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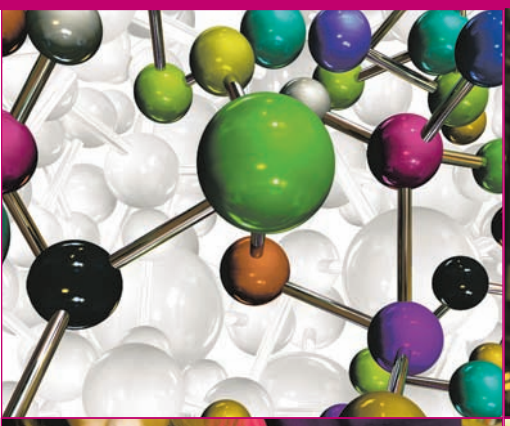
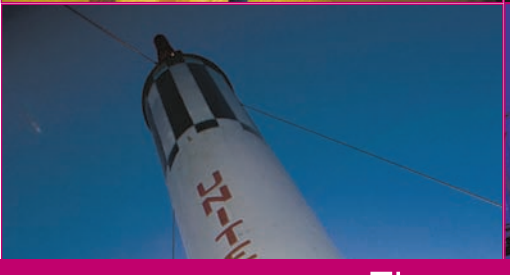
WOMEN IN SCIENCE ENGINEERING TECHNOLOGY





The problems and the solutions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MEDIA PLANET

WOMEN IN SET

A TITLE FROM MEDIAPLANET

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The tide is starting to turn

The statistics for getting British women into science and technology are not great, but a growing awareness of the issues, and a host of innovative solutions to tackle them, is beginning to make a real difference.

BY PROFESSOR JOCELYN BELL BURNELL DBE, PRESIDENT OF THE INSTITUTE OF PHYSICS

▲ Jocelyn Bell Burnell

Women scientists from 60 countries descended on Seoul, South Korea earlier this month. An international conference of women physicists and a forum of the UK-Korean Women in Science project gave us the opportunity to compare our position with women scientists overseas.

Our statistics may not be the best; the UK, along with the other English-speaking countries sits close to the global average for the percentage of women working in science, technology, engineering and maths (STEM). In contrast to a country like South Korea, where the government is handsomely funding projects to increase the number of women in science, our growth rate is slow. However, in terms of programmes and initiatives to attract, retain and advance women in STEM subjects, we have thought hard about the issues, and taken action. Our work is setting standards.

In the UK, programmes to advance women in science were initiated by concerned women scientists, working either within their professional bodies or in cross-disciplinary committees such as the Athena Project. Until recently, it was similar groups of women assisted by some equally concerned men, who kept the issues before us. Now professional bodies, such as the Institute of Physics and the Royal Society of Chemistry, provide leadership, there is Government funding for the UK Resource Centre for Women in Science Engineering and Technology (UKRC) and our recent Gender Equality Duty legislation is enviously regarded by women in science elsewhere.

Why does it matter?

There are several reasons: one is natural justice - if a woman wishes to be a scientist why should she have a harder time than a man? Another is economic - women make very good scientists and we cannot afford to waste their talents. At the moment only 25 per cent of women who have trained in science, engineering, or technology, are working in those areas. The third reason is that women often bring a different approach, ask different questions, work in different ways. A diverse body is always more robust and more creative than a less diverse one.

Awareness of the issues has grown, along with a growing willingness to address them. If well-implemented, the gender Equality Duty legislation should have a major effect. Of course, changes made voluntarily are better than those made under legislative duress. It is significant that this year several professional bodies and learned societies have appointed their first female presidents. They include three of the engineering societies, the geologists and the physicists. So is the tide turning at last? I suspect so; I sincerely hope so.

1 Yas Island, Abu Dhabi

2 London Tideway Tunnels, UK

3 Chongzun Expressway, China

4 Ingrid Lagerberg, London Tideway Tunnels, Delivery Team

5 Dames Point container terminal, US

6 Elzbieta 'Ella' Solowczuk, Graduate Engineer, Swindon

7 The Sheikh Zayed Bin Sultan Al Nahyan Mosque, Abu Dhabi

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Stereotypes and unwritten rules of game make it harder for women to feel a sense of belonging

Progress for women in science and technology has been agonisingly slow, but parts of industry and academia have woken up to the necessity of making their working environments more amenable to females.

When the Equality and Human Rights Commission claimed that a snail could go from Land's End to John O'Groats and halfway back in the time it would take to reach equality in the FTSE 100 company leadership, they were not talking about a science, engineering and technology (SET) snail.

If they had been, when the EHRC snail reached its destination, the SET snail would still be crossing Hadrian's Wall for the first time. A huge amount of work remains to be done to level the playing field for women in SET careers.

But women are desperately needed to plug the growing skills gap. In many industries, workforces are ageing and the traditional male talent pool is shrinking. There are also unprecedented demands for SET experts to tackle climate change, global security, food shortages and population growth.

The Confederation of British Industry (CBI) has calculated that 97,000 more SET graduates will be required by 2014. The most drastic shortfall is in the engineering sector, which must attract 50,000 new employees by 2012. Women are one of the obvious solutions, but currently they make up only 18.7 per cent of the SET workforce and 5.3 per cent of engineers.

Annette Williams, Director of the UK Resource Centre for Women in SET (UKRC) – a government body set up in 2003 to address these issues – says females are lost at every transition point.

"There is a leaky pipeline throughout the system and the higher up the pipeline you go the fewer women you find," she says. "We need to keep plugging the holes at every transition point."

If someone were to come and fix the pipeline, statistics suggest that it would probably not be a woman. Girls outperform boys at science A-level, but only 37 per cent of SET undergraduates are female. Most of those will be lost to industry, taking

up jobs in finance, or consultancy work. Only a quarter will follow careers in SET, which means that a staggering 450,000 qualified women are not working in the sector.

Annette Williams believes that gender stereotyping is as the heart of the problem.

"Stereotypes influence our perception of engineers and scientists, and of leaders and managers, making it hard for women to succeed in SET. The hardest of barriers to break down is workplace culture – intangible things, like the unwritten rules of the game, and the old boys' network. They make it hard for women to feel a sense of belonging," she says.

Neither is the academic world immune to the charge of making life difficult for women. Most undergraduates are female, but last year only a pitifully low 7.6 per cent of full-time professors were women.

In the past, women were held responsible for not fitting in and told to adapt, but there is a growing realisation that industry, and that includes academia, has to get its act together.

"We used to work on the deficit model, the belief that there was something innate about women's unwillingness to adapt," Annette says. "Now there is an awareness that employers need to consider how to attract women. They are looking at the different ways women think and seeing that it can actually bring benefits to companies."

Research supports the idea that a better gender balance increases productivity. A McKinsey Institute report showed that companies with at least three women on their management boards had higher profits than companies with none.

For industry, culture change is a matter of survival. For women, it's about two things – fairness and money. Engineering, IT and science jobs pay well above the national average wage. Management and leadership posts are also well-remunerated. Since women are underrepresented in all of these, the gender pay gap persists.

> "The hardest of barriers to break down is workplace culture"

The UKRC has a mandate to increase the participation and position of women in SET, but the Bradford-based organisation cannot tackle this complex and multi-faceted task alone. It focuses on addressing the issues for women over the age of 18, while the WISE (Women Into Science and Engineering) Campaign encourages under 19-year-olds to pursue STEM subjects and careers.

Parallel to the UKRC, the Athena Swan Charter monitors good working practice in SET in higher education and research. It was set up in 2006 by the UKRC, which provides 50 per cent of its funding.

There is much collaboration between these bodies and they use similar approaches to raise awareness: The UKRC employs its cultural analysis tool (CAT) to assess the working practices in a company, while Athena Swan does the same thing for university departments.

"Athena Swan methods and our CAT are trying to chip away at the culture," says Annette. "We ask them to start monitoring the representation of women and men in different roles. Getting that evidence base is the first step to identifying if you have a problem."

Common problems shared by academia and industry include inflexible working hours, the unavailability of part-time work, and an unwillingness to retrain women who have taken career breaks.

Instilling good practices also benefits men though, as the Institute of Physics concluded in a report, bad practice disproportionately affects women.

The science institutes are now showing a far greater awareness of the issues. The Institute of Biology, for example, offers half-price membership to females while they are on career breaks to enable them to keep up with research. It also funds a 10-week Open University course on returning to work. However, Annette is still critical of some of the institutes – though the Institute of Physics is a notable exception – for their habit of hanging lines of portraits of dead, white males on the walls.

"These sizeable portraits reinforce the feeling that men dominate and can make women feel less confident. It's so important to have positive role models. Every year we choose six high-achieving women and hang their portraits in the institutes, companies or universities where they work," she says.

Despite the appallingly low representation of women in SET careers, Annette believes there has been progress. Where first there was suspicion, there is now a willingness to seek solutions. Major companies, including BT Openreach and Atkins Engineers, have shown a high-level commitment to better gender balance by signing the UKRC's CEO charter for industry.

"There's been a huge shift," Annette says. "Five years ago we were still trying to convince employers that cultural change was needed, but that battle has been largely won. Some of the bigger companies have got on board and are pulling other smaller companies in their industries along."

Process industry searches for formula to resolve shortfalls in recruitment

The chemicals manufacturing industry in the North East needs 18,000 new recruits in the next 10 years, to cover industry expansion and replace an ageing male workforce, but can it attract enough women?

With its image of big, brawny blokes lifting heavy machinery while the rest of the world is fast asleep, the process industry has never been seen as women-friendly.

But a shortfall in recruitment caused by a combination of an ageing workforce and industry expansion has left it no choice but to fight hard to overcome these prejudices and attract more women workers.

The issue is vitally important for the UK's economy. The process industry employs 420,000 people and is the country's largest exporter of goods. Pharmaceutical companies invest more money in research than any other industry sector.

The shortfall is especially severe in the North East - one of the industry's heartlands – where a further 16,000 workers will be needed in the next 10 years. Half of the new recruits will cover the inevitable retirements from a workforce of 40,000 whose average age is 56. The other half are needed because of a £7.5 billion programme of spending on a huge bio-ethanol plant and an oil upgrader, as well as smaller projects.

NEPIC (The North East Process Industry Cluster), which represents 500 companies in the area, has been working with the UK Resource Centre for Women in SET (UKRC) to change its workplace culture to attract more women.

Ian Findley, of NEPIC, said: "Years ago mechanical fitter used to have to be big strong guys because of the heavy lifting. But lots of the equipment is much smaller these days and there are lifting aids available. There's no doubt that women can do it now. They can easily maintain the plants."

Mr Findley also insists that the notorious shift patterns have been made more conducive to family life. "The night shifts used to be very rigid, but we've introduced more flexible patterns. The work is now

concentrated into shorter periods, which may give some people short-term childcare issues, but then gives them the freedom of up to 10 days off."

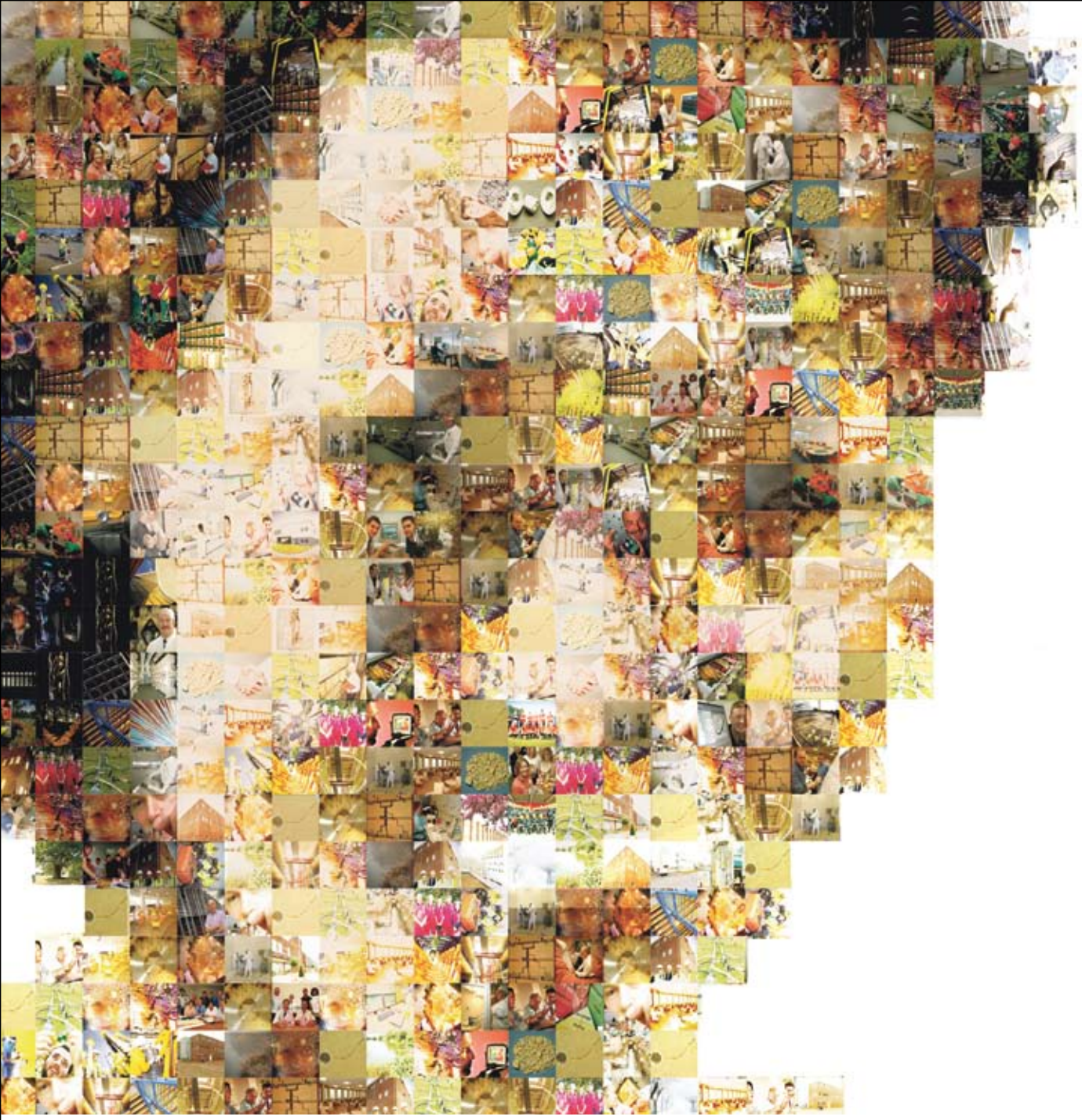
NEPIC works in schools and graduate fairs to promote the industry. It has produced DVDs showing what it does. But a lack of role models is holding back the progress of women, Mr Findley feels.

"We do need good industrial role models. The UKRC campaign has been successful in identifying and commending women who are successful in SET areas but they're often academic. We need more industrial role models to show that it's possible to get to the higher levels in this career and not damage family life," he says.

As a starting point to transforming its culture, NEPIC employed the UKRC's culture analysis tool (CAT), which gives all employees a chance to state their views on the work culture and how it can be improved.

NEPIC also signed the CEO Charter, committing itself to increasing the participation and progression of women at all levels in the workplace. The NEPIC chief executive made a personal pledge to support equality and diversity and promote best practice in gender equality. Several member companies within NEPIC also signed up independently, and are promoting the recruitment of women.

NEPIC has also begun programmes to inform teachers about industry opportunities and are offering careers advice.



TAKE A CLOSER LOOK

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ATOMIC WEAPONS ESTABLISHMENT

Inspace revolution sparks fivefold rise

After rethinking its workplace culture, the social housing specialist has seen a rapid growth in female recruits.

Stick-in-the-muds who doubt the viability of strategies to recruit more women into industry should consider the fivefold rise in the number of female trade apprentices at Inspace Partnerships.

Since it introduced policies to attract women two years ago, Inspace - Willmott Dixon Group's social and affordable housing specialist – has seen the proportion of its female apprentices jump from 3 per cent to 16 per cent. The new recruits will train in traditional male roles, helping to repair and maintain 80,000 homes, or helping to build 1,600 houses each year.

Once Inspace had decided on positive action, it sought advice from staff at the UK Resource Centre for Women in SET (UKRC), who suggested using their cultural analysis tool (CAT) to find out what employees at the Barnsley and Burton-upon-Trent branches felt about the culture and environment. It was the starting point for change.

"Two things came out of the survey," says Kate Flagg, Inspace's head of human resources. "The first was that two females might be working near each other, say in Richmond and Hammersmith, in London, but have no opportunity for connection because they are out in their vans all day. Staff emphasised the importance of workshops and other networking opportunities so they could talk about their needs."

Inspace responded by introducing more seminars and other opportunities to help overcome the isolation of the job.

"The second thing was the need for diversity

training," she continued. "Now every Inspace employee receives diversity training as part of their induction and also has an annual refresher course. It's a two-way process. We tell staff about our inclusive policy and our zero tolerance of any discrimination on the grounds of race, creed or gender. Employees then give feedback."

Happily, the feedback about employing more women to better reflect the public profile has been overwhelmingly positive.

"The vast majority in what is historically a male-dominated profession, and maybe partly because of that, are delighted to have more women on board," says Kate.

Further opportunities for employees to air their views about the workplace culture arise during employee forums.

> "The vast majority in what is a male-dominated profession are delighted to have more women on board"

"The tradespeople chair them and the managers listen to their concerns about the environment, and process and practice. We've found this an invigorating practice," says Kate.

After the internal culture change, the second stage of the campaign to recruit more women involved being more proactive. Inspace began providing work experience placements for girls, while ambassadors visited schools to generate interest in apprenticeships. A poster campaign reinforced the message that women were welcome.

"The inclusive policies, combined with the work experience placements, really increased the number of females. We've made rapid progress, but we're not there yet. We want to get closer to an even ratio of the sexes," says Kate.

Inspace has introduced a host of other measures designed to improve work culture. They include flexible working hours, subsidised childcare and the monitoring of office banter for anything sexist.

As part of its Fair Pay and Promotion strategy, Inspace has brought in equal pay guidelines and carefully defined career paths. A publicity campaign called Embracing Diversity details all the initiatives. As a final commitment to gender diversity, Mick Williamson, the managing director, signed the UKRC's CEO charter this year.

L'Oréal and Mott MacDonald earn full marks from staff for their progressive new workplace policies

The cosmetics company and the engineer may appear to have little in common, but women at both have praised their openness to flexible working practices, which have helped them strike a balance between work and family.

▲ Cathy Travers

They may seem like strange bedfellows, but cosmetics company L'Oréal and civil engineers Mott MacDonald both earned full marks from female staff for fair practices.

The experiences of Julie McManus, a scientific adviser at L'Oréal's Hammersmith office, and Cathy Travers, a divisional director for Mott MacDonald in Leeds, shared many resonances.

Julie, who has worked in the cosmetics industry for 15 years, said: "I consider myself lucky to work for such a supportive company. They gave me a good maternity package, and were very understanding when I came back to work.

"Returning from maternity leave can be quite daunting. Emotionally it's already a huge jolt and you worry that someone else has been doing your job better. L'Oréal took a lot of the pressure off. Nothing had changed. The salary bonus kicked in as if I had been there all along.

"They now let me work flexibly - I do two days a week at home and three in the office. It makes family life so much easier. My kids are very young - six, four and 11 months old - so there are all the inevitable bugs and doctors' appointments. Having such a supportive boss means that I can ring in and say it makes sense if I work from home today.

"Part of the flexibility is allowing employees sabbatical leave. One colleague has taken a year off to be with his young family, but will come back to exactly the same job. The security that comes from feeling you're never going to be cheated out of a job, or see your responsibilities diminish, or your standing in the company go down if you go off and take a break, makes you a happier employee.

"The loyalty is repaid. If I had felt less appreciated, I might have left and they would have lost 15 years experience in the industry.

"Generally, women are happy to work for L'Oréal. That is reflected in the high number of women scientists – 55 per cent – in the company. L' Oréal's For Women In Science fellowship award winners every year help women get back into science after a career break, which shows how much they value women's contribution."

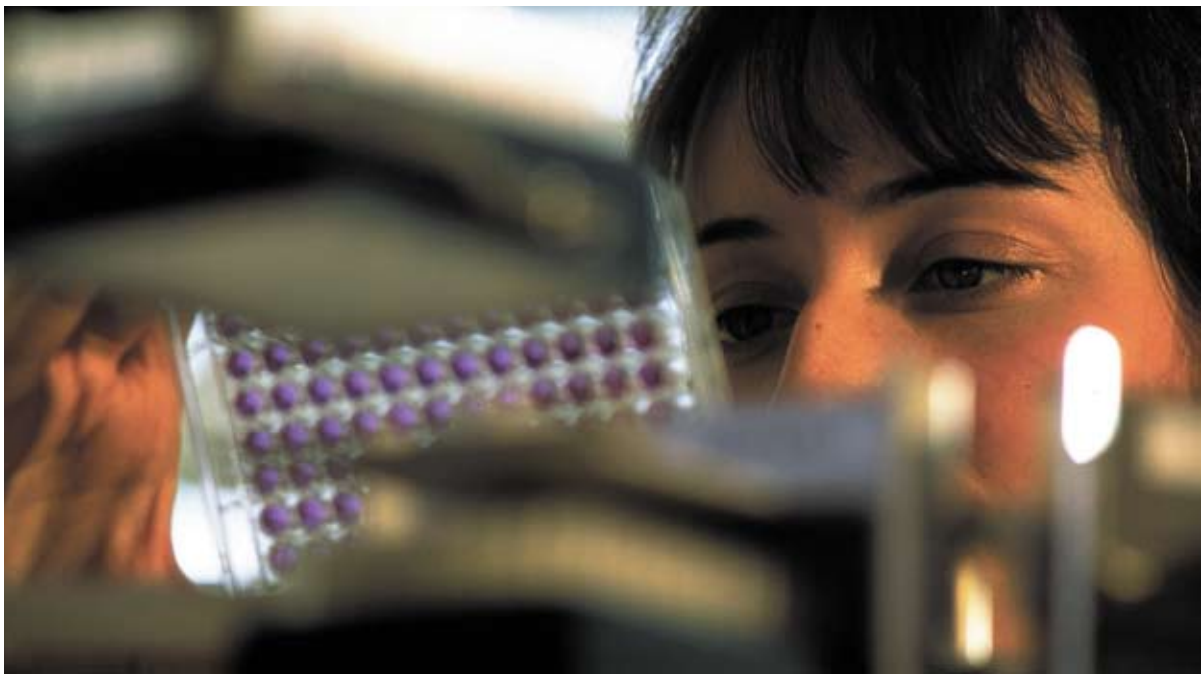
Cathy, who has been with Mott MacDonald for 20 years, echoed much of what Julie said.

"I wouldn't think of working anywhere else because of the flexibility and leeway Mott has shown to me over the years, which not all companies provide.

"When I was panicking about getting childcare for my two children during the 13 weeks, my boss negotiated an extra five weeks holiday for me so I could be at home during the holidays.

"More companies should follow their example. If you show loyalty to your employees, you get it back in spades. There is low staff turnover in Mott and a higher percentage of women than in the industry as a whole.

"Another consequence of the way I have been treated is that I will always show the same flexibility to my staff – whether male or female. If it suits them to start at 9.30am, take a short lunch and leave early, that's fine by me."



Picture: L'Oréal

▲ A L'Oréal scientist experiments in one of the company's laboratories, which are dominated by female staff

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Dr Maggie Aderin observes the bigger picture

Social barriers can appear absurd when the world is being viewed from the perspective of a space scientist.

When she was less well-know, Dr Maggie Aderin - a black, female space scientist - would enter a laboratory and be asked for hot drinks by male colleagues who assumed she was the tea lady.

Such racial and gender stereotyping might have offended a less optimistic character. But the gregarious Dr Aderin, who admits to seeing the world through "rose-tinted spectacles", laughs at the memory.

"As a black female I stuck out like a sore thumb, but when you're working together on an interesting project, gender and race soon cease to matter," she says. "The shared passion transcends all potential barriers. I have managed whole teams of men and once they know you are qualified and do a good job, there is respect."

Maggie has a theory that space scientists should be able to avoid pigeonholing people because of the nature of the work they do, which forces them to see the bigger picture. To illustrate her theory she tells the story of how she fell in love with science at the age of six.

"I was looking round the school library which, for a dyslexic child like me, wasn't normally a fun place. But when I saw a picture of an astronaut on the cover of a book, I was blown away. I immediately wanted to go into space," she says.

"In hindsight, using what I call my restrospectascope, I was attracted to the astronaut's global vision," she adds. "As a black girl with dyslexia growing up in London, I was aware of social divisions and experienced feelings of not fitting in easily. But when you're looking at the world from outer space, differences between people seem petty and pathetic."

All barriers, real or imaginary, are surmountable, she says. This is the great lesson of her extraordinary life and she is passionate about communicating it. Her company, Science Innovation Limited (SIL), tries to tear down barriers to people learning about science, especially girls and ethnic minorities.

Maggie tells her inspirational story to school children from backgrounds like her own in London's inner cities. "Just look at my story," she urges them. If she can do it, she insists, anyone can.

Maggie's parents broke up when she was a small child and she was shunted around the South East in the ensuing custody battles. She attended nine different schools. At first, her dyslexia held her back and she was placed in the remedial classes.

Despite the instability, she considers herself lucky. Both parents were loving and inspirational. Mother was a strong, steely character. Father was a natural problem solver who told her she could achieve anything through hard work.

▲Dr Maggie Aderin won a UKRC Outstanding Women of Achievement award

Even at school she was fortunate. She fought her way into the top set at La Sainte Union Convent School, Highgate, and found an inspirational teacher called Mr Vespey. She received a lot of help with her dyslexia. A logical mind and a capacity for hard work did the rest.

In her first year at Imperial College, London, she was one of only two black people and 10 women studying physics. It didn't bother her. She graduated and went on to earn a PhD in mechanical engineering.

Now 38, she has climbed to the top of her profession. She leads the optical instrumentation group at the European space company Astrium, where she makes satellite sub-systems to monitor climate change and designs complex instruments, including hand-held mine detectors and optical systems for space telescopes. She also holds a Science in Society fellowship from the Science and Technology Facilities Council. Recently, she appeared in the BBC TV series - The Cosmos: A Beginner's Guide.

Attracting girls

Nothing boosts her kudos more with the school children than her TV appearances. "Wow, cool Miss, can we have your autograph?" is a typical reaction. "The biggest problem is not one of gender, but of relevance," she says. "It's easy to see what you do with an accountancy degree, but not so easy with physics. Girls like to see its relevance to the world. I say, 'this is what you can do. This is where it leads'. Look at the work on landmine detection devices and how it can save people's lives, or look at how new instruments can help understand climate change."

If anyone can convert children to a love of science and make up some of the shortfall in scientists and engineers – 400 more are needed at Astrium – it is Dr Aderin. Her enthusiasm is infectious. "I love my job. What can be better than this?" she says.

York chemistry department transforms culture without lowering elevated academic standards

After becoming the first Athena Swan gold award winner from any university, York's high-flying chemistry department is being held up as a role model for the enlightened policies which have increased its percentage of female academics and raised staff morale.

The traditional macho route to success in university science departments – with its long hours, inflexible working patterns and mountains of research papers - has proved deeply unattractive to many women.

A disproportionate number of females still jump off every rung of the academic ladder. As a result, about 50 per cent of chemistry undergraduates are women, but at professorial level that has dropped to a mere 5 per cent.

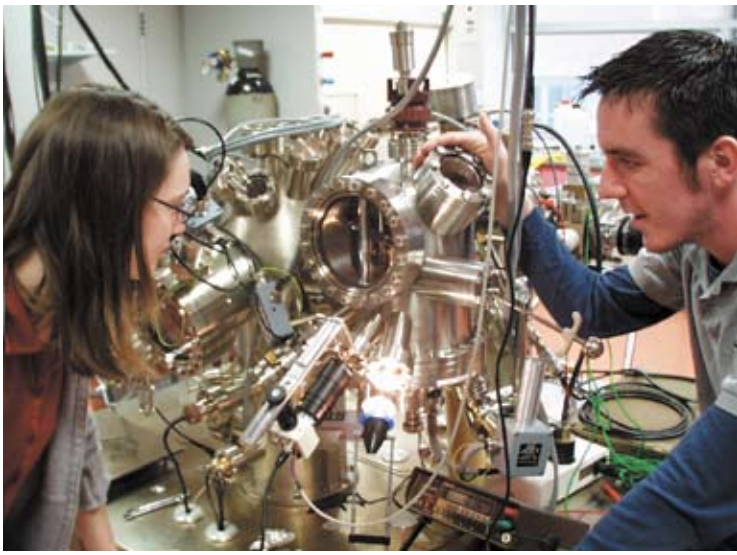
"It makes you want to go and weep," says Professor Paul Walton, head of chemistry at York University, and a man who is committed to achieving a 50:50 male-female ratio among his academic staff by 2020. "If we get there, I will die a happy man," he adds.

York has already made far more progress than almost any other science department in the UK. It has 25 per cent female academic staff against a national average for chemistry of 15 per cent, and its 15 per cent of female professorial staff compares well with the national average of 5 per cent. Paul expects the figures to improve dramatically in the next year or so. "Watch this space," he says.

The hard statistics are the result of enlightened policy-making. This received official endorsement last year when chemistry at York became the first university department to earn an Athena Swan gold award in recognition of its good employment practice for women working in science, engineering and technology (SET).

From a traditional standpoint, York's approach should lead to academic disaster, yet the opposite is true. The chemistry department is ranked a dizzyingly high fifth in the UK in both The Times and The Guardian good university guides.

"None of the changes come at the expense of quality," says Paul. "We are one of the best for teaching, if not the best, in the country and rated the best department for teaching at York University. We are graded in terms of research very highly as well. Management compromises



don't mean compromises of quality."

Defying the culture of long hours is one of the main ruptures with the long-accepted rules of the game. "You're not expected to work long hours as an academic at York, even though some do," says senior lecturer Dr Caroline Dessent.

Another revolution is the focus on the quality of research rather than quantity. Applicants for jobs are asked for their best four papers, not to flex their muscles by bringing in two dozen. "That policy opens up a different route to success in academia rather than the one accepted route," says Paul. "It's served us very well in academic reputation and output. It also galvanizes people who are considering working part-time to come and ask to work part-time. They know it will be well-received and it's not a

▲Heslington Hall, York University campus

route to academic anonymity."

Though Paul says the need for culture change is a "no-brainer", other university departments cling to outdated approaches. A conversation with an anonymous female academic in a science department at a rival university – not signed up to Athena Swan – serves as an interesting counterpoint to York.

Though she believes that there are fewer dinosaur attitudes than there used to be, a competitive culture still predominates. "We are still using a set of criteria from when it was a male-dominated profession. There is still a very deep-rooted belief here that competition is the best way to go," she says.

"Many women deselect themselves because they are not as good at self-promotion. Other ways of working, as team players, won't get full marks in the current system. We need better awareness of the operating differences between men and women to help select appropriately."

Sadly, many of the women academics in this academic's department have felt the need to fit in with the prevailing culture.

"There is a lot of machismo among our female academics. They feel they have a lot to prove," she says. "Only one of the female academics here has children; another woman academic who was recently promoted to professor said she couldn't possibly ever have children and do her work. It's depressing that we're still making it so hard to mix family and career."

The dismal, long-hours culture of cranking out research papers is also firmly in place.

"There is still an emphasis here on the number of research papers rather than the quality. If women have family responsibilities it makes it hard to travel around and talk about the work, gathering contacts and citations," she says.

The road to transforming culture can be a long one. Caroline traces the development of the York ethos back to the appointment of Robin Perrutz at head of department in 2000. He was a strong supporter of women in science and the department took on board suggestions for change made in a Royal Society of Chemistry report.

The next big leap came with signing up to the Athena Swan charter in 2006. A committee was set up to monitor progress by looking both backwards at what had been achieved and forwards at what could be improved.

Changes were made in the name of openness and transparency. All major committees had to include women; minutes of meetings and details of finances were made openly available. Meeting times were pulled forward to help those with childcare issues. A good gender balance was ensured among external examiners, guest speakers, or visiting industrialists.

The department also made some cosmetic, though important, alterations. Last year, it spent £150,000 on what Paul called "tarting the place up": public viewing platforms looked down on steaming test tubes, funkily painted walls declared a fun atmosphere and huge portraits of female scientists spoke of inclusiveness. A further £30,000 was spent on luxury lavatories in a comic, though sad, contrast to a science department at a rival university which still has no female conveniences.

The result of York's revamp has been a significant boost in staff morale, and a large rise in the number and quality of undergraduate admissions. "The feedback we get is that it looks nice and tidy and a good place to work," says Paul.

Though reluctant to stereotype, Paul tentatively suggests that the decision to spend money on the physical environment was borne out of a better gender balance on committees. "It led to greater concern about the fabric and the appearance of the building," he says.

There is still progress to be made. "It's all about practising these things so they become second nature, then eventually they become subconscious. We're at the second nature stage, but we haven't reached the subconscious level yet. When we get there people will become gender blind. Our aim is to reach a little utopian state where gender doesn't make a difference."

Daphne Jackson Fellowship saved returning scientist from abandoning her career in the industry she loves

After a six-year career break for family reasons, Jo Turner found herself unable to get a job and contemplating a change of career, until an advert in the local paper gave her the chance to retrain in a slightly different area of scientific research.

A six-year career break lay between the confident Jo Turner who was riding high as an environmental scientist and the uncertain character who could not even get a job interview.

Jo's story is a familiar one for many women who stop work to look after a family, or for other reasons, then find that the industry has moved on and no longer wants them.

Before her break, Jo had been heading towards the top of her profession. Studying for a PhD, she felt highly valued as a researcher at Kent University and with the Institute of Freshwater Ecology in Dorset. But, six years on, the experience of trying to get back into the area of science she loved, almost broke her spirit.

"It was a soul-destroying time for me," she says. "My confidence was very low after being out of industry for so long and sometimes, being a mum, you can feel a little undervalued. I was desperate to find a job but didn't even get to interview stage after a year of applying."

In common with many people in her position, Jo found that the industry had changed so fast that it no longer valued her skill levels.

"The environmental market is extremely competitive. You lose your contacts and you are not necessarily up with all the current literature, or changes in methodology. The legislation also develops rapidly," she said.

Jo began considering the type of career change which is common among returners whose valuable experience is then lost to industry. But a stroke of fortune saved her from leaving science for good.

She saw an advert in the local paper from the Daphne Jackson Trust, which offers two-year, part-time paid Fellowships in universities and industrial laboratories throughout the UK for returners like her.

The advert offered an industry fellowship with the pharmaceutical company Pfizer. It would mean retraining as a molecular biologist, but Jo was happy to do that as it meant she could stay in science. She became one of the first Daphne Jackson fellows to work in industry rather than a university.

"I began to retrain on the job," Jo said. "My skills were constantly being updated on courses and my confidence grew. My life has been turned around and I can honestly say that the old confident Jo is back now."

Many returners are unaware of the amount of help which is available to people in Jo's position.

There are the specialist organisations like the Daphne Jackson Trust; learned societies and professional organisations; the UK Resource Centre for women in SET and returners' fellowships from funding organisations like the Wellcome Trust.

Many returners find mentoring helpful and one of the most successful schemes is MentorSET, which is now funded by the UKRC. The Open University also runs a popular 10-week course aimed at women wanting to return to a SET career.

The Institute of Physics produced a career break guide in 2006 with useful information for those able to plan ahead, but many will still lose touch with previous employers. Often, a career break for a family will coincide with relocation and then it becomes even harder to return to a career with no previous contacts and in a new area. Many research scientists find it necessary to retrain in a slightly different area, like Jo, in order to open up more employment prospects.

Helping You Step by Step

THE FACTS

There are around 50,000 women with qualifications in Science, Engineering and Technology (SET) who are not currently working in their field. The UK economy suffers if the talents of these people are simply wasted. If we keep losing SET professionals there will be a tremendous gap in the skills base and UK industry will not be competitive with the rest of the World. It is a sad indictment of today's society that the retention of SET professionals is not top of the agenda for many decision makers. The Daphne Jackson Trust is addressing the problem by making people aware of the importance of returning SET professionals to their full potential.

WHO ARE WE?

The Daphne Jackson Trust runs a returners scheme for SET professionals who have been disadvantaged by taking a career break. We currently offer two year part-time Fellowships. Fellows carry out a supervised research project and retraining programme at a UK University or institution with an R&D facility. Fellows are offered support, guidance and mentoring throughout the application process and Fellowship. At 96% our success rate in returning Fellows to scientific careers is excellent.

HOW CAN YOU HELP US?

The Daphne Jackson Trust relies on its Sponsors and Donors to continue its work. The more Sponsors willing to support the Trust, the more we can do to increase the number of SET professionals we are able to return to their careers. We need to secure funding for Fellowships, as well as donations for training courses, networking events, seminars, workshops and the general running of the Trust. We continue to reach out to the community to raise the profile of the Trust.

TO FIND OUT MORE…

Contact The Daphne Jackson Trust
on (01483) 689166
or email:
djmft@surrey.ac.uk

The Daphne Jackson Trust

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www.daphnejackson.org

Registered Charity no. 1009605

Successful work placement experiences are crucial in attracting women into industry

Placements can put women off science unless they get support from other females.

Though female engineering students at Aston University typically return from year-long work placements enthused about their future careers, the process can be disastrous when it backfires.

Professor Julia King, the university's vice chancellor, says the majority of placement students return more motivated and achieve a grade higher on average than students who don't do placements. But there are notable exceptions.

"I remember one extremely bright, very tall girl of African origin going off to this oil company on placement," she says. "Before she left, she was full of confidence, but she found the environment intimidating. It hadn't hit her that it would be quite isolating in a male-dominated environment. She was smitten with feelings of self-doubt and her self-confidence spiralled downwards."

The student felt that when a man made a mistake, it would soon be forgotten. But everyone remembered her mistakes because she was the only female and the only black person.

"It was sad," says Julia. "She needed a lot of reassurance when she came back. I

told her they would also remember the things she had done very well. But she came back wondering whether it was the right career for her."

The student's negative experience illustrates the dangers of inappropriate placements. Ideally, women should be positioned in appealing and friendly environments, where there are other women around.

"It helps if they can see women succeeding in that company or industry and not be one woman in a huge office full of men," says Julia. "We know in engineering that they will be in a minority and feeling a bit insecure, to put it mildly, so it's important that they see other people they are going to find it easy to talk to."

Mentoring schemes also help enormously because they give females someone to confide in. Undergraduates, however, often underestimate their importance.

"The girls have beaten the boys at A-level, are outdoing them at rock climbing and they think they can conquer the world," she says. "But when I talk to women who've been in industry five years or longer, they often wish they had joined a mentoring scheme. We need to anticipate how some girls, away from a university environment, find these things pressurising."

> "It helps if they see women succeeding in that company or industry and not be one woman in a huge office full of men"

A sympathetic ear can help the young women deal with vexations that might be minor in themselves, but build up over time.

"Women often don't stay because of the accumulation of small frustrations – the third time you answer someone's phone and it is assumed you are the secretary, the repetitive teasing about how you ought to make the tea. It's the constant reminders that people don't expect women to be the professionals. Sometimes you need someone to sound off to who understands why such apparently trivial things are upsetting you."

Women also need to get the message that engineering jobs are about people and not just things, she believes. Girls tend to be the ones more interested in environmental issues and need exposure to those jobs.

Women at all stages of their career can take advantage of networking time at the Women in Engineering Forums, taking place at the National Engineering & Construction Recruitment Exhibitions on 14 & 15 November at Earls Court 2, and 28 & 29 November at the NEC.

Host of school schemes fight to overcome the stereotypical beliefs about what girls can do

Subconscious assumptions about feminine roles, naïve beliefs about geeky scientists, and an ignorance of what jobs in industry entail, all need to be addressed if more girls are to be persuaded to take science subjects at school.

▲ Engineer Katherine Jackson takes her passion for the subject into schools

According to stereotype, a gang of teenagers spending the week with the Royal Navy marine engineers - pulling up their sleeves, yanking chains, getting dirty and loving every minute of it - would have to be boys.

But those assumptions are wrong. The group of engineering enthusiasts on board HMS Bristol this summer on a joint scheme between the navy and WISE (Women In Science and Engineering), consisted of 16 year-10 girls from the Portsmouth area.

"These are not the sort of things stereotypically interesting to girls," says Terry Marsh, the director of WISE, which encourages girls under 19 to pursue STEM subjects. "Careers advisors tell girls they can be nice, clean-and-tidy engineers. But ours rolled their sleeves up and got stuck in. They had a great laugh and enjoyed it."

Such projects play a crucial role, she says, in undermining the clichés about gender identity, which influence subject choices and careers.

"What I call the 'pinkification' of girls is a powerful social phenomenon," Terry says. "It begins when they are little girls and continues through their lives. So many gender, and other societal stereotypes, are constructed by Disney and the marketing men, and they do influence behaviour."

So powerful is the subconscious belief that engineering is more of a boys' thing that WISE often sets up single-sex visits for girls to avoid feelings of inferiority.

"If the girls are there and the boys are being competitive it doesn't work as well," says Terry. "The girls feel inadequate next to someone who is stereotypically meant to be better at engineering. The same could apply to a handful of men with lots of women in a nursery. The men would feel awkward, as though they might break the babies if they touched them. It's what both sexes internalize from society, the opposite sex, advertising, even teachers."

A recent survey supports Terry's views about gender identity. Just 4 per cent of teenage girls were interested in training as engineers and only 14 per cent wanted to be scientists. But a third craved a career in modelling. The research by Noise (New Outlooks in Science & Engineering) showed that 35 per cent of teenage girls were put off careers in SET because they didn't know enough about them; one in four said these industries were not represented in their magazines.

The aversion is reflected in school choices. Despite scoring 51 per cent of A* to C grades at GCSE in maths and double science last year, girls made up 22 per cent of physics' A-level students and 29 per cent of IT/computing students. Yet, many universities insist on A-level physics as a pre-requisite subject.

The problem lies not just in girls' self-image. Simplistic ideas about science and engineering jobs also have a damaging effect. Technology reporter Maggie Philbin - the former Tomorrow's World presenter – has found a novel way to address misconceptions. Her initiative, TeenTech, will bring 600 schoolchildren from the Thames Valley area to meet dozens of local engineering and science companies, on November 13.

The idea of TeenTech arose in a Eureka moment when Maggie was drinking coffee in Carluccio's restaurant in London and musing on the problem of school children's ignorance of SET jobs.

"Kids are keen to find out about these jobs, but schools can't take them to all the laboratories covering hundreds of careers," she says. "Neither is it possible to get speakers from every industry to come to school. It struck me that the solution was to bring the mountain to Mohammed."

"TeenTech puts all the scientists in one place and we'll bring the kids to them. Day-in-the-life presentations and fun demonstrations will enthuse them. The idea could work

for the whole of the UK. "

Meeting companies is important for girls, who are far more adversely affected than boys by negative media images of geeky lab technicians.

"Girls love technology just as much as boys and never stop bragging about their mobiles, but the perception that the people who work in technology are sad geeks with unspeakable social habits does influence them," Maggie says.

"I've told the companies not to send any geeks in cardigans because the aim is to show them as normal people – the types the girls might want to date one day," she jokes.

Engineering companies are also reaching out to schools. Mott MacDonald civil engineer Katherine Jackson took children from Horndean Technology College, near Portsmouth, to study the structure of bridges over the Thames. Local firms then gave prizes to the pupils for the best paper bridges. Fun was had adding weights until they broke, and lessons learned about teamwork and the practical application of engineering.

Some aspects proved especially attractive to girls. "They enjoyed all the debates about routing the roads effectively and responded to the social importance of the work, how people in science and technology make a very important contribution to society," Katherine says.

The Centre for Science Education, based at Sheffield Hallam University, is another dynamic organisation promoting STEM subjects to young people. Among many initiatives, their work scheme placements challenge gender stereotypes.

The work on promoting engineering to girls is paying dividends. When WISE was set up 25 years ago, 8 per cent of engineering graduates were female and the figure is now around 16 per cent. However, Terry Marsh believes there is still a long way to go.

"I'd say we've won the easy battles and progress is steady," she says. "We are aiming for equality. Back in the 1970s, the same situation applied in accountancy, law and medicine. Nobody wanted a female lawyer because she would have hysterics, or her period. No one wanted a female sorting out money because they couldn't count. They cracked it. Physics and engineering haven't cracked it yet.

"The Government needs to put more money in. As it stands, for every £999,999 they will spend go on getting girls interested in these careers. They have a social responsibility to encourage 50 per cent of the population into engineering."

Useful email addresses:

The WISE Campaign
www.wisecampaign.org.uk

Science Learning centres
www.sciencelearningcentres.org.uk

Sheffield Hallam University
www.shu.ac.uk/research/cse

Athena Swan
www.athenaswan.org.uk

UK Resource Centre for Women
www.ukrc4setwomen.org

Daphne Jackson Trust
www.daphnejackson.org

Wellcome Trust
www.wellcome.ac.uk

Institute of Physics
www.iop.org

The Open University
www.open.ac.uk

Visit to Cavendish labs proves inspirational

GCSE student Melanie Coates from The Meridian School, in Hertfordshire was amazed to find out about the different career applications of her favourite subject – physics.

Many teenagers assume that physics only relates to the highfalutin world of Stephen Hawking and Albert Einstein, and so their interest disappears down a black hole of ignorance about its more practical applications.

But a visit to the world-famous Cavendish laboratories at Cambridge University opened the eyes of a group of schoolchildren from the Meridian School in Hertfordshire to some of the everyday uses of physics.

The year 10 students were given six 15-minute presentations about different careers open to physics graduates. For 15-year-old Melanie Coates, the experience was crucial in fostering her nascent interest in the subject.

"Some of the work was fascinating and I had no idea beforehand that it involved physics," she says. "We learned about how forensic engineers use physics to understand why bridges and other structures break. I also really enjoyed the presentation on how Stansted airport's train system relies on physics to run on magnets."

A bright girl who enjoys the rigorous, logical nature of physics, Melanie already had aspirations to choose the subject at A-level, but the trip has convinced her that studying it could lead to many different careers.

"Normally you think of physics as being about astronomy and space, but learning about other jobs keeps you motivated and helps you see the relevance of your studies," she says.

Melanie's physics' teacher, Caitriona McKnight, the head of science at Meridian, was involved in an Institute of Physics' study into what puts children off physics, which she found "helpful", though "quite upsetting".

Some of the problems related to both sexes, such as the lack of specialist teachers to answer the awkward, supplementary questions of inquiring minds, but other problems related more specifically to girls.

▲Donna showing April and Rosie how to go about the scientific experiment

"There was a dislike of all the technical language and a lack of confidence in their ability to do the subject," Caitriona says. "One girl I know with 10 A* GCSEs didn't think she was clever enough to do physics A-level. She's now doing brilliantly."

As a result of the research, Caitriona has adapted her lessons to ensure that she demonstrates practical applications wherever possible. This helps the girls overcome the stumbling block of feeling that physics is too remote and difficult.

As for Melanie, she does not appear to suffer from the diffidence which the IOP study found common among girls.

"When I'm told that physics is a boy thing it makes me want to study it even more just to prove people wrong," she says.

"Just today at school we rewired a plug and the girls got higher marks. The boys weren't happy and they said the teacher was showing favouritism towards the girls. They assumed they would be superior because it was about plugs and circuitry and those are supposed to be boys things, but the fact is we girls did it better."

Getting more women into power is next step

The UK has a long way to go to catch Norway up, but much progress has been made and there are reasons to believe the situation is getting easier for British women.

When Norway enacted a law in 2003 requiring companies to fill 40 per cent of corporate board seats with women by 2008, the country's male-dominated business sector was up in arms. But five years later the target has been reached, with some companies embracing the change enthusiastically.

The rise of women in Norway will challenge the damaging assumption that men are the natural leaders, an expectation that is deeply embedded in the conservative world of science and engineering in the UK.

In her seminal book Why So Slow? - about why women's progress is taking so long - Virginia Valian describes a psychological experiment which illustrates this unconscious bias. Someone entering a meeting and seeing a man sat at the side of the table and a woman at the head will automatically assume that the man is chairing. Her conclusion was that men accumulate advantage incrementally as women accumulate disadvantage.

This country needs far more women in positions of power in the world of SET, to challenge these assumptions and speed up the process of change. The idea of gender blindness is still a distant dream.

However, progress has been made: We have looked at how traditional industries and university departments are working to change their cultures. The science institutes are discarding their stuffy images and embracing change. Many initiatives seek to inspire school children.

Robert Taylor

▲ Women in science: from left, Julia Goodfellow, Kathy Sykes, Rebecca George

There are two more reasons for optimism. The first one is that the gender duty aspect of the Equality Act from 2007 puts a duty on public sector organisations to consider the impact of their policies on women. The second reason for optimism is that an ageing population is leaving more men in positions of power with caring responsibilities, so that they are increasingly demanding part-time or flexible working arrangements. Women will also feel the benefits of better working practices.

L'Oréal UK and Ireland Fellowships for Women in Science

in partnership with the United Kingdom National Commission for UNESCO, the Irish National Commission for UNESCO, the Royal Institution of Great Britain and the UK Resource Centre for Women in Science, Engineering and Technology

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To pre register please visit:

www.womeninscience.co.uk

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