bits, which are either ON (1) or OFF (0), qubits can exist in superpositions of both states simultaneously, enabling powerful new modes of computation. This principle underpins quantum computing, which promises exponential speed-ups for problems in materials science, cryptography and climate modelling.

For the students, this project was more than theory — it was a hands-on engineering challenge. They explored how transistor design can be adapted for quantum purposes, how electron behaviour at the nanoscale defies classical intuition, and how quantum tunnelling and Coulomb blockade phenomena affect real-world devices.

The project reflects the core Orbyts model by giving school students the opportunity to engage with authentic, cutting-edge research while building confidence and identity in STEM. It also bridges the often-siloed worlds of physics and engineering, highlighting how quantum technologies demand both theoretical understanding and practical innovation. By learning to trap and manipulate single electrons, these students quite literally engaged with the future of engineering — one quantum dot at a time.

Engineering a CubeSat from the classroom up

Orbyts students from a school in Newcastle have been designing and building a 1U CubeSat called AURORA alongside researchers PhD student Utsav Panchal and Professor Robert Wicks. The AURORA CubeSat will observe changes in the atmosphere with altitude and the effect of sunlight and UV levels. The CubeSat sensor board, developed by the students, will measure the acceleration, atmospheric pressure, light level, magnetic field, temperature and UV light. The aim is to launch the CubeSat on a high-altitude balloon to test the systems. The sensor performance has been validated by experiments in the school lab, showing responses to motion, altitude, magnetic field and temperature. This hands-on satellite systems engineering experience is equipping students with real-world skills in electronics, systems integration, and data analysis — core capabilities for the next generation of engineers. The next steps of the project will be an integration and testing programme, defining the operations of the system and a launch on a high-altitude balloon!

Real-world impact

Orbyts is reimagining how we build the future of engineering — not by widening the pipeline, but by reshaping it. Through long-term partnerships between scientists and schools, students from underrepresented backgrounds are engaging in real research and seeing themselves as scientists and engineers for the first time. By embedding mentorship, authenticity and inclusion at its core, it's not only improving diversity in STEM, it's redefining what early engineering education can look like. These projects empower students to tackle real-world problems from quantum computing to CubeSats, and foster a generation of engineers who are not only technically skilled but deeply connected to the communities they serve.

If you're a scientist or engineer, or work for a school and are passionate about widening participation, join our growing network! We'd love to hear from you at **orbyts@orbyts.org**

We welcome industrial partnerships from engineering, science and STEM-related companies to co-create and deliver bespoke projects to inspire the next generation of engineers and scientists! You can also visit our website to read our impact report, see previous projects and read student and teacher testimonials at **www.orbyts.org** or follow us on LinkedIn to see our latest updates!

The Woman Engineer

WOMEN'S ENGINEERING SOCIETY

wes

www.wes.org.uk

WES JOURNAL GOES DIGITAL

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