

The Woman Engineer



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From the editor's desk

Welcome to the Autumn 2022 issue of *The Woman Engineer*, which is dedicated to celebrating innovation. From those amazing women who gave us an insight into their daily challenges and triumphs at work through their presentations at our Annual Conference earlier in the year, to the efforts being made by inventor James Dyson to encourage more women to pursue a career in engineering, and the recipients of this year's Top 50 Women in Engineering Awards (WE50) – all inventors and innovators.

The overriding message seems to be “never give up”, “you’ve got to keep pressing”, “don’t take ‘no’ for an answer”. It appears that where innovation is concerned, being a competent and experienced engineer or designer is not enough – you also need tenacity, determination and self-belief. As I write this editorial, I am energised by the performance of our Lionesses, who roared their way to victory at Wembley and I am delighted by the media coverage and encouragement from the public. It is much the same (albeit on a less epic scale) as the attention that the engineering sector has been receiving recently – the work on raising the profile of the wide-ranging industry/career options engineering offers is



Lynn Postle, FICME

paying off. A global pandemic also helps to highlight who will solve the world's problems! However, we've “got to keep pressing”.

This is exactly what the fabulous WE50 winners have done to achieve the recognition they so thoroughly deserve. WES, in association with The Guardian and Ball Corporation, has honoured them because they have demonstrated the creation or improvement of a product or process that makes a difference. Refer to page 9 to see who they are and for more detail visit: www.wes.org.uk/WE50

It's also good to reflect on how our current existence has been enabled by those who have innovated in years gone by. For inspiration see page 10 to read about some remarkable women who understood that to innovate you have to keep pressing.

In the meantime, let's celebrate the fact that “it's come home”!

Next issue: Winter 2022, contribution deadline – 10 October 2022



President's Message

Continuing my theme of online, in person or hybrid events from the last issue of *The Woman Engineer* – it is clear we want choice! Whilst we continue to have successful events, the feedback and statistics are by no means conclusive which leaves us with a conundrum about how to shape next year's programme.

The *Annual Conference* was relatively well attended and did receive great feedback but was not close to achieving the attendance from the previous year. Whereas the *WE50* afternoon tea received amazing feedback and was well attended, but required a lot of last-minute pushing by the team to ensure that there were sufficient attendees. Consequently, we need to review these formats to understand what will deliver the most benefit and gain the most support next year. Elizabeth and the team will think this through.

INWED on the other hand (which was really a hybrid event with our online session and hundreds of other in person and online events) was as incredible as ever with an extended reach of over 150 million more than the phenomenal half a billion achieved last year and with greater endurance to our trending number one on Twitter as well. However, we do feel there is more we can do to push the other channels and participation beyond the social media soundbite to truly maximise the impact of this amazing event.

I know you will be able to help us in our thinking, so please do get in touch to let us know what events and formats you would like us to hold. It is so important to us that we deliver for our members and volunteers. This is undoubtedly a tricky time with the shadow of the pandemic still over us and the ongoing challenges around the certainty of being able to hold in person events, but I know we can find a solution that both meets your needs and delivers against our purpose.

Dawn Childs FREng

don't miss

Check the WES website for events and updates at:
www.wes.org.uk/events/wes-events



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The value of MENTORING

For several years, WES fellow and STEM Ambassador Dr Connie Wilson FWES has been involved with mentoring young people with a view to seeing them enter into STEM based careers. She re-joined BAE Systems as a STEM Returner as a Systems Engineer, at the Naval Ships site in Dorchester in 2018. Here she tells WES members and The Woman Engineer readers about the importance of embracing mentoring.



Since she returned to BAE Systems, Connie has been volunteering, leading the STEM outreach into Dorset and the surrounding counties with a great passion and enthusiasm. In 2018, she created a two-week work experience programme, leading to several students joining the company on apprenticeships, this continued in 2019 with similar results. In 2020 Covid did not stop her from turning the programme around in a very short space of time into a virtual work experience, ensuring all of the students did not miss out and were able to complete it – resulting in winning a BAE Systems *Business Leader Award* for her team. Connie has also mentored a large number of students/new staff members along the way.

In 2021 Connie developed a new mentoring programme called STEMcourage, which is a structured programme for A Level students over the two-year duration of their A Levels. This concept programme was created in around six weeks (whilst working full time) to meet the needs of Smallpeice Trust scholars without a mentor. This programme is designed to have as little impact on BAE Systems' staff daily projects as possible, but to have significant effects on students receiving mentoring. Connie explains: "There is a real need to give good quality mentoring and support the future generations coming into the business, I am constantly being told by staff that they wished such a programme existed when they were studying for their A Levels".

Current mentees agree: "Overall the tasks have been pretty engaging and interesting because I've been able to discover new things that challenge me in unique ways. For example, the journal helps keep me up to date with extracurricular activities, and researching tasks allow me to learn new skills and knowledge of the topics they're based on", said Ridh.

Another mentee, Becky, commented: "With the mentorship I received from Dr Connie Wilson and the excellent resources provided by the STEMcourage team, I was able to grow and develop my knowledge and skills in STEM. Through the mentoring scheme, I also grew my passion for STEM. Since finishing as a mentee on the scheme, I am now a degree apprentice within BAE Systems. I believe that with the help and guidance I received, as well as my participation within the scheme, I was able to develop the necessary skills to be able to achieve this. I am extremely grateful to the STEMcourage team and my mentor for all that they do."

Mentee Tessa added: "I think the tasks have been really useful, they've helped me look into aspects that I wouldn't usually learn about. I have also learnt a range of new research techniques which has been super helpful."

This programme has received a glowing report from the Smallpeice Trust and Simon Wilson, Arkwright Engineering Scholarships Programme Manager, said: "More recently and following the development of our own mentoring enrichment, I am very pleased to see the introduction of the STEMcourage programme for our scholar cohort, which you have personally developed and built from the ground up. This programme provides the pooling of mentor resources from BAE alongside a very structured delivery approach to providing this form of enrichment to our scholars. You are to be personally commended for your development of this mentoring approach which is exceptionally well received. I think the STEMcourage programme you have

provided is exemplary... I wholeheartedly endorse this programme..."

Here, some of Connie's mentees talk about their experiences :

Matthew Parry, LDEW Systems Modeller, BAE Systems

After my A levels I went to Swansea University where I achieved a First in BSc Physics, with my final year project focused on the simulation of the diffraction light around different shapes. In the future I see myself becoming a chartered engineer and in the long term I look to become a senior engineer with a focus on physics based engineering. Being part of BAE Systems is part of working in a community with people within my team collaborating, helping each other find solutions and helping each other progress in our professional development. I most enjoy solving the technical and physics challenges present on the projects within the company.



I started work in Chelmsford as a Systems Modeller in January 2020, with it being my first job out of university. This is a role I have continued with up to the present day and I am currently working towards becoming a chartered engineer. I apply my knowledge of physics to simulate the real world and to analyse experimental data to validate the simulations we perform. This involves research via reading academic papers, creating mathematical equations from first basis, data analysis and taking part in running experiments.

I first knew Connie as a family friend; when I finished my degree, I mentioned to her that I was looking for physics related careers and she encouraged and supported me in applying for a role in BAE Systems...this culminated in my current role. Connie has since been my mentor and I am now one of her STEMcourage programme mentors myself. I am really looking forward to giving back to the next generation of engineers and I am very excited to take part.

Rebecca Bond, Engineering Degree Apprentice, BAE Systems

Connie has been my mentor for a significant amount of time. I joined a work experience programme Connie had created and was running in July 2019 at the BAE Systems, Dorchester site. Nine other work experience students and I spent two weeks working on a lifecycle project



to design a take-off and landing system for the QEC carriers. Through this experience I was able to learn a lot about the engineering lifecycle process as a whole, as well as the scale of some projects. It also cemented my desire to pursue a career in engineering, as I was able to understand better what my role as an engineer could look like.

Over the course of my A Levels I was sponsored by BAE Systems through the Arkwright Engineering Scholarship scheme and continued to be mentored by Connie. Through giving me research and practical tasks, I was able to build up my knowledge base with her guidance, as well as develop researching skills that I have found beneficial in both my A Level studies and more recently college work for my apprenticeship. Having been involved in the work experience programme in 2019, I was asked to lead a section in the 2020 virtual programme. By doing this I was able to develop my presentation and leadership skills, both of which have proven useful to me more recently. Alongside her mentoring, Connie also gave me practical advice for when I started work as an apprentice, this I have found to be invaluable in helping me transition from school and A Levels to working and studying for a degree.

In September I joined the company as an Engineering Degree Apprentice and have been involved with the STEMcourage programme. Having become a STEM Ambassador during my A Levels, I have been helping with the organisation and planning for STEM events as well as become an Arkwright mentor myself. Being given the opportunity to mentor and provide support and guidance to young people still deciding on their future is incredible and I hope that through my own experiences with mentoring and the Smallpeice Trust I might be able to help inspire and encourage more women to take up engineering and STEM roles in the future.

Victoria Badham, Arkwright Scholar on the BAE Systems STEMcourage Mentoring Programme

Engineering pervades so many areas of our lives. The screen you're reading from, whatever mode of transport you take, the electromagnetic waves passing through you every second, carrying invisible information at light speed. It's incredible. So, when I found out about Arkwright Engineering Scholarships (which offer A Level students



£300.00 per year to spend on their own engineering projects and connect them with mentors in industry), it was an opportunity which I couldn't miss. After filling out my application form and sitting an exam, I was pleased to have been awarded the scholarship and excited to discover that I was to be mentored by BAE Systems.

I don't think many students my age have much of an idea of what careers in engineering and industry really entail, and considering that many students like myself are hoping to spend their careers as engineers, it's important to be able to find out more. Therefore, being able to speak with someone like Connie who is currently in engineering is an invaluable experience. I think she is particularly inspiring. Over the course of the mentoring scheme, she has brought many engineering events to my attention including online conferences, webinars and lectures as well as given me several book recommendations, all of

which have added to my knowledge and understanding.

The format of the mentoring scheme is very enjoyable. Each month, I'm interested to find out what the next task is: they are always thought-provoking, with a grounding in engineering of all kinds. In completing these tasks, I have learned more about BAE Systems and the work they do, and more about engineering in general. The feedback I receive on each task points out things I perhaps didn't consider or could improve on, which I find very valuable. Overall, I think the mentoring scheme is motivating, helps me build confidence, and is a great source of guidance alongside my A Level studies.

Matthew Peckham, Higher Engineering Apprentice (Mechanical)

Once I had completed my A Levels in sixth form I was unsure what path I was to take to earn the qualifications I wanted as well as gaining valuable experience working in a company. I was set on mechanical engineering as I am passionate about engines, robotics, hydraulics and anything mechanical, this also aligned with my hobby of rebuilding and restoring cars and modifying for track use.



After some searching, I decided that for me an apprenticeship would suit me best, and so applied to BAE Systems. I had multiple offers but found that BAE Systems was the best option, as well as the fact that Connie had offered to help and be a mentor for me as a family friend after she had heard about my application. I also met Connie first-hand at a careers stand at a local school.

This helped me massively through the application process as well as getting started in the new job. Connie also helped me in terms of guidance for future career opportunities and helping me decide where I want to end up qualification wise from her experience.

I'm now in my second year of being in the company and enjoying the variety that comes with moving around the company departments, and have decided that on completion of my HNC course to continue further to a HND. I am also starting to get involved in becoming a STEM ambassador and now a STEMcourage mentor, which I think will be a great opportunity to help others and offer similar support that I found so useful myself.

Mentoring helps develop YOUR skills

STEMcourage mentors also give their perspective on mentoring as something worthy of undertaking, Abigail from BAE Systems, Submarines said: "Being a mentor has allowed me to grow my skills as a STEM ambassador in a new direction, spending longer with one young person rather than the usual five to ten minutes you get at a STEM event. This has been really rewarding, especially as the conversations we have been having are reminiscent of the ones that I needed at that time in my life".

Abi at BAE Systems Air also added: "The programme is a fantastic opportunity for scholars, mentors and the business alike. Scholars get to work with real engineers in industry while developing their communication, leadership, time management and critical thinking skills alongside their A Level studies. Staff mentors benefit from networking between different sectors throughout the business and all mentoring activities can be used as evidence when pursuing professional accreditation. The business can use this time to promote degree apprenticeships and the wide variety of roles within the sector, while fostering core values and behaviours within its own staff".

Sharing our own experiences of A Levels, school or college, university, apprenticeships, the projects we have worked on and even life experiences, can give the student insights into so many facets of STEM careers and help them understand for themselves what they really might like to do with their lives; helping them to make informed decisions and develop their own skills.

There are so many benefits to mentoring including some of the following:

BENEFITS FOR MENTEES

- Gives mentees the chance to work with engineers in industry.
- Provides support and guidance in pursuing further education.

- ❑ Develops key technical and soft skills, i.e., communication, leadership, time management and critical thinking.
- ❑ Helps mentee to make the most of their potential.
- ❑ Supports mentee with their career development.
- ❑ Promotes and enables planning for the future.
- ❑ Encourages individuals to be the best version of themselves.
- ❑ Provides an interactive sounding board for ideas and queries.
- ❑ Boosts self-confidence and motivation.
- ❑ Provides an opportunity for constructive feedback.
- ❑ Expands the professional network.
- ❑ Provides a vehicle for professional registration.

BENEFITS FOR MENTORS

- ❑ Evidence in pursuing professional accreditation.
- ❑ Improved network between different business sectors through the mentor network.
- ❑ Training and development to support the role.
- ❑ Supports mentor with their own career development.
- ❑ Development of characteristics such as people engagement, communication, problem solving etc.
- ❑ Offers satisfaction in seeing the mentee develop.
- ❑ Offers a reminder that learning can be a two-way process.
- ❑ Supports the development of effective mentoring/leadership listening and questioning techniques.
- ❑ Allows a re-assessment of own leadership skills and competencies.

BENEFITS FOR THE COMPANY

- ❑ Develops mentoring skills in employees; in particular, improved communication is very useful to the whole business.
- ❑ Nurtures transferable skills.
- ❑ Fosters core business values and behaviours.
- ❑ Helps develop cross-business unit networks.
- ❑ Provides staff who can contribute through their development.
- ❑ Achieves a more engaged, motivated and successful workforce.
- ❑ Fosters core business values and behaviours.
- ❑ Helps develop cross-business unit networks.
- ❑ Increases the transfer of knowledge and best practices.

Finally, Connie's words for thought: "Mentoring is an essential part of being an engineer, whether you are in your early career right through to those in the latter part of their careers, I believe it is important and I believe everyone has something to offer through mentoring. I think everyone should get a little training and have a go at helping someone else – it is so rewarding for all the participants!"

WES congratulates Dr Connie Wilson FWES on the scheme she has instigated at BAE Systems and we remind WES members of the importance of mentoring. MentorSET is the mentoring scheme run by WES for women in STEM. Unlike many mentoring schemes, MentorSET offers cross-sector independent mentors from around the UK and is open to both men and women.

You can use our specialist software to search for a mentor who has the experience and skills to enable you to reach your milestones – keep track of goals, schedule meetings and communicate with each other over your twelve-month partnership.

MentorSET is a cross-sector mentoring scheme, enabling participants to connect with a mentoring partner outside of their place of work. Networking opportunities are offered in forums enabling mentors to connect with other mentors and giving individuals the opportunity to connect with others who share common goal or challenges.

MentorSET is open to both men and women, but particularly prides itself on the support it provides to women working in STEM and men and women returning after a career break.

Mentoring allows participants to focus on how they can forward their careers and overcome work related issues. A mentor can provide guidance, support and space for mentees to think. Women in STEM face many issues and so may need a mentor with particular expertise or experience rather than one who has followed exactly the same career path. MentorSET can help.

Mentoring partnerships usually last one or two years, but for those looking for a quick boost or help with learning a specific skill. MentorSET can also help.

We encourage women who are mid-career to apply to be both a mentor and a mentee. You do not need to be at the top of your profession to be a MentorSET mentor and you will gain more by being both a mentor and a mentee.

A mentor is a guide. A friend. A resource who paves the way to success and who derives satisfaction from helping others succeed. The mentor's role is to inspire, encourage, and support the mentee, and to contribute to their professional and personal development.

We welcome both male and female mentors. Mentors should have a degree or equivalent and at least a couple of years working experience in the science, engineering or technical sectors. We would also be delighted to hear from would-be mentors with leadership experience in the science/engineering/technology sector or with coaching backgrounds.

To learn more visit: www.wes.org.uk/content/mentorset-1



NMITE announces new scholarship funding for women engineering undergraduates

The New Model Institute for Technology and Engineering has announced a £5,000 scholarship for every woman who will be joining their undergraduate Master's Degree in Integrated Engineering programme in September 2022.

NMITE's She / Her =Future Engineer scholarship aims to attract more women in to engineering by offering a competitive funding package specifically for females, or those who identify as female, wanting to further their education in engineering.

"The engineering industry has told us time and again that there is desperate need for more diversity in the sector. NMITE has pledged to recruit a gender-equal student population, and these scholarships will enable us to attract a wider diversity of undergraduate engineers with greater gender representation," said NMITE President and CEO Professor Elena Rodriguez-Falcon.

Every student joining NMITE in September 2022, regardless of gender or background, will receive a £2,000 bursary with females receiving a further £3,000.

NMITE's vision is to deliver a different model of engineering higher education developing work-ready, talented engineers. It aims to recruit a diverse cohort, including learners who may not have considered engineering as a career. These learners won't be studying engineering, instead they'll be learning how to become engineers. NMITE's curriculum brings the engineering disciplines together and integrates the liberal arts and the interpersonal skills needed by today's employers to tackle the world's problems.

NMITE offers several other financial support options for future applicants, including means-tested bursaries and employer-funded scholarships. More information about scholarships and bursaries offered by NMITE can be found at <https://nmite.ac.uk/bursary>



WES Apprentice Board

New faces and new ideas



The WES Apprentice Board has welcomed a new chair, vice chair and five new board members. The new Chair is Natasha Dunkinson (above, left), an Aerospace Engineering Degree Apprentice at BAE Systems, the new Vice Chair is Jade Kimpton (above, right), a Substation Engineer Apprentice at National Grid. Both Natasha and Jade are “really excited” to be leading the board this year and they look forward to collaborating together on new projects.

The WES Apprentice Board also welcomes five new board members:

- Alice Belcher, Operational Planning Apprentice at National Grid.
- Amelia Warren, Mechatronics and Robotics Apprentice at Amazon.
- Sam Katanda, Aerospace Engineering Apprentice at BAE Systems.
- Jessica Chatburn, Aerospace Engineering Apprentice at Airbus.
- Katie Mackintosh, Power System Engineer Apprentice at National Grid.

The WES Apprentice Board is looking forward to hearing the new ideas and perspectives which the new members have to offer. The board has many exciting upcoming projects, including the recent launch of their new podcast series, which features interviews from various amazing women in engineering, including Elizabeth Donnelly the CEO of WES. It is hoped that the podcast will inspire its listeners to pursue engineering careers and to provide an insight into the engineering industry. The podcast can be found on Spotify using the search: ‘Women’s Engineering Society Apprentice Podcast’.

The WES Apprentice Board is also continuing to develop a social media presence to try and further build a network of women apprentice engineers. The APB can be found on LinkedIn, Twitter and Instagram @WESAPB; where you can find further information about the board members and get exciting updates on the board’s progress.

WES joins the Tomorrow’s Engineers Code

WES has joined the Tomorrow’s Engineers Code to work together with other signatories to the code to improve the diversity and number of young people entering engineering.

TOMORROW’S ENGINEERS | CODE

To achieve the Code’s goals, Signatories make four pledges about their approach to funding, designing, delivering, and learning from engineering outreach activities (including STEM programmes dedicated to inspiring young people into engineering).

The Engineering Brand Monitor showed that perceptions of engineering start early, with 63 per cent of young people aged 11 to 19 agreeing that ‘girls face more barriers that make it harder for them to get ahead in engineering than boys’. It was also highlighted that 65 per cent of parents and 55 per cent of secondary school STEM teachers agreed that ‘women face more obstacles that make it harder for them to get into engineering than men’.

WES CEO Elizabeth Donnelly said: “These figures clearly show that there is a long way to go to improve young people’s perception of engineering, and WES organises INWED every year to show how brilliant engineering is. INWED is about celebrating the amazing work that women engineers around the world are doing to support lives and livelihoods every day. INWED profiles the best, brightest and bravest women in engineering, the inventors and innovators who dare to be part of the solution and who are helping to build towards a brighter future. I could not be happier about WES joining the Tomorrow’s Engineers Code, and I hope we can pave the way for more diversity and inclusion in engineering.”

To learn more visit: <https://code.tomorrowsengineers.org.uk/>

Early Careers Board



Happy to offer advice and support, the WES Early Careers Board continues its series of Engineering Agony Aunt columns for The Woman Engineer readers.

Engineering Agony Aunt Speaking in Meetings

Question: Dear Engineering Agony Aunt, how do I tackle speaking up in meetings? sometimes I have something I’d like to share but struggle with fearing that what I say is actually silly/ has no value.

Thank you for this question, this is a very common fear that many people deal with, especially those in their early careers. Meetings are a great way for individuals to touch base, share thoughts, collaborate, and update on information. For a start, if you are invited to a meeting your perspective is valuable and you have every right to share your opinion, if you feel like the ‘outsider’ in your meeting it is even more reason that you are there as your unique perspective and ideas can help generate new ways of doing things and optimise existing processes.

Here are my top four tips:

1. **Prepare in advance** – If you feel anxious about a meeting, preparing before can help ease the fears. Read the agenda if there is one or ask the meeting organiser what the context of the meeting is about, so you will be able to prepare some notes, and feel more knowledgeable on the topics discussed.
2. **Ask for feedback** – Feedback is a great way to improve on speaking up. Tell your Line Manager or individuals who can help you with your development that you are trying to improve your communication skills at meetings and ask for feedback every time you do so.
3. **Progress over perfection** – in meetings it can be easy to wait for the right time or wait for an idea to be fully formalised and thought out. It can be easy to censor yourself until you end up with nothing to say. It’s important to remember that you’ve been invited to the meeting for a reason. Someone knows the value that you bring to the discussion and wants to hear your thoughts. Nobody is expecting you to be perfect.
4. **Be inquisitive** – A great way to start speaking up is to ask questions; it shows enthusiasm, interest and that you are engaged with the meeting discussions which people will appreciate.

WES shortlisted for the NATIONAL DIVERSITY AWARDS 2022

WES is delighted to announce that we have been shortlisted for the National Diversity Awards 2022 in the Community Organisation for Gender category. CEO Elizabeth Donnelly said the nomination was “humbling” and that: “It is wonderful that our mission ‘to support women in engineering to fulfil their potential and support the engineering industry to be inclusive’ is being recognised in this way”.

The Community Organisation for Gender Award applauds groups, charities and voluntary organisations that have made an outstanding contribution to their local community, or nationwide, with diversity as their core focus.

Winners will be announced on Friday 16 September 2022.

Cluster News

WES Cluster successfully co-ordinates INAUGURAL UNIVERSITIES JOINT EVENT

On 27 April 2022, the WES Tyne and Tees Cluster organised the inaugural North of England Universities Joint Event. This was the first time that all of the North East university engineering departments had come together with the aim of facilitating networking and celebrating INWED.



WES CEO Elizabeth Donnelly took part and chose the event as the global launch of INWED22. As the 2022 theme of INWED was inventors and innovators, everyone was encouraged to #ImagineTheFuture where sustainability and inclusion are “simply what we do”.

The whole day was a great success with in-person events at each



of the universities which included talks, panels and networking over lunch. This was supported by virtual online sessions which allowed a greater number of people to come together to see what can happen when an inspirational group of female engineers, academics and staff combine their efforts. All participants then took part in an interactive roundtable discussion across all five universities.

The students, staff and attendees enjoyed the event, and everyone has agreed it is to be the first of many. The success of the event also encouraged further involvement from male and female students and staff to set up WES University Groups to continue to bring together people who want to actively support and encourage student engineers from all backgrounds.

The event was organised by Dr Beth Barnes, Assistant Professor at the University of Durham, supported by Laura Brown, Networks & Innovation Team Manager and Principal Consultant at TNEI. The WES Tyne and Tees Cluster would like to thank them for their efforts and to thank everyone who took part in what is hoped will become a regular event.



New Members

WES welcomes the following new Members:

Kelly Adams, Bilan Ali, Alisa Ahmad, Alaia Ahmed, Corina Avram, Ana Blanco-Alvarez, Alice Belcher, Valentina Biles, Emily Blance, Elissa Bridge, Sravya Buridi, Meltem Cakir, Luiza C Campos, Rosalba Carandente, Simon Chandler-Wilde, Jessica Chatburn, Shivani Chhanabhai, Martina Cihova, Daniela Clarkson, Jules Daly, Olivia Darling-Finan, Gabriella Di Girolamo, Martine Ehrlich, Lucy Fox, Rosinda Fuentes Pineda, Georgina Fuller, Emma Furness, Nicola Gatensby, Carole Goble, Tracey Gray, Ciera Greensill, Constance Gnanasagaran, Anwasha Gupta, Chloe Harland, Jennie Harrison, Angela Holt, Rama Hosakote Subba Rao, Christiana Igube, Michelle Iyalla-Harry, Aida Juarez, Ioni Kalospyrou, Konstantina Kanari, Meena Khuttan, Rebekah King, Joanne Kirkland, Hemant Kumar, Louisa Macdonald, Sarah Macdonell, Julia MacFarlane, Andrea Mackenzie, Katie Mackintosh, Nicola Martin, Gugulethu Masuku, Océane Tessa Mbaguta, Bethany Milton, Rihab Mohammedhassan, Elham Mohammed Khair, Sara Monaghan, Veronica Monzon, Hannah Myatt, Lilly Northrop, Osazee Frances Oko, Jada Olumbori, Agata Otto, Maria Phipps, Olivia Plunkett-Hanson, Sally Postle, Sarah Pye, Louise Rattigan, Tejjashree Rao, Sue Richards, Emily Roach, Tanya Ruseva, Angelica Rutherford-Hacon, Gill Ryan, Chana Anna Saias, Gemma Sapp, Lily Scott, Sally Semple, Tom Semple, Ahlam Shah, Jo Smith, Chloe Solomou, Stephanie Spruce, Henritta Suapim, Sandi Suleman, Mae Ann Ta, Allison Thiel, Dorothea Tomeli, Nicola Trickett, Divya Vaidya, Emma Vizzino, Jessica Wattle, Samantha Wells, Amy Wright, Emma Yeung, Kelly York

New Fellows

WES congratulates the following new Fellows:

Lisa-Jayne Cook, Laura Shrieves, Emily Spearman, Dr Connie Wilson

Partner News

WES is delighted to welcome our new Partners:

Company Plus Partners: Amazon and Accenture, Company Partner – SMS Corporate Services, Siemens Healthcare, MI-GSO PCUBED and KLA, Education Partners: Hull University, Middlesex University London, University of Hull, Recruitment Partner – NES Fircroft, SME – Indicatura and The Software Institute.

We are also grateful to our renewing Partners which include: Ball Corporation, HMD Sealless Pumps LTD, Network Rail, Focusrite, Laing O'Rourke, Hitachi Informa, Equinix, ABB LTD, Dyson Institute, Ulster University, Liverpool John Moores University, University College London, Edinburgh Napier, CBRE, FM Global, Building Engineering Services Association, The Smallpeice Trust, Metropolitan Police, Blue Ocean Seismic Services, Institute of Refrigeration.

Partnership and Sponsorship enquiries, contact: partners@wes.org.uk

WES Annual Conference celebrates innovation

The WES Annual Conference was held on 28 and 29 April 2022 and attracted high calibre speakers and many virtual attendees. In this second part of the report on the event we highlight the importance of committing to an innovative culture and constantly reassessing this to embrace new developments and adapt to changing consumer/customer behaviour, whilst keeping sustainability as a central focus.



Creating a culture to support world-changing innovation

Speaking about 'Creating a culture to support world-changing innovation,' Cecile Searle of Magway Ltd said she thrives on variety. "We are the 'demand' generation, we want everything instantly," she said. This attitude has driven an increased need for delivery vehicles and systems that is growing year on year. Magway has been established as a zero emissions, parcel delivery system and is currently working towards the ultimate objective of building an interconnected network of electric, linear motor tracks that deliver parcels house to house and warehouse to house, via tunnels. This would reduce the HGV traffic on the road and solve the 100,000 shortage of HGV drivers in the UK. She gave a presentation detailing the technology and enthused about the amount of innovation and blue skies thinking that she is encountering from her colleagues. The company is currently working to upscale its concepts and developments and employs a combination of graduates and experienced engineers who are decades into their careers. "We ask people to do what they are good at, and we are constantly learning," she said. "Flexibility and autonomy are vital in a delivery system for the future. 70 per cent of HGV journeys are empty space. This is an extraordinary global opportunity."

Sustainability was also at the centre of the presentation by Dr Napoleana Anna Chaliasou, Lecturer in Civil Engineering at the Civil Engineering Department, SPECS, University of Hertfordshire. She considered decarbonisation in the traditional construction industry. She warned: "There's a tsunami of demolition waste coming our way," thanks to the need to maintain and rebuild many of the bridges that were built 50-60 years ago, which only, she said, have a maximum lifespan of one hundred years. "We must look at the recyclability of construction materials – end of life impact is crucial." In addition to the need to rebuild bridges she said: "We have also filled our buildings with non-recyclable materials such as polymers, plastic pipes etc. There is also a great CO₂ footprint. Ten per cent of the country's CO₂ emissions are directly associated with construction activities: supply chain issues, energy consumption of the buildings themselves during their life and servicing."

Noting that there is "no single solution" to the problem, she advocated learning from the past. "We don't separate local from global optimums. We cannot generalise local solutions as global ones. Until the Industrial Revolution, construction was very different. We need to be inspired by vernacular architecture. We must digitise the industry and learn from other industries, for example our efficiency is nowhere near that of the automotive sector. We need to try to replace Portland cement with other materials. Making concrete more sustainable is vital."

Automotive autonomy on the way

As if to emphasise Chaliasou's point, Kirsten Abernethy – Commercial Vehicle Strategy and Planning Engineer at Ford Motor Company Ltd – explained the concept behind how the company is planning for its vision in the commercial vehicles sector in 20 years' time. "Product development takes time," she said. "A typical vehicle is ten years in production, and we always start with the customer, as every good engineer should. Right now, we can see that delivery activities are changing. The online boom means consumers order two or three different sizes of clothing, then return the ones that don't fit. In terms of the Gig economy, they use their own vans to deliver. We must think about the number of deliveries, size of deliveries, number of times a van door needs to open and close!"

She also considered tradespeople and their needs, along with utility vehicles such as minibuses, people carriers and campervans.

"After we focus on the customer, we look at technology," she explained. "At the moment, batteries are a big focus: what cell chemistry is most cost, load, and space efficient; the most durable; the lead time to ramp up to production volume. Regulatory issues influence things, for example emissions, charging times, ranges etc."

She then looked at safety, saying: "The evolution of vehicle safety has been dramatic – the number of sensors and data proliferated around the vehicle. We are moving step by step closer to autonomy. We then must consider how autonomy will work and how infrastructure will communicate with the vehicle."

She said the next stage was to consider what the competition was doing and how vocations differ by region, bringing cultural considerations into the mix.

Her enthusiasm hasn't waned, she said. "The job is complex, but it fuels my curiosity. My passion is sustainability, and, in this role, I get to be involved and influence this. I influence how people will go about their work and the impact on the Earth. After *Earth Day* we have made some pledges, now we are accountable to them."

In an interesting Q&A session, Abernethy was quizzed on electric vehicles. In terms of the question of hydrogen fuel cells versus EV, she answered: "There's a great benefit in terms of no charging time, which is especially relevant for commercial vehicles. However, there is a cost element to producing and storing hydrogen which is being looked at. All the work we are doing on EVs is complementary to hydrogen fuel cell development, so we will see more hydrogen fuel cells in the future. There is no one single solution, we need to look at all the solutions."

Persistence was hailed as a vital aspect of driving a project through, according to Jo Parker MBE, Director of Watershed Associates, in her talk entitled '*A world first for water management*'. She

presented two case studies, explaining: "At the time we didn't have the technology to support the ideas we had, but you have to keep innovating."

She said that the complex network below our feet often creates innovative thinking for new solutions to our water management needs, which has led to the development of a national failures database which models how networks are failing. "We are the only country in the world with a database of this kind," she enthused. "It was a real achievement." She said the work has not only identified the failings of older water mains equipment but also that of newer pipes failing "far too quickly." She also recounted how evaluation of innovative technology was also vital to ensure it still meets expectations. "We recently discovered that fewer people were uploading data to the database because it was an old-style system, so we are updating it. You can't rest on your laurels with development, you must keep moving."

The development has led on to a further project, the building of a national database of all variable assets, not just water pipes. The National Underground Assets Register was launched in 2021. "We are not reinventing the wheel but have built on previous projects," she said. "The full project should be up and running by September 2024." She said that collaborative projects such as this have been more achievable thanks to a change in attitudes around health and safety. "We had to keep pushing to get these two projects moving, don't give up if you want things to change," she urged.

Innovation in sustainability

The role of innovation and inventive thinking in delivering net zero in the energy sector was considered by Laura Brown and Sarah Sheehy, Networks & Innovation Team at energy industry consultancy TNEI.

"We get excited by saving electricity," Brown said, "but other factors matter too."

She explained that innovation and invention are needed to change the system amid the "uncertainty on the road to net zero", saying that "we need to change at pace and at scale."

Looking at net zero operability and whether we could shift demand and consumption to times when the resource is available, such as utilising wind power when it is available and switching to other sources when it isn't, they emphasised how managing supply of energy to meet demand was fundamental to the process.

They also highlighted that the transition would require flexibility and a thorough understanding of consumer behaviour.

Susan Mantle, Technical Director at structural and civil engineering consultancy Heyne Tillett Steel, spoke of a “desire to do better and build on our knowledge” at the company. She advocated the company’s twice weekly meetings where the whole team discuss their projects, leading to increased research and knowledge gathering projects. “It’s a way of us improving and building upon what we do,” she said. “Ten per cent of employees’ time is spent on new research and ideas. We give these ideas a project number and resource them like they are an externally financed client project.”

Having drilled down into this process, the company discovered the external project work had to take priority and the internal ideas process was hard to manage. Linking the innovative thinking to their sustainability desires, they decided a dedicated team was required for such objectives. “We now have three full time researchers and a part time one working on this,” she said. “We are now looking at how we can collaborate and share knowledge with the wider industry to help move things forward.”

Some of the initiatives being looked at include: composite timber, it’s behaviour and where it could be used; a carbon counting tool process, measuring the embodied carbon in the structure not just in what the building uses; HTS, steel is a carbon intensive process to make, so looking at trying to reuse it.

She enthused that it would be quite something to go from “keeping carbon in the timber to reusing steel.”

Ford’s sustainability aspirations were put under

the spotlight by Alice Swallow, Senior xEV Applications Engineer at the company. “We are making sure we are designing for sustainability in our vehicles,” she said. “We are looking throughout our supply chain – tiers 1,2 and 3 – at how raw materials are sourced and the impact of that. Also, ways to reduce our impact in logistics, inbound and outbound. We are even looking at our sales dealerships and how to reduce CO₂ there, and in use – reducing the CO₂ for the whole life of the vehicle.”

Taking this one step further, she spoke of how Ford is supporting urban living and “even supporting reducing the number of vehicles on the road.”

“By 2030, 50 per cent of Ford’s global sales will be EV,” she revealed. “We need to localise battery supply chain and ethically source, we also need to work out how we can reuse them.”

Anyone for coffee?

It’s always time for a coffee break and a high energy presentation from Emily Burchell gave an insight into a “world of innovation at Costa Express.” She explained that with 3,820 coffee shops in a total of 32 countries, plus 13,500 Costa Express machines, the company has succeeded and grown since it was established in 1999, through innovation, new technology and machine upgrades.

Having progressed from forecourt attendant who knew how to manipulate the machine, to working for the machine supplier – Costa – her love for her job was infectious. “I’m in my dream job,” she enthused. “Innovating new technology into our machines.” She went on to detail the challenges the company faced when developing the new Marlow Ice coffee machine, including: keeping the ice quality high and the coffee machine warm; UV light to kill bugs and prevent bacteria in the water; how to offer alternative milk even though plant-based milk reacts differently to dairy; and how to avoid coil blockages. “It’s a lot to cram into quite a small machine,” she said.

The newest inventions for Costa are fully non-dairy machines and the option for a twin system that can switch from dairy to non-dairy without any contamination.

She teased that “even more exciting bits of kit are coming in 2023. Look out for a game-changer.”

Another enthusiastic, innovative thinker is Eno Essien, CEO of Rheytrak, who was billed as “the woman who took on the transport industry and won.”

She explained that her route into an innovative career was forged in recognising an opportunity and a gap in the market. “My biggest business is recovering stolen vehicles by using tracking devices within the Nigerian boundary,” she enlightened. Having launched the company straight after finishing university, 14 years ago, she said passion, commitment and focus were the catalysts. However, she admitted that “there are not many women in this space.” Undeterred by that fact she said: “You need to dream and dream big; everyone can do this. Just imagine what the future will be like.”

Her advice to others: “Equip yourself with enough information. I grew the business by referrals and am constantly looking for clients. A happy client tells people about you.” She is now a mentor for other women. “If I can do it, so can you.”

This was very much the sentiment of the event – innovate and celebrate to succeed.

WES thanks sponsors of the event, Ball Corporation, McLaren Racing and Jaguar Land Rover.



A 'magnificent' piece of history

Heritage Officer Helen Close writes about a new acquisition to the archive.

It's always exciting when someone contacts us saying they have something they wish to donate to the archives, although we're never sure how useful it will be.

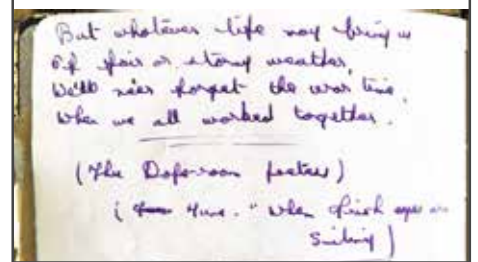
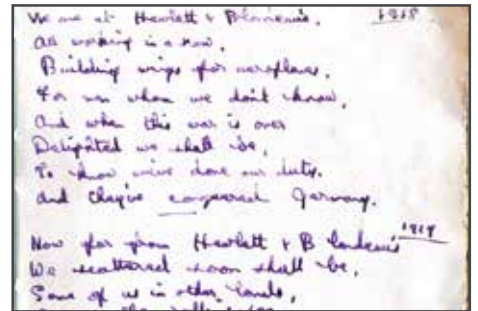
We were recently contacted by a woman who had bought an old photograph from an antique shop in Biggleswade, Bedfordshire, in 1984. On purchase, the antique dealer stipulated that an autograph book must remain with it as part of the sale. I was intrigued to discover that the photograph was in fact from the aircraft manufacturers of Hewlett and Blondeau, names were detailed on the reverse and the autograph book was signed by several of those in the photograph as well as others. I couldn't wait to find out more and eagerly arranged collection.

Hewlett & Blondeau Ltd was set up by Hilda Hewlett and Gustav Blondeau to manufacture aircraft, after previously having formed the Hewlett and Blondeau flying school at Brooklands. In May 1914, Hewlett and Blondeau bought a field in Leagrave, Bedfordshire, specifically to build Farman aircraft. During the First World War, the company manufactured more than 800 military aircraft and

employed up to 700 people. After the war ended, the company diversified into manufacturing farm equipment but had closed by the end of October 1920.

Hilda Hewlett, or 'Billy' and later 'Old Bird' as she was affectionately known by her family, was another one of those 'magnificent women' that we love to celebrate at WES. Hilda Beatrice Herbert was born in Vauxhall, London on 17 February 1864 to Louisa Herbert née Hopgood and George William Herbert, a Church of England vicar. She married barrister and writer Maurice Henry Hewlett on 3 January 1888 in St Peter's Church, Vauxhall. The couple had two children, Pia and Francis. In August 1911, Hilda became the first woman in the UK to gain a pilot's licence at Brooklands and later that year taught her son, Francis, to fly. Hilda and Maurice separated in 1914. After the closure of Hewlett & Blondeau Ltd, Hewlett emigrated to New Zealand with her daughter and died on 21 August 1943 in Tauranga, North Island, New Zealand and was buried at sea.

The photograph that was donated to the WES archive can be dated to between 1914-19 when the factory was operational and shows some of the workers of the



'wings' part of the factory. The autograph book begins with the poem below, dated 1918:

"We are at Hewlett & Blondeau's,
All working in a row
Building wings for aeroplanes
For men whom we don't know
And when this war is over
Delighted we shall be
To know we've done our duty
And they've conquered Germany."

The poem continues in the same handwriting, dated 1919:

"Now far from Hewlett & Blondeau's
We scattered soon shall be
Some of us in other lands across the rolling sea
But whatever life may bring us
Of fair or stormy weather
We'll ne'er forget the war time
When we all worked together."

Hopefully, further research will reveal more about the women in the photograph and the signatories of the autograph book. It is certainly a lovely addition to our collection and our thanks go to Mrs J O'Byrne, Norwich, for her kind donation.



WES Heritage Open Days

Once again, WES is taking part in the Heritage Open Days Festival, between 8 and 19 September 2022.

This year's theme is 'Astounding Inventions', which fits in nicely with our WE50 Inventors and Innovators.

We will be doing "Ten Days, Ten Women" and linking with various heritage organisations around the country to celebrate some of WES's astounding inventors. There will be a variety of online and in-person events throughout the festival as we visit the stories of some of our most well-known women engineers from history, including Caroline Haslett, Verena Holmes and Monica Maurice and some lesser-known ones too. Keep an eye on the WES Events page for more details.

If you've done some research and fancy giving a talk on your favourite women inventor/engineer as part of the festival let the WES Heritage Officer, Helen Close know at heritage@wes.org.uk



Bridging the engineering gender gap

The Engineering & Design Institute London (TEDI-London), a new, degree-awarding higher education provider specialising in engineering, has announced the appointment of Professor Julie Bregulla as Director of Innovation (Projects & Partnerships). Her extensive experience in engineering leadership alongside her standing within the industry will enable her to place real-industry issues at the heart of TEDI-London's project-based curriculum, benefitting both its current and future students. Professor Bregulla joins the institute's all-female senior leadership team; a demonstration of its commitment to tackle the gender gap within the engineering industry.



Professor Julie Bregulla

Having joined TEDI-London in March 2021 as Director of Project-based Learning, Professor Bregulla has already played a significant role in designing module projects around current industry issues to provide students with both the theoretical knowledge and workplace skills they need to thrive as engineers. Prior to her involvement with TEDI-London, she had worked in a broad range of roles within the industry, including academia, consulting and construction. This provided her with a wealth of knowledge and experience across numerous areas of the engineering industry, all of which will be invaluable within her new role. Professor Bregulla is also a Fellow of the Royal Academy of Engineering, a member of the ICE Council and chairs key industry initiatives.

Commenting on her appointment, she said: "I am delighted to be stepping into the role of Director of Innovation (Projects & Partnerships) at TEDI-London. My time here has already proven to be an exciting journey, during which our vision of project-based learning came to life with the onboarding of our first student cohort last year. As we prepare to welcome more students in just a few months' time, I look forward to broadening our industry partnerships. This will not only challenge and inspire our students as they progress further through their education, but also leverage their creativity and skill to make a positive impact on the communities we interact with and strive to support."

Professor Bregulla's appointment bolsters TEDI-London's already-thriving, all-female senior leadership team; a rare find within a historically male-dominated industry. TEDI-London itself stems from the vision of its three founding partners – Arizona State University (ASU), King's College London and UNSW Sydney – to bring a new generation of more diverse problem-solvers into the industry. An all-female senior leadership team exemplifies TEDI-London's dedication to this vision. By drawing upon the team's own collective experiences to change the narrative on what engineers can do, as well as inspiring other women to consider a career in the industry, TEDI-London welcomed a 50 per cent female first student cohort in September 2021. Since its inception in 2019, it has also been granted degree-awarding powers, earned its 'institute' status and received significant capital funding from the Office for Students (OFS).



TEDI-London's senior leadership team



Increase of women working in engineering

New research from EngineeringUK has shown that 16.5 per cent of those working in engineering are female, compared to 10.5 per cent as reported in 2010.

Analysis of trends in women in the engineering workforce between 2010 and 2021 shows a six percentage point increase in the proportion of women in the engineering workforce. The actual number of women working in engineering roles also increased from 562,000 in 2010 to 936,000 in 2021, along with an overall expansion of the engineering workforce from 5.3 million in 2010 to 5.6 million in 2021. Strikingly, the increase in the number of women in engineering roles continued to rise even when the total number of people working in engineering fell in 2020 and 2021 during the Covid-19 pandemic.

Historically women have been underrepresented in engineering and the report finds differences by industry and by sector. For example, women make up only 12.5 per cent of those working in engineering jobs within the engineering sector, compared to 24.4 per cent outside of the engineering sector. This suggests that industries not traditionally associated with engineering might be more successful in attracting women engineers into the workforce.

Some engineering roles have seen higher than average increases in female representation, for example, the increase from just under 19 to over 28 per cent of women in engineering roles classed as 'science, engineering and technology associate professionals'.

Dr Hilary Leever, Chief Executive of EngineeringUK, said: "It's great to see an increase of women working in engineering roles, particularly for *International Women's Day*, with almost 370,000 more women in those roles in 2021 compared with in 2010.

"The fact that women represent only 16.5 per cent of those working in engineering should still be a major concern to the engineering sector. We hope that our analysis stimulates more exploration of how we can do better – why are women more likely to work in engineering outside of the engineering sector than in it? What changes have happened in some areas of engineering to make them more attractive to women? What can we do to bring more female engineers back into engineering?"

"We need to ensure that engineering is a career choice that attracts the next generation of young women and that we respond to the needs of women who have left the engineering workforce and actively bring them back. Engineering businesses and organisations recognise these needs and are working together more to learn how to improve our efforts. I am optimistic that by learning and working together, we can quicken the pace of change and achieve the diverse and insightful workforce needed for the UK to thrive."

The 'Women in Engineering' summary report and extended analysis are available at www.engineeringuk.com/women

Previous Education Secretary backs James Dyson's call for more women in engineering



James Dyson issued a call for more women and young girls to consider a career in engineering, on International Women in Engineering Day. His comments came during a visit by the then Education Secretary, Nadhim Zahawi, to Dyson's Malmesbury Campus.

Sir James Dyson, Founder of Dyson, said: "We need the brightest engineers in the world to solve the problems of our age and create the technologies of the future. We urgently need more engineers and encouraging more women into engineering is a must. That starts in schools and continues through education, ultimately showing how fulfilling a life spent in engineering can be. At the Dyson Institute of Engineering and Technology in Malmesbury, 41 per cent of our first-year undergraduates are women. This is more than double the national average for engineering courses. This isn't the result of some Government quota, but it might be because we look for engineers who are curious about the world and want to solve real problems in a hands-on way. I hope *International Women in Engineering Day* inspires even more to follow in their footsteps and join us."

Following his visit, Nadhim Zahawi said: "As a government we have set ourselves a clear ambition of this country being a science and tech superpower by 2030 which means more engineers. To do so means making sure more women can gain the skills they need to secure careers in engineering. It was great to visit Dyson's Malmesbury campus and meet some of the brilliant women engineers who carry out research and development there. What they are doing is truly pioneering. I congratulate James Dyson on his efforts to get more women into engineering, especially through the Dyson Institute of Engineering and Technology."

At the time of the visit Nadhim Zahawi was the Education Secretary and he was given an exclusive look at Dyson's research and development labs, and met Undergraduate Engineers from the Dyson Institute of Engineering and Technology to learn about how the degree programme is creating a new generation of pioneering young engineers, through academic learning and hands-on work. During the visit, Zahawi met with female students from the Dyson Institute, and listened in to Dyson's Women's Engineering Society event, led by Undergraduate Engineers.

Dyson sees positive progress through its work with the Dyson Institute for Engineering and Technology, the James Dyson Foundation and the *James Dyson Award* to encourage more women into the field.

- Dyson has increased the representation of women in its Executive Committee by 37.5 per cent over the past year.
- 41 per cent of the most recent cohort of the Dyson Institute identify as female, compared to a national average of 15.1 per cent on engineering and technology university courses.
- For the past three years, the winners of the global *James Dyson Award* have been designed by pioneering young women in engineering.
- Three times as many female students were interested in pursuing engineering following a six-year Design and Technology project the James Dyson Foundation ran with schools in Bath.
- The Dyson School of Design Engineering at Imperial College London (funded by a £12m donation from the James Dyson Foundation), now in its sixth year, has a 42 per cent female cohort.

Dyson recognises that the organisation's teams are stronger and its products and technologies are better when designed by a diverse team. Throughout history, the



engineers and scientists who have embraced different and new ways of thinking have been able to make breakthroughs in their field.

With the aim of inspiring the next generation of engineers, Dyson has also released a new video where its female engineers share what engineering means to them and their experiences of working in the industry at the tech company.

Vicky, Engineering Manager at Dyson, says: "To me, *Engineering at Dyson* is a platform where you can learn and develop everything and anything and it's therefore a never-ending journey of knowledge and discovery."

Jade, Undergraduate Engineer at the Dyson Institute, says: "Dyson is a hub of creativity and innovation. Everyone is passionate about finding the most creative and elegant solutions and there is a culture of 'no idea is a bad idea' because we learn from every outcome."

Andrea, Design Manager at Dyson, says: "What sets Dyson apart is how your ideas are given space to grow and develop into concepts, projects, and finished products. It takes determination, vision, and the drive to follow something all the way through to see what happens. It's rare to find those bold qualities in a company of this size, and it makes for exciting, interesting, and varied projects."

Dyson is half-way through the largest engineering recruitment drive in its history. 2,000 people have joined the tech company this year, of which 50 per cent are engineers, scientists, and coders. The company has also announced it is supercharging its robotics ambitions, recruiting 250 robotics engineers across disciplines including computer vision, machine learning, sensors and mechatronics, and expects to hire 700 more in the robotics field over the next five years.

