

# The Woman Engineer



**STOP PRESS.....** WES wins award for NWED, see page 10

## featured engineer

Helen Randell



### *Karen Burt Award Winner*

A constant battle against mother nature's heavy rainfalls in her daily working life and a growing 'to do' list do little to dampen the spirits of the 2015 *Karen Burt Award* recipient Helen Randell. She says she "absolutely loves" her role as a civil engineer despite contending with tight timescales and harsh weather conditions.

Speaking to *The Woman Engineer*, Helen said she was "delighted" to receive the award but the reality of it still hasn't sunk in.

"I was particularly pleased to attend the *Prestige Lecture* in London for the award presentation and meet with my peers and my reviewers for the award. The lectures were brilliant and were worked together seamlessly. Although I often think we need more women engineers in senior positions being at the lecture gave me an opportunity to appreciate that there are women in real positions of power, which is really inspiring."

Helen is a born problem solver and champion of engineering for women and girls. A chartered civil engineer who graduated only five years ago, Helen started acting as an ambassador for the engineering profession while she was still a student at Cambridge. Since then she has worked on major projects with Interserve Construction including Severn Trent Water, Glasgow Energy from Waste Scheme, motorway and A-road new junctions and widening and the Hereford and Worcestershire Energy from Waste Scheme.

Her work on these projects, coupled with a significant contribution to the promotion of engineering to young people and women in particular, has earned her a place on the roll call of winners of the *Karen Burt Award*, given by WES to honour the best of the year's newly qualified women engineers.

During her career, Helen has mentored many young people embarking on careers in engineering; presented at science fairs; given talks to schools and even developed her own

school learning packs to introduce children to surveying, earthquakes, bridge building, water filtration and renewable energy. She continues to inspire young engineers through her new role at Buckingham Group Contracting Ltd while mentoring engineering apprentices. She can currently be found on site near Atherston where she is working to a tight timescale on the national distribution centre for Jaguar Land Rover.

"I have a female graduate on my site at the moment," she said. "I love mentoring people and doing a lot with schools - opening up people's eyes as to what they want to do. There are lots of opportunities and so much is going on. The difficulty is getting the message across, as there are so many different engineering sectors and roles within each one that the profession is almost too good for our own good - it's hard to explain the role of an engineer when it's so wide and varied. I think because of this we miss getting girls into the industry because we don't articulate enough."

Helen says for her the decision was a natural one. "I was rubbish at English but good at physics and maths. What was really good for me was that I did a year in industry so I could see what it was really like. People have to choose to specialise really early on when they don't fully understand what they want to do. I would recommend a spell in industry early on. Apprenticeships are also absolutely brilliant as workplace learning is an excellent option."

Helen's role is full of what she calls "constant change". She says she thought she would be worrying about the big decisions when often she finds herself juggling logistics decisions. Luckily for Helen she has become very skilled at problem solving. She still chuckles though when a delivery driver on site queries whether she is OK to sign for something (presumably because she is a woman). "Well I did order it," she tells them, "so I should be able to sign for it!"

### physics

Encouraging girls to study physics

Page 4



### gender pay gap

The latest news

Page 6



### WES student group

Groundbreaking launch

Page 11



### prestige lecture

Bridges, past, present and future

Page 12



# From the editor's desk

For many the road to an engineering career begins with an aptitude for two subjects in particular in our formative years – maths and physics. However, the latter subject is often discarded in favour of other sciences or softer subjects. We hear it time and time again – “I am good at it but I don't see it as something I want to do in the future”. For some time now we have been convinced that our education system is letting the engineering profession down but it is hard to pinpoint why. In this issue we turn to Professor Averil Macdonald for her conclusions following in-depth work she has done to identify why girls are less likely to pursue their physics education than boys. Her ideas may just help us readdress the balance.

It's difficult to reflect on the problem in the wake of the WES Student Conference which highlights the opposite end of the spectrum where enthusiastic and talented young women are pursuing degrees that could result in them becoming the engineering pioneers of tomorrow. Surely it is these myth-busting women – both the delegates and the presenters – who point to a more positive future where the importance of diversity in the breadth of engineering is no longer up for discussion – it merely exists without us needing to comment! There will be a report on the Student Conference in the next issue.

Having just been subjected to hours of media time dedicated to marking the very day Marty McFly travelled to in his time machine in *Back to the Future*, it was notable that all the female characters in that film were confined to side-kick, girlfriend and mother



Lynn Postle, FICME

roles, whereas the male characters were inventing time machines! In many respects we have come a long way since the eighties when the big screen thought of women in terms of supporting roles, however it seems that actresses are still paid considerably less than their male counterparts so not much has changed in that respect. The gender pay gap is something we also touch upon in this issue as the government looks to force companies to consider the often-taboo matter.

According to statistics from the Institute of Physics the numbers of girls taking A-level physics also hasn't improved in thirty years, so perhaps in many ways we are still living in the eighties. Our clothes are better, our communication systems have transformed beyond our wildest dreams and our tolerance to improper behaviour has heightened so please don't tell me we are going back to the future...

Next issue contribution 20th January 2016

## President's Message

I would like to thank Past President Dawn Bonfield, she will be a hard act to follow as she has played such a significant role in the development and growth of WES into a charity that is approaching ever closer to its 100th year through the devotion of its volunteers.



So what has happened since I became President in October? I was asked to talk live on the BBC on *Ada Lovelace Day*. The media has embraced the day from its launch in 2009 and it has grown from strength to strength with engineering being talked about and tweeted worldwide. I took the opportunity to share the concern that women make up only 9 per cent of the engineering workforce, and how we are losing girls when they drop physics at A-level. Also we talked about women engineers taking to twitter to dispel the myth that all engineers are men – the posting under the #looklikeanengineer – and the selfies were posted online and attracted comments about the credibility of these women, thereby changing the assumed sexist appearance of engineers. Is there cyber sexism, where images used to portray us as engineers are not relevant or are too male biased? Does this have an effect on girls being put off applying for physics A-level or engineering?

Newly appointed Naomi Climer, IET President, also made news with the suggestion of women engineering quotas to ensure a more diverse workforce. I am sure it is of no surprise that over the coming decade the profession will require 1.8m people who have an engineering skill, so we cannot afford to lose our young talent by not portraying the exciting careers we all operate within.

I was unfortunate not to attend the *Prestige Lecture* and get a chance to meet the successful winner of the *Karen Burt Award* Helen Randell or hear about '*Bridges: past, present and future*', as I understand there were nearly 200 people with both men and women in attendance, a huge success with such a good turnout. The event had been arranged at the IET as we were especially keen to hold it in the refurbished venue, but with the venue not being complete the ICE stepped in and ensured our event was still a success.

Benita Mehra CEng MIET MSC MBA MWES

**STOP PRESS.....** Join WES in January and get 15 months for the price of 12.

## don't miss

**Talent 2030 National Engineering Competition for Girls**

28th September to 18th December. Free to enter competition for 11-18 year old girls to submit their ideas for 'How can engineers solve the challenges of the 21st century?'. [www.talent2030.org/competition](http://www.talent2030.org/competition)

**IET's Young Woman Engineer Awards 2015 including the WES Prize**

3rd December, Savoy Place, London. [www.conferences.theiet.org/ywe/](http://www.conferences.theiet.org/ywe/)

**Lecture – 'The raising of the Costa Concordia'**

12th January 2016, Strathclyde University, John Anderson Building Lecture Theatre, 5.45 for 6.30pm. A free lecture by Titan Salvage - joint WES meeting with IMarES, ICE, RINA, IMechE and IStructE

**Women of Silicon Roundabout**

28th January 2016. WES members can get a 20 per cent discount by using the code WES20. see: [www.women-in-technology.com/](http://www.women-in-technology.com/)

**National Women in Engineering Day**

23rd June 2016 - nationwide

Check the WES website for more events



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Women's Engineering Society

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*Plans for a world-first international festival programme of science and arts have just been announced: EnergyUnearthed celebrates Cumbria's unique position at the core of the biggest international challenge of our time - energy and climate change.*



*Host and director of Newton Rigg College, Dr Jane Sullivan (far left), with Robert Alford (left), speaker from the Nuclear Institute, taking part in the consultation workshop*

# Introducing EnergyUnearthed

The first of a series of planned catalyst events, which will run between now and the first international festival in summer 2017, took place on 13th October in Penrith. Fifty educators heard from leading speakers, including Mike Berners-Lee, author of *The Burning Question*, and were invited to help shape this exciting initiative. More events are intended and WES members are invited to take part.

The purpose of EnergyUnearthed is not to drive the energy debate, but to increase public understanding of energy and climate change science. Energy touches every aspect of our lives and the festival will use this as a springboard to explore the latest technology, engineering and environmental topics, as well as food and farming, health and wellbeing, arts and architecture. An advisory panel of leading industry and energy experts will guarantee the quality of science being presented, ensure neutrality and support the delivery of the latest good science fact.

EnergyUnearthed's managing director, Andrew Lucas, outlined the vision at the October event. At its heart is a family-friendly interactive festival of workshops, exhibitions, games, performances, and street entertainment. Other core elements will extend the reach of the work through the year and include a legacy of online resources. EnergyUnearthed is supported by Fellows of the Royal Society for the encouragement of Arts, Manufactures and Commerce (RSA) and has a growing body of local and national partners including the Women's Engineering Society.

A key focus is EnergyUnearthed's STEAM-powered education programme - adding



the arts to STEM to drive creativity and to communicate new concepts and ideas. Dr Sarah Peers, WES Vice President and EnergyUnearthed's director for education and industry, adds: "The education programme aims to inspire schoolchildren, parents and teachers, but we will also wish to challenge perceptions of engineering and STEM, which includes addressing diversity amongst other issues and highlighting creativity as a key skill. We want EnergyUnearthed to be transformational - not only by addressing the skills gap in energy and adjacent sectors, but by enabling educators and the young to understand the science of climate change. We will be linking to the Sparxx WES project and are keen to hear from WES members who would like to support or get involved, particularly to promote engineering for energy and as a route to solving climate change."



*Dr Sarah Peers in conversation with delegates at the first EnergyUnearthed catalyst event*



*Climate change expert and author of *The Burning Question*, Mike Berners-Lee, speaking at the event on 13th October*

*For more information, contact Dr Sarah Peers and Andrew Lucas through [info@energyunearthed.com](mailto:info@energyunearthed.com) or EnergyUnearthed's facebook page or through twitter @energyunearthed.*



## A revolutionary approach to getting girls into science and engineering

*After 30 years of time, effort and money, it is clear that we have failed completely to increase the proportion of girls choosing physics and engineering studies and careers, leaving the UK at the bottom of the European league tables for women employed in science and engineering.*

*A revolutionary approach by Network Rail, which saw the organisation achieve an 83 per cent increase in applicants to its graduate engineering programme in only five months, could be the answer says Prof Averil Macdonald OBE.*

Her claims are based on the report 'Not For People Like Me' which she helped prepare for WISE (Women in Science and Engineering). The report is sponsored by Network Rail, and investigates why STEM outreach and engagement activities have a limited impact on girls and other young people who are under-represented in the STEM workforce. The report recommends a fresh approach - focusing on the types of people who succeed in science, technology and engineering - using adjectives to describe their personalities and aptitudes, rather than the jobs themselves.

Speaking from the heart and from the head at a Worshipful Company of Fuellers conversation evening earlier this year, Prof Macdonald said that one barrier is that many teachers and mothers simply didn't appreciate the opportunities physics offers later on in life. "Girls don't like to limit their options," she said. "Remember that girls tend to think logically and they are often told that physics is not something that can be used beyond being a teacher or scientist."

Prof Macdonald argued that the trend towards organising physics and science competitions to encourage more girls to study physics was also part of the problem. "Competitions simply don't work," she said. "For those girls who don't win, it reinforces the

message that you aren't good enough. It is a repeated message."

Renewed research suggests that although many girls are good at physics they still believe "It's not for people like me".

### PHRASEOLOGY

According to research by [www.bbc.co.uk/news/education](http://www.bbc.co.uk/news/education), on average, girls achieve well in the subject at GCSE but female participation begins to fall at A-level. Just 21 per cent of A-level physics students are girls. The situation is different for biology and chemistry, where 58 per cent of biology A-level students and 48 per cent of chemistry A-level students are female.

Also the same research found a quarter (25.2 per cent) of female candidates achieved an A in AS-level physics, compared with just over a fifth (21.4 per cent) of male candidates and at A2 35.5 per cent of female candidates achieving an A or A\*, compared with 29.9 per cent of males.

Ironically, the very reason that girls have an aptitude for physics – logic – is often the reason so many choose not to pursue the subject on an on-going basis. "Girls are making a logical choice but based on poor information", said Professor



*Averil Macdonald OBE is professor emerita of science engagement at the University of Reading and leads on diversity for SEPnet, the South East Physics Network of nine physics departments.*



Macdonald. "We are using incorrect words and selling the wrong message. If we use *verbs* to promote a profession, half of the population – those who consider themselves in terms of *adjectives* are instantly alienated from applying as they don't consider the position to be of relevance. It's not for people like me."

Averil said that by adding the "person" specification to the job description when talking to young people, the balance can be readdressed. As part of the work, Prof Macdonald has developed a careers resource. Using a set of adjectives she has mapped adjectives to the roles that exist in STEM businesses and trialled it with 300 girls. She said it had proven effective in encouraging girls to see they have a role and a place.

The messages focusing on what pure scientists and engineers 'do' rather than their personal attributes are not working so the report suggests that careers from STEM need to be described instead in terms of the personal characteristics required. Young people and their influencers – parents and teachers - need to be convinced that STEM careers offer what they are looking for.

The report suggests that there should be NO implication that girls must change; the needs of girls and young women, including supportive employment conditions and the ability to progress while working part time, must be consistently embedded into all messaging from the STEM sector; and all girls need to be able to self-identify that 'science is for people like me'.

The research also suggests that there is a larger problem in state schools than in independent schools.

The realisation that girls are good at physics but they simply believe that it "is not for people like me" has at least helped us to focus on whether it is the manner of promotion and terminology that is the problem. Time will tell if adopting a new approach to promoting further study in the subject including a route to engineering will change the statistics – let's hope it is not too much time as a growing lack of enough professional engineers means that time is something we don't have a lot of.

### Smart enough for science? A third of British girls don't think they are despite it being one of their favourite subjects

A new study by EDF Energy, to mark the launch of its #PrettyCurious campaign, has found that many girls aged 11 to 16 are not taking their passion and aptitude for science-based subjects beyond school and don't see its relevance to their careers, with boys the same age five times more likely to want to pursue a career in engineering (20 per cent versus 4 per cent). As well as worrying they aren't smart enough to be a scientist, other barriers for girls are revealed to be:

- That they are unsure what they can do with a science qualification (17 per cent)
- They feel they are too creative to go into science (15 per cent)
- They believe companies who employ scientists would prefer to employ men (13 per cent)

The study reveals young girls also have a lack of visible role models, with less than one in three (29 per cent) knowing a female relative, friend, family friend or other women that work in a science and engineering-based job.

The research, carried out by YouGov, was commissioned to mark the launch of EDF Energy's #PrettyCurious programme, which will introduce teenage girls to role models they can identify with, who each have varied and rewarding STEM careers.

### Institute of Physics statistics facts:

- 10 per cent of all those who are eligible to take A-level physics choose to do so.
- Physics is the fourth most popular subject for boys - 24,000 or 15 per cent of eligible males choose physics.
- Physics is the 19th most popular subject for girls - around 7,000 out of more than 150,000 eligible girls take physics.
- 49 per cent of state schools in England and Wales send no girls to study A-level physics while girls from single sex schools are 2.5 times as likely to study A-level physics. School culture is the predominant factor in this.
- Girls make up 20 per cent of those taking A-level and 21 per cent of those taking degrees in physics - a percentage that hasn't improved over 30 years of interventions.
- Maths is the most popular degree subject for girls who have taken A-level physics.

### Cyber sexism putting girls off engineering careers

Online images still portray engineering as a job for the boys, leading to girls being put off potentially well-paid and exciting careers, according to new research from EngineeringUK.

The study, released to mark the start of *Tomorrow's Engineers Week* (2nd to 6th November), found a host of organisations, including universities, media outlets, and search engines are all guilty of reinforcing engineering stereotypes through their choice of images online.

Almost a third (29 per cent) of all those 11 to 16 year olds surveyed believe images used to represent engineering are not relevant to them, with 28 per cent of girls saying they are too male orientated.

Almost one in ten (7 per cent) of the girls went so far as to say that images they'd seen online have put them off a career in engineering.

### GCSE Physics for Life App now features WES role models



The app for *GCSE Physics For Life*, supported by WES Company Member National Grid, now features WES role models. There is an Apple and an android version.

*WES provides various outreach activities to help promote engineering careers to schoolgirls. Visit [www.wes.org.uk/content/education-and-outreach](http://www.wes.org.uk/content/education-and-outreach)*

### Accenture report on lack of women in STEM careers

*A survey of 4,000 girls, young women, parents and teachers, published by Accenture, reveals that there is a perception that STEM subjects and careers are better suited to boys. Half (51 per cent) of the teachers and 43 per cent of the parents surveyed believe this perception helps explain the low uptake of STEM subjects by girls.*

Responding to the survey, Naomi Climer, IET President-elect, said: "The difficulty in attracting women into engineering is down to a combination of many things, including the image of engineers within the UK, careers advice girls are given in schools and the way that companies with engineering roles advertise their opportunities.

"If we continue to fail to attract women into engineering, the UK will be in a significantly weakened position to find the 1.82 million engineers it is estimated the country will need by 2022.

"Women are missing out on interesting and rewarding career opportunities and industry is missing out on the innovation that comes with greater diversity in the workforce."

Research published by the IET in March 2015 as part of its *Engineer a Better World* campaign, revealed that only 7 per cent of parents feel that engineering would appeal to their daughters as a career.

# Are Government measures to reduce the gender pay gap failing women over 40?

*An inquiry to inform government strategy on reducing the gender pay gap, focusing on women aged over 40, is being undertaken by the Women and Equalities Committee. Despite extensive evidence that this is where the gender pay gap is greatest, the government's recent announcements devote surprisingly little attention to the issues faced by this particular group.*

The government will be announcing its proposals to tackle the gender pay gap in early 2016. Currently the gap between all male and female employees stands at 19.1 per cent (2014), measured by median gross hourly pay. For all full time employees the gender pay gap is 9.4 per cent, but there are wide variations by age and sector.

Younger women, from 18-39, in full-time work experience a very low or even reversed gender pay gap. ONS data shows the gap for hourly earnings growing from the age of 40 onwards. It is greatest for women in their 50s. This is partly due to the fact that half of women over 50 work part-time, and hourly wages for part-time workers are significantly lower than those for full-time employees.

The gender pay gap is not confined to those working part-time though. Women over 50 working full-time earn 82 per cent of what men of the same age working full-time earn. Some of this discrepancy is down to occupational segregation. At present, two-thirds of women aged over 50 are employed in just three sectors: education, health and retail.

Committee chair Maria Miller said:

"The gender pay gap is mainly a problem for women over 40, and currently hits women in their 50s even harder. However, the measures already announced by the government don't target this group. Our inquiry aims to fill this gap in government thinking. We'll be asking about barriers to promotion; recruitment and training; problems facing women in predominantly female sectors and non-professional roles – and much more. Our inquiry will make recommendations that will tackle the gender pay gap where it hits the hardest."

Key policies that the government has already announced include:

- every company with more than 250 employees being required by law to publish the difference between the average pay of their male and female employees
- new steps to compel larger employers to publish bonus information by gender
- gender pay reporting rules being extended to include the public sector, as well as private and voluntary organisations

This inquiry aims to fill that gap by considering three key areas:

1. How effective will the government's proposals announced so far be in reducing the gender pay gap faced by women aged over 40?
2. Are there changes to these proposals that would help to reduce the gender pay gap for this group more quickly or effectively?
3. What could be done to improve the position of women aged over 40 regarding recruitment, retention, promotion and training?

*The deadline for suggestions has passed but at the time of going to print WES was hoping to contribute to the inquiry.*

## Ninety per cent of companies face a standing start on gender pay gap reporting

The government is currently consulting on imminent new gender pay gap reporting requirements. But, a new survey shows that less than one in ten manufacturing and engineering companies (9 per cent) currently report any gender pay information and providing data is going to be a significant challenge:

- 83 per cent of companies are aware of government proposals on gender pay gap reporting, but less than one in ten (7 per cent) are up-to-speed in their understanding
- Less than three in ten companies (29 per cent) are prepared for the forthcoming requirements and 30 per cent are concerned about the amount of work required to provide the data
- Challenges: only a third of companies (33 per cent) have undertaken a pay audit in the last five years – 27 per cent have never undertaken one while 45 per cent don't have an official pay scale
- Opportunity: 47 per cent see gender pay reporting as an opportunity to benchmark against peers and other industries – 38 per cent say that it will help them get to grips with their pay structures and auditing
- Context, support and a phased rollout will be key to minimising challenges and maximising opportunities, says EEF, the manufacturers' organisation.

68% of the companies surveyed say that women make up 30 per cent or less of their workforce and there is recognition that this could cause a problem when reporting. A third (32 per cent) agree that industries struggling to attract women into skilled roles are likely to have a wider gender pay gap. This means that context must be provided when the data is published and that every effort is made to ensure that gender pay gap reporting doesn't make it even harder to attract skilled women into industries where they are currently under-represented.

*The research was conducted online by EEF in August 2015 amongst 100 UK manufacturing and engineering companies. For more information visit [www.eef.org.uk](http://www.eef.org.uk)*



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*A Winston Churchill Memorial Trust Travelling (WCMT) Fellowship enables recipients to travel to develop themselves and to make a difference to society in some way on their return.*

## Royal celebrations for the Winston Churchill Memorial Trust Travelling Fellowship

*Dr Susan Bullivant (pictured above), former WES Vice President and council member, understands the trust only too well having been awarded her fellowship in 1981 to go to the USA to study initiatives to encourage and support women in engineering. At the time Susan was a lecturer in engineering mathematics at Loughborough University of Technology (LUT). Earlier this year she attended a reception hosted by Her Majesty the Queen in her role as Patron of the Trust at Buckingham Palace.*

In 1979 Susan formed a *Women in Engineering Student Group* at LUT and with funds from the Department of Trade and Industry (Dti) established a schools liaison initiative in which she and the women undergraduates went into schools to talk about careers in engineering. "At the time I had no knowledge of WES as an organisation", Susan recalls. However, following a visit to LUT by Maria Watkins and Peggy Hodges (former presidents of WES) the student group, together with a Cambridge University group became the first student groups to be affiliated to WES. "It was interesting to read recently that a new Loughborough Student group has just joined WES," she said.

Susan's fellowship entailed visiting government institutions, universities, professional bodies, industry and SWE groups along the Eastern seaboard of the US. She received tremendous support from SWE members including Evelyn Murray (a British engineer who was the SWE president) and Betty Preece (an active WES member). She was also fortunate to see the first space shuttle launch at Kennedy Space Centre.

### ROLE MODEL BROCHURE

On her return, she and her research assistant Cynthia Onions (a chemical engineer) produced a role model brochure of women engineering students at LUT, which was funded by the Dti and LUT. This was subsequently reprinted during 1984 by the Equal Opportunities Commission and then distributed to secondary schools as part of the *WISE Year* initiatives.

Documents and information obtained on SWE's corporate sponsor scheme was also developed by WES council to establish its corporate liaison membership programme which helped support WES both financially and in kind to develop its own role model brochure and other national initiatives such as its student and professional member group network. Dianne Winfield, the schools liaison manager at the IEE and WES member also developed a training pack for members to assist them on how to give talks in schools.

Susan was invited to be on the *WISE 1984* steering committee chaired by Baroness Beryl Platt and undertook a survey in 1983 with Cynthia Onions for the Engineering Council on 'Examples of good practice in schools, FE/HE and industry to encourage women in science and engineering' to help inform its strategy for the launch of *WISE Year 1984*. "I was very impressed with Beryl Platt in the way she was supportive and approachable to me and her dedication and help given via her contacts and position to make *WISE* successful."

### AN IMPORTANT BOOST

Speaking about what the WCMT Fellowship meant to her in terms of self-development and making a difference, Susan told *The Woman Engineer*. "I felt it gave me the experience, contacts and confidence to do this and to start my own consultancy organisation. Initially I built on my experience writing career profiles for CRAC, mainly on

women graduates working in engineering. In 1985 I worked with the Women in Work Unit at Aston University to develop and run a *Women in IT* fourteen-week programme for women with no previous experience in computing/IT. Subsequently I then raised funding for, and ran some short programmes on *Women in IT and Enterprise*. Later I worked with companies and educational institutes in professional and organisational change as well as research studies and project management for government departments. My last major project brought me back to a *WISE* initiative. I was appointed the first *Athena* project director taking it from concept, developing its strategy and successfully overseeing its launch and implementation. The fellowship provided a catalyst for a career change from academia to the business environment and it is still providing opportunities for me - to meet new friends, through its regional associations and of course to meet the Queen."

As 2015 marks the 50<sup>th</sup> anniversary since Churchill's death, the WCMT is awarding 150 travelling fellowships rather than its usual 100. Projects undertaken can be related to professional and/or personal interests and enable an individual to 'travel to learn....return to inspire'. The WCMT funds British citizens, whatever their background, to investigate ground breaking practice in other countries and return with innovative ideas for the benefit of people in the UK. This year's categories included craft, design, education, environment, medicine, mental health, science, technology and innovation, housing and young people. Grants cover all travel, daily costs and insurance for overseas travel of between four to eight weeks. It is not aimed at gap year travel projects.

Although the deadline has passed for 2015 anyone registering with the organisation will receive an email in May 2016 when the application process opens for travel fellowships to be undertaken in 2017. For more information visit: [www.wcmt.org.uk](http://www.wcmt.org.uk)

Susan is enthusiastic about the possibilities: "I would encourage WES members to look and see if there is something they feel passionate about and consider applying for a fellowship which could help them make a difference to themselves, others, their community or profession on their return. Good Luck!"

## Fellow of the Royal Academy of Engineering

Professor Karen Holford, Cardiff University's pro vice-chancellor, College of Physical Sciences and Engineering, has been elected a Fellow of the Royal Academy of Engineering.

The admission, one of the highest national honours an engineer can receive, recognises Professor Holford's distinguished research career in industry and academia, as well as her commitment to outreach activities and promoting engineering as a career.

After undertaking her first degree in mechanical engineering at the University of Wales Institute of Science and Technology (Cardiff) as an undergraduate apprentice sponsored by Rolls Royce, Professor Holford went on to work as a senior design engineer at AB Electronic Products Ltd, where she led a variety of projects in the automotive field with companies such as BMW, Jaguar and Rover.

She joined Cardiff University's School of Engineering as a lecturer in 1990, and became the school's director in 2010. In Sept 2012, she was appointed pro vice-chancellor for the College of Physical Sciences and Engineering.

Professor Holford's current research focuses on acoustic emission, and how high frequency sensors can be developed to monitor damage in a number of different structures and systems, such as bridges, buildings and aircraft landing gears.

In addition to her research, she is a proud advocate of engineering and is part of a number of committees and organisations that actively encourage young people to consider a career in the field.

In 2006, Professor Holford was named the *Welsh Woman of the Year in Science and Technology*, and in 2007 was awarded the *WISE (Women in Science and Engineering) Excellence Award* for her long-term commitment to supporting girls and young women in science and engineering.

On being named a Fellow, she said: "I am absolutely delighted to be named a Fellow and to be recognised alongside such an esteemed list of world-leading engineers. To receive this honour is the pinnacle of an engineer's career and I hope it can be used to inspire the next generation to consider studying or working in the field. I look forward to working more closely with the Academy as part of the Fellowship in the future."

As a Fellow of the Royal Academy of Engineering, Professor Holford will be engaged in a variety of activities on behalf of the Academy, supporting engineering research, policy formation, education and entrepreneurship and public engagement.



## ENGINEERING EMPLOYERS predict education system won't keep up with technological change

Demand for engineers continues to rise but over half (53 per cent) of employers are struggling to recruit suitably skilled staff, says the *2015 Skills & Demand in Industry Report*. Published by the Institution of Engineering and Technology (IET), the report reveals that 61 per cent of employers are least satisfied with skills among graduates - and that two thirds (66 per cent) are concerned that the education system will struggle to keep up with the skills required for technological change.

This is the tenth year that the IET has published its skills report and the role of education comes under the spotlight, together with ongoing diversity issues in engineering and a lack of both available graduates and more experienced engineering staff.

Women account for only 9 per cent of the UK engineering workforce and yet 57 per cent of employers do not have gender diversity initiatives in place.

Nigel Fine, IET chief executive, said: "Employers also need to recognise the need for workforce diversity and do more to attract recruits from a wider talent pool. This might include looking at other professions, such as medicine and accountancy that have been more successful at attracting a diverse workforce. It also means working with parents and teachers to promote engineering as a creative, rewarding and exciting profession for girls, as well as boys."

Sheila Brown, director at South Midlands Communications, a specialist in radio, broadcast and communications products, said: "A whole generation has focused too much on the service industry instead of manufacturing, and now productivity, which has led to a gap that the next generation of school leavers need to fill."

And on the subject of graduate recruits: "We are not convinced that universities are focused on preparing their students for the workplace. They have become funding-driven, not outcome-driven, and seem to have lost the will to link the teaching of STEM subjects to industry requirements.

"Universities appear to be more research-focused (as a revenue stream) rather than concentrating on the primary teaching function. In electrical engineering, we have noticed a trend towards focusing on electronics rather than power engineering - is this because it is 'cheap' to provide students with printed circuit boards and a box full of resistors and capacitors, rather than need to give practical experience on large motors, generators and switchgear?"

Krystyna Nowak, managing director, board practice at Norman Broadbent – the executive search company - comments on *Lord Davies' Women on Boards Report*.

"Lord Davies' final report is another step on the ladder to resolving the gender inequality in business today. With the FTSE 100 reaching its 25 per cent women on boards objective ahead of target, we expect this new goal of one third of women on FTSE 350 boards, to be met before the end of this decade.

"However, this is a missed opportunity as the recommendations in the report are somewhat disappointing. By only increasing the target for the percentage of women on the PLC board, many companies will just continue the trend of appointing women to non-executive director positions, manipulating board composition to achieve targets and leaving the executive board to continue to be dominated by men. The onus now lies on CEOs of our country's top PLCs to promote females to C-level positions and lead the reform of a gender equal executive pipeline. The government now has a chance to address these issues in its equality boosting measures planned for 2016."

## Ultimate STEM Challenge

The *Ultimate STEM Challenge* is a new competition for 11 to 14 years olds.

Organised by BP, the Science Museum and STEMNET the contest involves teams of two to four students from across the UK putting their science, technology, engineering and maths skills to the test to win some fantastic prizes, including an invitation to a celebratory event at the Science Museum in London, £500 for their school and Science Museum goodies.

It is a great option for STEM clubs. It's very flexible as there's a choice of three challenges, which can be completed over a shorter or longer period. The deadline for entry is 15th January 2016.

To learn more visit: [www.bpes.bp.com/stem-challenge/ultimate-stem-challenge/](http://www.bpes.bp.com/stem-challenge/ultimate-stem-challenge/)



## More commitment for diversity from technology giant

Following on from Intel's announcement at the beginning of the year that it will invest \$300m in diversity efforts in its own business, the technology company has now launched the *Intel Capital Diversity Fund* where it has committed to invest \$125m in technology startups run by women and underrepresented minorities.

## Rail chief demands new graduate intake reflects diverse society

Network Rail has announced it is increasing the number of engineering places on its 2016 graduate scheme by more than 50 per cent. Chief executive Mark Carne welcomed the recruitment boost but warned the company needs a more diverse workforce that better reflects the society it serves.

In a message to his 35,000-strong workforce, the chief executive said: "I am proud that we have increased the number of women joining our graduate programme to 29 per cent in the last year and to 28 per cent from black, Asian, minority ethnic backgrounds, but we have to accelerate that growth so that it better reflects the society in which we live and serve."

Graduates can apply for around 150 places on the 2016 graduate programme. There are 80 places across the three disciplines of mechanical, electrical and civil engineering – a 40 per cent increase on the 2015 intake; with the other places split across general management, finance, property, project management, business technology, supply chain and human resources.

## Challenge for change issued

*British engineers must start shouting loud and proud about their achievements, if they are to optimise opportunities, says the woman tasked with skilling the sector.*

Ann Watson, CEO of Semta, the not-for-profit employer-led organisation 'engineering skills for the future' believes that the engineering community is guilty of concealing abilities.

Addressing the Society of Operational Engineers she said: "As an engineering community we need to stop hiding our lights under bushels, start blowing our own trumpets and herald what a fantastic career engineering can be."

She said that young people needed to know what wonders await in a career in engineering, and she mourned the loss of STEM graduates choosing careers outside the sector.

"The problem we have is that too many are choosing to apply their skills outside of STEM sectors. More than 12,000 engineering graduates are working in financial services, for example – that's undoubtedly good news for financial services!"

She bemoaned inadequate careers advice, which she said is part of the problem. "Only 10 per cent of educators feel confident in speaking about an apprenticeship. Too many teachers have never set foot in a modern engineering workplace."

Companies can sign up to Semta's *STEM Exchange* to offer opportunities for educators to be educated about the world of work in the sector.



## Engineering Qualification wins top award

*A qualification linking industry with schools took the chequered flag for victory at the inaugural FAB awards to complete a great evening for the specialist awarding body for industry, EAL.*

EAL's *Level 1 Foundation Certificate in Engineering Technology*, mapped to F1 in schools activities, picked up the qualification of the year at the Federation of Awarding Bodies (FAB) first annual award ceremony.

It came as Carolyn Barker (pictured), EAL's head of governance and regulation was elected to the FAB board as a director.

"Winning the award is fantastic recognition of the team's hard work in developing the qualification and its innovative links with *F1 in Schools*," said Barker. "It is a new qualification so to pick up this award is a real boost for us."

"I am also really delighted to have been elected by the FAB membership as a director of the board. I am looking forward to working with my colleagues and in widening my liaison with key stakeholders. We have the opportunity to work more closely with employers, regulators and other government departments and agencies to ensure sufficiently robust qualifications and skills development are achieved through high quality vocational education and training which remains at the heart of the skills agenda."

The *F1 in Schools Technology Challenge* provides an exciting yet challenging educational experience through the magnetic appeal of Formula One. Teams of learners aged 9 to 19 deploy CAD/CAM software to collaborate, design, analyse, manufacture, test, and then race miniature compressed air powered polyurethane based F1 cars.

FAB's chief executive Stephen Wright said: "The EAL entry had everything we could have wished for. Engineering is a key sector for the success of the whole economy however research from the Royal Academy of Engineering suggests that by 2020 we will need more than a million new engineers and technicians. The *Level 1 Foundation Certificate* is just the sort of qualification that can help close the skills gap, plugging into the *F1 in Schools* competition to introduce 15 to 18 year olds to the basic principles of engineering in an engaging and inspiring way with a combination of practical workshops and theory sessions. A well-designed qualification in a key sector makes it a very worthy FAB qualification of the year winner."

EAL's *Level 1 Foundation Certificate in Engineering Technology* has three optional units (*Introduction to Computer Aided Drawing (CAD)*, *Introduction to Computer Aided Machining (CAM)* and *Introduction to Engineering Project Planning*) mapped to *F1 in Schools* activities, helping learners achieve the qualification through activities that would otherwise not be officially recognised.

It is part of EAL's new suite of KS4 & KS5 qualifications, designed by industry experts to provide young people aged 14-19 with a seamless progression path from school to apprenticeships and industry careers.





## New CHAMPION on board

WES is delighted to welcome Professor Isobel Pollock OBE BSc (Eng) CEng Hon DSc FIMechE FCGI as our new patron.

Prof Pollock has championed the importance of engineering for over 30 years and was awarded an OBE for services to mechanical engineering last year after a career that includes working in world-leading multi-nationals and making major contributions to the promotion of engineering.

She is of course a familiar face to many of us having been present at a number of WES conferences and events and she has worked with young people to encourage sustainable and innovative design through the Audi Design Foundation, the Bloodhound schools outreach project and the Design and Technology Association.

WES's Dawn Bonfield said of the appointment: "Isobel was a natural choice for us and I am delighted that she was able to accept our invitation to be our patron. She has so many great accolades to her name, many of which have involved bringing engineering to new audiences, something WES is very passionate about. I know she will be great champion for our cause."

She is the second female president of the Institution of Mechanical Engineers and soon, subject to election, will become the first female Master of the Worshipful Company of Engineers.

WES is grateful for the support of our four other patrons: Professor Dame Ann Dowling FREng, Meg Munn, Sir Robert Malpas CBE, FREng, Professor Patrick Dowling CBE, DL, FREng, FRS.

A more detailed profile on Prof Pollock will appear in a future issue of *The Woman Engineer*.



WES would like to thank the *Student Conference* headline sponsors - BAE Systems, Dialog Semiconductor, P&G and Selex ES and the conference sponsors Aston University, BP, Finning, Instron, Mars Petcare for their support for the 2015 WES Student Conference held on 20th to 21st November at Aston University. We also thank all our volunteers, speakers and delegates for their continued support. A full report on the event will be published in the next issue.

## Plea to TEACHERS

Anyone teaching young girls who have an interest in CRESTA (creativity, engineering, science, technology and art), can sign up to Sparxx, and should encourage students to sign up too. Our aim is to ensure that news, events competitions, freebies and much more are brought to the attention of engaged girls to help to retain their interest. Sparxx seeks to inspire their future choices.

CRESTA events, competitions, games or quizzes, will also feature so please email relevant content to WES with the subject line 'Website Content'.

To sign up to the Sparxx monthly e-newsletter or for more information visit: [www.sparxx.org.uk](http://www.sparxx.org.uk)

## New Members:

Ebru Avcioglu, Eileen Banks, Sukhpreet Bansal, Jenny Barna, Rachel Barrett, Rebecca Bennett, Jo Bray, Annette Brookes, Ivanka Brown, Nancy Campuzano, Samuel Carter, Sophie Cartwright, Esperanza Castro Martin, Gemma Christie, Stephen Clarke, Sarah Clayton, Chiaki Crews, Ioana Dikanska, Hazel Easton, Emma Faulkner, Julie Forbes, Rachel Graham, Sarah Granger, Michelle Grant, Liz Griffin, Poppy Howe, Elizabeth Hutchison, Kristin Ivanova, Alessa Jaendling, Scarlett Jenkins, Susan Jones, Shilpa Joy, Laura Justham, Catriona Kelch, Ziaena Koppernaes, Diana Kornbrot, Georgia Kremmyda, Blinne Lappin, Dawn Love, Alisa Magar, Stephanie Malyon, Kate Marks, Lauren McGarry, Katie Meredith, Rachel Nicholls-Lee, Ajoke Onojeghuo, Keletso Orapeleng, Gillian Passman, Dominique Pitman, Helen Randell, Yoana Romero, Jemma Rowlandson, Jessica Salisbury, Samira Salmin, Deanna Sharma, Hannah Short, Suzanne Smith, Natasha Stevenson, Nicola Telcik, Lucie Thaxter, Helen Thomas, Emmie Thrush, Kimberley Travers, Helen Tresadern, Charlotte Tyers Hunter, Patricia Verrier, Maria von Prittwitz und Gaffron, Helen Wade, John Walker, Mackenzie Walker, Seren Wilson, Wanda Wojciechowska, Louise Wood

## Corporate Partners

BAE Systems is the first WES Member to renew their *Event Partnership*. As *Event Partners*, BAE Systems has helped ensure success at all WES events and conferences over the past year. Malvern and Mars Petcare have also both renewed as *Company Members* and RAEng continues its support of WES as a *Not For Profit Member*. All the support from our partners provides the much-needed funds and impetus to help WES deliver various programmes and events. We'd like to extend our gratitude to all our current members who make this possible.

For more information on Partnerships with WES, whether through membership or sponsorship, contact:

[corporates@wes.org.uk](mailto:corporates@wes.org.uk)



## Stop press...

At the time of going to print WES had just been announced as the winner of the *WISE Campaign Award* (sponsored by Network Rail) for *National Women in Engineering Day*. This is a huge achievement and real recognition for the event from the broader engineering world.

Two WES Corporate Members also won awards. Kris Harrison, head of lean engineering at Selex ES picked up the *WISE Inspiring Young People Award* (sponsored by Atkins) and Amrita Ahluwalia, professor of vascular pharmacology, William Harvey Research Institute, at Queen Mary University of London won the *WISE Research Award* (sponsored by Thale).

More information will be published in the next issue of *The Woman Engineer*.

## Royal Aeronautical Society support

WES is delighted to announce that it has been awarded £3,000 from the *Royal Aeronautical Society Centennial Scholarship Fund* towards the *Magnificent Women in their Flying Machines* outreach activity.

The activity provides resources for schools and other organisations based on building aircraft wings designed to replicate the work that was undertaken by women during the First World War. It allows schools to combine the design and technology aspects of creating and building authentic wing structures out of Stixx (rolled up newspaper), with the pioneering work of women in engineering over the past 100 years, the scientific aspects relating to wing design and flight mechanics, team working skills, careers advice relating to the modern day work of aerospace engineers highlighted by role models, and the history of World War One including the rise of the suffrage movement.

For more information on the activity visit [www.magnificentwomen.org.uk](http://www.magnificentwomen.org.uk)

We thank the Society for its continued support.





## Senior Members' Lunch

WES is pleased to report that the *Senior Members' Lunch* held in Birmingham on 10th October was a great success. Not everyone attending would necessarily describe themselves as 'senior' but there was certainly an abundance of experience amongst the 17 women taking part with more years in WES membership than anyone would care to count.

Nine past Presidents, past committee and council members caught up with personal affairs, business and current preoccupations whilst enjoying a pleasant meal with wine to oil the larynx and a substantial sugar hit by way of the dessert. Eleven other long-term members had sent their apologies and good wishes, inspiring a wave of nostalgia for those not present.

The lunch was good fun - no need here for a facilitator to encourage discussion with lots to talk about. In the afternoon the participants joined the other members of WES for the AGM, which was beneficial to everyone. As would be expected there was a good deal of interest in the 100th anniversary, ideas to be pursued and perhaps some will volunteer their services.

Sue Bird and Linda Maynard, who organised the lunch, have taken on board feedback that the lunch should be repeated in the not too distant future, so watch this space.

## NWED 2016

Sponsorship for *National Women in Engineering Day 2016* is already gathering pace with a number of new sponsors coming on board. Joining Cummins, Prospects College of Advanced Technology and Yorkshire Water; National Structural Integrity Research Centre (NSIRC) and Sheffield Hallam University have now also committed to sponsor NWED. With this generous support, WES can continue to produce and distribute our fantastic resource packs and develop further innovative ways to reach out to more young women across the UK.

To sponsor NWED 2016, email: [nwed@wes.org.uk](mailto:nwed@wes.org.uk)



The winner of the *WES Prize* will be announced and presented at *2015 Young Woman Engineer Awards* ceremony on 3rd December at the IET in Savoy Place, London.

The prestigious awards honour the very best early career female engineers working in the UK.

For more information visit: [www.theiet.org/ywe/](http://www.theiet.org/ywe/)

## WES Student Group launched at Sixth Form College

It was a first for WES when on 2nd October 2015, a WES Student Group was launched at Welbeck Defence Sixth Form College (DSFC) in Loughborough - the first time a group has been set up at a sixth-form college.

This groundbreaking initiative was organised and set up by Lisa Hawkins, a WES member who works at the college.

Welbeck DSFC specialises in preparing students for a technical or engineering career. This may be as an officer within the Royal Navy, Army or Royal Air Force or as a civil servant within the MOD. As part of the *Defence Technical Officer and Engineer Entry Scheme (DTEES)*, the students study STEM subjects at A-level at Welbeck and then move on to one of eleven partner universities to study engineering and technical degrees.

The launch was announced to the students by the principal, Peter Middleton before WES Past President and Welbeck governor Sue Bird spoke to the students about WES. Sarah Hainsworth, professor of materials and forensic science at Leicester University, a WES Fellow, then gave a presentation on her work, including that in the automotive industry investigating mechanical properties and failure mechanisms of coated components, and also of tool mark analysis and stabbing investigations, which were used in the recent examination of the skeleton of Richard III. Prof Hainsworth also answered questions from the students and gave some invaluable advice about their future careers as engineers.

After the formal part of the event, tea was taken by about 30 Welbeck students who talked to Prof Hainsworth and other women engineers who were present, including past Welbeck students, and members of the WES group at Loughborough University.

The group has already planned its first outing to the Space Centre at Leicester University.



Sue Bird talks to students at Welbeck DSFC



Guests, staff and students at the WES Student Group launch

### A flurry of activity for Student Groups

The student group at Warwick University has affiliated with WES, and WES's Cath Heslop reports that there seems to be real momentum for student groups with the WES office receiving a recent flurry of enquiries from universities about joining up.

Anyone who wants to get involved or who needs help setting up a student group should contact: [info@wes.org.uk](mailto:info@wes.org.uk)

Ricardo employees Oliver Adams and Adam Drury on their Ricardo 100 Global Challenge drive at Kenilworth Castle



Two engineers at Ricardo chose WES as a charity to fundraise for, as part of their company's one hundred year anniversary celebrations.

## DRIVING AMBITION

Having raised £355 from various activities, including a quiz night, treasure hunt, work mufli day, driving challenge and half marathon, Oliver Adams and Adam Drury are delighted that their employer Ricardo agreed to match the funding making a total of £710.

Speaking to *The Woman Engineer*, Oli said his girlfriend Lizzy Adam and the male dominated environment at university was the catalyst for selecting WES as his chosen charity. "My girlfriend has always championed equality and I was so amazed at university to be surrounded by men. I found it really frustrating that some people don't realise what opportunity they have. I am really inspired by the fact that WES encourages everyone."

Oli's route into an engineering profession was he says inevitable: "It started when I was very young and just wanted to build things or take them apart and see how they worked. It's an important profession and we need more engineers so we need more women to be given the opportunity."

Founded in 1915, Ricardo is a global engineering, strategic and environmental consultancy. The company employs over 2,700 engineers, scientists and consultants around the world.

In the transportation and security industries the company designs and develops engines, transmissions, hybrid and electric systems, right through to complete vehicles. Ricardo has a niche manufacturing and assembly capability which delivers finished products to motorsport, aerospace, defence and other high performance industries.

In the energy sector the company focuses on low cost sustainability and engineers solutions for conventional and renewable power generation, energy storage and distribution and in scarce resource and waste services they deliver environmental consulting focused on air quality, chemical risk, climate change, resource efficiency, water and waste management.



## Building bridges with fellow engineers

Taking place on 4th November in the home of the Institute of Civil Engineers in the heart of Westminster, attendees of this year's WES Prestige Lecture saw civil engineer Helen Randell being presented with the Karen Burt Award (refer to the front cover of this issue for more information on Helen).

There followed three lectures about *bridges of the past, present and future*. Sue Threader (pictured), bridge clerk from the Rochester Bridge Trust spoke of the fascinating history of bridges, which inspired the audience to find out more. Sandi Rhys Jones focused her presentation on Waterloo Bridge, sometimes called the *Ladies Bridge*, and launched a campaign for a sculpture by Barbara Hepworth to be installed on the bridge to commemorate the work of the women who were drafted in during World War II to construct the bridge. She also took the opportunity to present various ways in which to garner interest in the subject and in engineering in general.

Caroline Tong gave a presentation on the future of bridges, looking at their importance for communities in the developed world and sharing designs of modern bridges that focus on giving the user an 'experience', as well as being functional.

The feedback from attendees on the calibre of speakers and quality of the presentations was particularly pleasing, quoting one delegate: "There were a variety of speakers who found an interesting interpretation of the subject matter and didn't just spend 20 minutes stating the most obvious."

There was also great praise for Helen Randell's acceptance speech where she recounted her experiences and provided a "stand out" moment for some attendees.

The excellent speeches were just part of an evening which included ample networking and socialising opportunities.

WES would like to thank all concerned and encourages more members to look out for next year's Prestige Lecture.

## WES AGM hailed a great success

The WES annual general meeting, held at the IET offices in Birmingham on 10<sup>th</sup> October, was a great success and we would like to thank everyone who took part. We were delighted to welcome our nine new Council members.

There was an excellent presentation from Henrietta Heald on WES founder Lady Rachel Parsons, which was followed by a lively question and answer session.

During the day, the *Isabel Hardwich Medal* was also awarded to Carol Marsh and Anne Wiseman - two council members who are stepping down after long service. Carol and Anne have worked as volunteers for WES for many years and it was a fitting occasion to recognise the service they have given to the Society.

WES also announced Sophie Parsons as the winner of the *Gillian Skinner Award* for 2015. Sophie won the award in recognition of the work she has done running the 'She's an Engineer' feature on the WES website.

More information on WES awards can be found at [www.wes.org.uk](http://www.wes.org.uk)

