

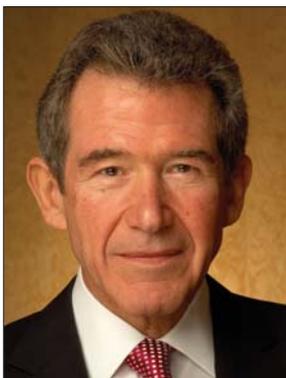


The Royal Academy
of Engineering

Inspiring Women Engineers



Foreword



Lord Browne

Diversity is now recognised as an imperative issue for the engineering profession. The business benefits of diversity have long been appreciated and with the engineering skills shortage facing the UK, it is more important than ever to attract engineers from diverse backgrounds.

The importance to the UK economy of attracting more students into the science, technology, engineering and mathematics (STEM) professions was raised in both the 2006 Leitch *Review of Skills*¹ and 2003 Lambert *Review of Business-University Collaboration*². More recently this issue was highlighted in the 2007 Sainsbury Review of Government's Science and Innovation Policies *The Race to the Top*³, and in the 2008 DIUS White Paper *Innovation Nation*⁴.

If the UK is to remain competitive we must seek out, develop and use the full talents of potential engineers from all backgrounds. Diverse teams produce better results in engineering, where different experiences and ways of thinking often lead to innovative outcomes. Engineers serve society, and the profession should reflect the diversity in our society in order to understand, communicate and engage effectively with the wider community.

Women make up a large pool of talent that is still significantly untapped by the engineering profession. This was recognised in the establishment of the WISE Campaign which celebrates its 25th Anniversary this year⁵. The Academy has always supported this campaign, which has made great progress: today 13% of engineering undergraduates are women compared with the 4% of twenty years ago. However, there is a considerable way to go to achieve the gender balance.

The Academy has always been keen to promote diversity in all its schemes, working in close collaboration with the UK Resource Centre for Women in SET (UKRC) and the Athena Programme. It is widening access to the engineering profession for women, ethnic minorities and late entrants through the London Engineering Project which is now being rolled out nationally in a further six regional centres of the National Engineering Programme.

A prominent factor in this work has been a close engagement with industry and the ability to provide examples of the interesting and rewarding careers available to women throughout the STEM sectors: in particular to show that firms and companies are keen to recruit them and provide career opportunities to help them rise to the top of their profession. We welcome the UKRC's CEO Charter and the Athena SWAN Charter initiatives. These will give ostensible public recognition to progressive companies and universities who are actively pursuing full diversity. In particular, this will give direction and reassurance to women in their choice of organisation to approach and at the same time help advertise the wide range of modern, innovative science, engineering and technology with which they can engage.

Lord Browne of Madingley FEng FRS

President of the Royal Academy of Engineering

January 2009

1. http://www.hm-treasury.gov.uk/media/6/4/leitch_finalreport051206.pdf
2. http://www.hm-treasury.gov.uk/media/9/0/lambert_review_final_450.pdf
3. http://www.hm-treasury.gov.uk/media/5/E/sainsbury_review051007.pdf
4. http://www.dius.gov.uk/publications/innovation_nation_docs/SciencelInnovation_web.pdf
5. <http://www.wisecampaign.org.uk/>

Inspiring Women Engineers

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1. The mission

As an employer and scheme provider the Royal Academy of Engineering is committed to recognising and improving diversity in engineering. Our mission is to move engineering to the centre of society and implementing an integrated diversity strategy is crucial towards realising this goal. The objectives are to:

1. Develop effective practice standards and guidance for all professional activities and schemes of the Academy
2. Diversify the Academy's Fellowship to better reflect the engineering community and encourage under-represented groups
3. Actively promote engineering as a career to young people from under-represented groups and low-income backgrounds.

Through working towards these objectives, the Academy will be a role model to the engineering institutions and employers.

The Academy recognises the wider diversity issues relating to all under-represented groups in engineering and strives to tackle them through relevant activities. However this particular report will focus on women, to reflect the current focus of our campaign.

2. The need for change

Inspiring people to become engineers and to maximise their potential within engineering is vital to the continuing health of the UK economy. However the UK is failing to keep pace with the demand for engineers; while total university admissions rose by 40% from 1994 to 2004, the annual number of students starting engineering degrees in that period remained static⁷. Retention is another problem; with just over half of engineering graduates subsequently choosing to enter the profession⁸.

We must recognise that the UK is undergoing rapid demographic change – by 2011, only 20% of the workforce will be white, able bodied men under 45 years old⁹. This group has been the traditional source of engineers, so in order for the UK to maintain a skilled workforce, the engineering community must attract engineers from different backgrounds such as:

- Women – who now form over 45% of the UK labour market⁹. Additionally, 68% of women with young children are in the labour market.
- Ethnic minorities – although only accounting for 8% of the UK population, 80% of the ethnic minority population is aged 16 to 35 and this will lead to ethnic minorities forming an increasing proportion of the workforce
- Disabled people – around 18% of the working population have a disability.

7. *Educating Engineers for the 21st Century, The Royal Academy of Engineering, 2007*

8. *Engineering UK 2008, ETB*

9. *Office for National Statistics, Quarterly Labour Force Survey, Jan – Dec 2007*

The key business driver for improving diversity is that the engineering profession is not taking full advantage of the potential talent available. Currently only 13% of engineering undergraduates are women¹⁰, and large numbers of SET-qualified women are not working in SET jobs⁹. According to Baroness Greenfield's 2002 report on women in SET, the under-representation of women in science, engineering and technology significantly threatens the UK's global competitiveness¹¹. The Women and Work Commission estimates that increasing women's participation in the labour market could be worth between £15 billion and £23 billion¹².

Many UK companies have realised the numerous benefits of improving equality and diversity, which also apply to the engineering sector. These include:

- **Cost benefits:** Better retention of staff results in a better return on the financial investments into recruitment and training.
- **Retaining intellectual capital:** when staff members leave a company the knowledge base is eroded. After career breaks many women leave SET industry or return at a lower level, suggesting a considerable waste of talent.
- **Innovation:** a diverse mix of employees will create a better environment for creativity and innovation to flourish as employees will bring different ideas and ways of thinking to the company.
- **Better access to markets:** to maintain a competitive edge, companies must have an understanding of all potential customers and markets. A diverse workforce will help companies to better understand and communicate with customers, particularly when they are involved with the design and development of products and policies.
- **A motivated, productive workforce:** where individuals feel valued by their employer, they will be more motivated, committed and therefore more productive.
- **Wider benefits for SET:** maximising diversity will lead to new priorities, questions and perspectives in SET, and ultimately affect the directions of SET.

Engineering employers need to counteract the threat of a growing skills shortage by maximising all the potential engineering talent in the UK. In 2007 the Academy produced a report *Implementing Diversity Policies: Guiding Principles*¹³ which provides a guide for engineering businesses that want to benefit from diverse workforces.

10. HESA 2008, *Students in HE Institutions 2006/07*

11. SETFAIR, *The Greenfield report on women in SET, DTI, 2002*

12. *Shaping a Fairer Future, Women and Work Commission, 2006*

13. <http://www.raeng.org.uk/about/diversity/pdf/Equalitec.pdf>

3. The work of the Academy

The Academy has long recognised the outstanding contributions made by inspiring women engineers, particularly those among the Fellowship, and the need to invigorate the engineering profession by attracting more women. The Academy has been a strong supporter of the WISE Campaign, the Athena Project and the Equalitec Diversity Forum.

In September 2007 the Academy agreed that it should implement a diversity policy in order to be an exemplar to engineering institutions, employers and the profession. The Academy is working with the UK Resource Centre for Women in SET (UKRC) to develop the Diversity in Engineering campaign strategy.

Since the late 1980s the Academy has been proactive in recruiting students into the engineering profession through its Better Engineering Science and Technology (BEST) programme of schemes. This comprises a variety of engineering education and experiences, commencing in primary schools with the Young Engineers Clubs and continuing through secondary schools with the Smallpeice Trust courses, the Dragonfly courses, the Engineering Education Scheme, the Headstart and Insight courses. The Year-in-Industry provides a high quality gap year engineering placement. The students are then supported through an Undergraduate Programme and the Engineering Leadership Advanced Award schemes. Those pursuing an academic career become eligible for the Academy's Research Fellowships while the Sainsbury Management Fellowships are available for MBA studies for entrepreneurial potential leaders of industry.

The main focus of current activity is to encourage more of the engineering institutions and industrial partners to commit to the principles laid out in the UKRC CEO Charter and to encourage university engineering departments to adopt the Athena SWAN Charter.

The UKRC CEO Charter



Emma Nevelos

In October 2003, in response to the European Commission's Women in Industrial Research Study, Andrew Gould, Chief Executive Officer (CEO) of Schlumberger, launched a 'Wake up call from CEOs'.

A group of organisations who lead international efforts to enlarge the reservoir of talent in Europe committed to double the number of women in science and engineering, to ensure that their skills were maximised by industry. These organisations shared a vision for women to have greater decision-making

responsibilities in industrial R&D. They have committed themselves to co-operate and place the issue on the public agenda.

The UK Resource Centre for Women in Science, Engineering and Technology (UKRC) has used this wake up call as the basis for a CEO Charter for Women in Science Engineering and Technology (SET). The Charter is a visible commitment from the CEO and top management of SET organisations to increase the participation and progression of women by implementing positive culture change. It also complements the Athena SWAN Charter for higher education.

For diversity and inclusion policies to be effective and fully implemented within an organisation there must be commitment from the top management levels. Signing up to the CEO Charter enables organisations to show they are serious about recruiting, retaining and progressing women scientists, engineers and technologists.

The Charter

By signing up to the Charter, the CEO and top management of the organisation makes a commitment to:

1. Actively support the aim of increasing the participation, at all levels, of women in SET
2. Develop and communicate the business case for gender equality within their organisation, their supply chain and their wider networks
3. Promote and showcase their organisation's approach and examples of best practice at relevant events and forums
4. Develop clearly defined strategies and implement practices which encourage women to enter and progress in, or return to, SET careers

To find out more about the Charter and the organisations signed up, please visit **www.ukrc4setwomen.org.uk/html/employers/ceo-charter**.

14 <http://www.raeng.org.uk/about/diversity/equalitec.htm>

The Athena SWAN Charter

The Athena SWAN Charter is a scheme that recognises and celebrates good employment practice for women working in science, engineering and technology (SET) in higher education and research. The Charter was launched in June 2005. Any higher education institution which is committed to the advancement of the careers of women in SET in higher education and research can apply for membership.

The beliefs underpinning the Charter are:

1. The advancement of science, engineering and technology (SET) is fundamental to quality of life across the globe.
2. It is vitally important that women are adequately represented in what has traditionally been, and is still, a male-dominated area.
3. Science cannot reach its full potential unless it can benefit from the talents of the whole population, and until women and men can benefit equally from the opportunities it affords.

Membership of the Charter, with its Bronze, Silver and Gold SWAN recognition awards, helps universities work towards sustaining equitable working environments and will enable universities to identify themselves as employers of choice, not only to their staff, but to students, funders, research councils and industry

As of December 2008, 34 higher education institutions are members of the SWAN Charter, including Imperial College, University of Cambridge, Loughborough University and Brunel.

To find out more about the Athena SWAN Charter please visit www.athenaswan.org.uk/

4. WISE Campaign

Whether it is media images, pressure from friends or inappropriate advice, young women often don't consider engineering as an interesting and well paid career. Women into Science, Engineering and Construction (WISE) believes that girls should feel confident to choose from the widest variety of career options, and not be limited by outdated thinking or stereotypes.

WISE takes a creative approach, injecting colour and inspiration into these career opportunities. Encouraging girls to stick with maths and physics gives them the foundation upon which they can build successful careers, and possibly change the world.

The WISE Campaign was established in 1984 following a call by the Engineering Council for more girls to consider an engineering career. Since then WISE has collaborated with educators and industry to encourage girls to value and pursue STEM or construction related courses in school or college, and move on into related careers. WISE does this by listening to girls and understanding their concerns, then communicating these messages to the wider world

By working creatively with delivery agencies and other bodies, WISE offers models, tools and approaches to support organisations in challenging traditional approaches, and engaging and supporting young women in order to demonstrate equitable involvement and positive results.

WISE prioritises activities that:

- focus on outcomes for girls and young women in education/training
- collaborate with existing schemes to maximise their impact with girls
- influence the influencers to promote policies that are effective for girls
- innovate and pilot models, tools and approaches
- explore and measure the drivers of success

Through its initiatives, the campaign has helped to double the percentage of female engineering graduates from 7% in 1984 to 15% today.

For more information about the WISE Campaign and innovative projects to encourage girls into engineering, please visit www.wisecampaign.org.uk.

Baroness Platt of Writtle DL CBE FREng



Baroness Platt of Writtle
DL CBE FREng

Baroness Platt is the Founding Chair and Patron of WISE, and a role model to all girls who are thinking of following a career in engineering.

When the young Beryl Myatt arrived at Girton College, Cambridge, she found herself one of only five girls amongst 250 men reading Mechanical Sciences, (which we now know as Engineering). In 1943 women were not allowed to graduate with the same honours as their male counterparts, so she was not awarded a degree, only a 'Title of degree'. It was only in 1948 that women were admitted to degrees at Cambridge

Shortly after graduating, Beryl took a job at Hawkers experimental flight test department.

'I arrived in the Hawkers experimental flight test department at Langley, Buckinghamshire and you could see by the look in the men's eyes, My god there's a war on and we've got a woman engineer too! So I couldn't ever let anyone down. We were testing and producing fighters (Hurricanes, Typhoons Tempests and Furies) which really made a difference to winning the war.'

Following the end of the war, Beryl Myatt went on to work at the newly formed British European Airways in their research department where she was primarily involved with air safety. During the 1970s, (then Beryl Platt), she chaired the Essex County Council Education committee and has since served on various other national bodies for technical education. Her personal experiences ensure she is not only extremely aware of the key issues, and potential solutions, but is also passionate about the future of engineering and technology in the UK.

In 1981 Beryl Platt was appointed to the House of Lords, choosing the name Baroness Platt of Writtle, after her home village in Essex. Lady Platt became the chair of the Equal Opportunities Commission in 1983. In 1984, as a result of encouragement from the Finniston Report, the EOC together with the Engineering Council set up WISE - Women into Science and Engineering. Lady Platt is still an active member of the House of Lords and has only recently retired from the Select Committee for Science and Technology.

5. UKRC Women of Outstanding Achievement

In 2006 the UKRC launched the “Women of Outstanding Achievement Photographic Exhibition” by commissioning an exciting collection of portraits by the celebrated photographer Robert Taylor¹ as both a celebration and tribute to the collective and individual contributions that women are making to science, engineering and technology.

The following case studies profiling and showcasing the inspirational Women Engineers of Outstanding Achievement and their aspiring successors in the Academy schemes will illustrate both what is already being achieved and the potential for future expansion.

Professor Dame Wendy Hall DBE FREng Woman of Outstanding Achievement 2006 - For Scientific Discovery and SET Innovation

Wendy Hall is a Professor of Computer Science at the University of Southampton in the United Kingdom and was Head of the School of Electronics and Computer Science (ECS) from 2002-2007. She was the founding Head of the Intelligence, Agents, Multimedia (IAM) Research Group in ECS.

She has published over 350 papers in areas such as hypermedia, multimedia, digital libraries, and Web technologies. Her current research includes applications of the Semantic Web and exploring the interface between the life sciences and the physical sciences. She is a Founding Director, along with Professor Sir Tim Berners-Lee, Professor Nigel Shadbolt and Daniel J. Weitzner, of the Web Science Research Initiative.

She has recently been elected as President of the Association for Computing Machinery (ACM), and is the first person from outside North America to hold this position.

She was Senior Vice President of the Royal Academy of Engineering (2005-2008) and is a Past President of the British Computer Society (2003-2004). She is a member of the Prime Minister’s Council for Science and Technology, a member of the Executive Committee of UKCRC and Chair of the newly formed BCS Women’s Forum. She is the Chair of the Advisory Board of the new Company, Garlik Limited, and is a founding member of the Scientific Council of the European Research Council.

She was awarded a CBE in the Queen’s Birthday honours list in 2000, and became a Fellow of the Royal Academy of Engineering in the same year. In 2006 she was awarded the Anita Borg Award for Technical Leadership. In the New Year honours list 2009 she was appointed DBE for services to science and technology.

A full biography is available at <http://users.ecs.soton.ac.uk/wh/>



Professor Wendy Hall CBE FREng

Professor Julia King CBE FREng Woman of Outstanding Achievement 2007 - For Leadership



Professor Julia King CBE FREng

Julia King has gained distinction in both technical and business leadership throughout a remarkable career.

During her research career at Nottingham and Cambridge Universities, Julia created a major group and published over 140 papers on fatigue and fracture in structural materials. She acquired an international reputation for her work and was awarded the Grunfeld Medal of the Institute of Materials for achievement by a researcher under 40, as well as the Bengough and Kelvin Medals and a Japan Society for Promotion of Science Fellowship.

In 1994 Julia joined Rolls-Royce plc as Head of Materials running a team of 250 engineers and scientists. Promotion soon followed to Director of Advanced Engineering for the Rolls-Royce Industrial Businesses, and then on to Managing Director of Rolls-Royce Fan Systems – a £180M pa turnover business responsible for the design, manufacture and procurement of the fan systems for Rolls-Royce aeroengines. She then moved back into engineering in 2000 as the Engineering Director of the newly enlarged Rolls-Royce Marine Business. Whilst at Rolls-Royce Julia was elected to Fellowship of the Royal Academy of

Engineering and received a CBE for 'services to materials engineering'.

Julia's success and achievements continued when she moved back to the public sector. After two years as Chief Executive of the Institute of Physics, she became Principal of the Engineering Faculty at Imperial College London, leading the Faculty's research strategy and overseeing a 60% increase in the Faculty's research income. Since becoming Vice-Chancellor of Aston University, Birmingham in 2006, Julia has delivered the King Review of low carbon cars for the Treasury in 2008 and become a member of the UK's Committee on Climate Change. She is also a member of the Governing Board of the European Institute of Innovation & Technology, the Technology Strategy Board and the DIUS Strategic Board.

Julia is a strong advocate of initiatives to support women in SET. Despite her other commitments she still finds time to speak at school prize days and mentor young women engineers. She is committed to ensuring that other women have the same opportunities and experiences that she continues to enjoy.

Dr Joanna Kennedy OBE FREng Woman of Outstanding Achievement 2008 - For Leadership and Inspiration to Others



Professor Joanna Kennedy OBE FREng

Joanna is a Director of Arup, one of the UK's largest firms of consulting engineers with over 10,000 staff and 90 offices in 37 countries. They have a reputation across the globe for dramatic and adventurous engineering projects such as the Beijing Olympic Stadium and Watercube, Sydney Opera House, the Channel Tunnel Rail Link and Anthony Gormley's Angel of the North. As the leader of Arup Project Management in Europe, Joanna is responsible at any one time for a range of construction projects, often worth hundreds of millions of pounds.

After gaining a first-class honours degree in Engineering Science at Oxford University, Joanna specialised in the design of structures such as bridges. She subsequently developed her skills in the leadership and management of large multidisciplinary projects and was instrumental in establishing Arup's practice in Project Management.

Joanna has successfully combined her career with family life and bringing up two sons. She has been active in promoting her profession, and describes her own experience of engineering as 'exciting, creative and practical'. She has held a wide range of public appointments including membership of the Engineering Council. In 1993 she was appointed a Trustee of the Science Museum by the Prime Minister and is non-executive Vice Chairman of the Port of London Authority. Joanna was awarded an OBE in 1995 for 'services to consulting engineering'. In 1997 she was elected Fellow of the Royal Academy of Engineering. She had a key role in the launch of WISE and is now a patron. In 2007 she was chosen as *Woman of the Year* in the inaugural AtkinsInspire Awards across the range of the built environment professions.

6. Case studies of women in Academy Schemes

The Academy is delighted at the increasing numbers of women applying to and participating in its schemes and hopes that the sample of case studies presented here will prove both informative and inspirational to future participants and sponsors.

London Engineering Project (LEP)

By supporting science, technology, engineering and mathematics (STEM) in schools and colleges and by creating attractive degree courses in universities, the LEP promotes engineering as a strategic subject and gives London students the chance to claim their place in the technology-based future of London.

The project was developed by a cohort of fifteen partner organisations led by the Royal Academy of Engineering with a remit to:

- Educate and enthuse young people about the positive applications of engineering.
- Transform schools' science and maths, increasing and improving student skills.
- Widen participation and improve social inclusion in engineering.
- Promote and protect engineering as a strategic subject.

Since its inception in 2005, the LEP has already begun to change the face of STEM education in the London Boroughs of Southwark and Lambeth. A team of dedicated field workers, mentors and project managers deliver STEM activities in schools. In universities, the project is already funding, developing and delivering brand new, socially relevant engineering courses to encourage and diversify participation in engineering higher education. Adult learners, women, black and minority ethnic groups and students from families with no history of engagement in higher education are specifically targeted.

LEP Case Study: Central Foundation School for Girls



Central Foundation Girls' School is an exciting place to work and learn. It is a large and inclusive 11 to 18 inner-city girls' school in East London. The ethnic, linguistic and cultural diversity of the school's community is a great strength, and it actively promotes equality of opportunity.

Head of Design and Technology at the school is Colin O'Donnell. Colin believes that working with organisations like the London Engineering Project is extremely important. It enables his students to learn in an environment away from the classroom and brings an extra dimension to his subject of Resistant Materials (RM). He also wanted to challenge the stereotype image of RM being a subject that is more for boys than girls, and the extra activities offered by the LEP have enabled him to do just that. Colin has focused his LEP activities on students in Years 9 and 10.

He says,

"I have taken Year 9 on LEP Smallpeice Trust STEM days and to their Trebuchet challenge; activities that they all enjoyed. For the older Year 10 students, I use the LEP's expertise to get them really interested in and focused on possible access to engineering-type careers."

With this in mind, Colin took 20 girls from his Year 10 Resistant Materials class to the LEP residential course at Harper Adams University and is hoping to permanently build this into his class in the future. They attended an Engineering Islam event at London South Bank University too and have been visited in school by the LEP team who delivered their wind tower activity; an activity in which eco-minded pupils design and construct an efficient wind turbine to convert wind power into electricity and are encouraged to discuss the many different renewable energy sources available.

Working with the LEP has helped Colin achieve his aims for the school. Resistant Materials is now a very popular subject at Key Stage 4 and the students have become interested in pursuing engineering-type careers, understanding that RM as a subject and engineering and technology careers can be suitable and rewarding for both girls and boys.

Colin adds

"In school, my subject has progressed rapidly. Within the last two years we have begun running two optional classes of Resistant Materials at Key Stage 4 and plan to set up a post-16 option in 2009-2010. The girls have thoroughly enjoyed their LEP involvement and this has aided and reinforced the popularity of Resistant Materials. Stereotypes are being broken down and Resistant Materials is now being seen as a subject for girls as well as boys. This can only benefit the students and give them an understanding of the role they could play in the future of engineering."

BEST Programme

BEST which stands for 'Better engineering, science, technology', is the Royal Academy of Engineering's central initiative in engineering education. BEST aims to:

- Recruit, train and retain the brightest and most motivated young people into and within the engineering profession to fulfil the needs of the economy and society.
- Create mutually beneficial partnerships between industry and education, where the needs of companies and the aspirations of individuals are satisfied.
- Provide comprehensive, value-adding education and training opportunities that can be accessed throughout an individual's engineering career.

The Academy is committed to total quality throughout the BEST programme. It offers employers the opportunity to identify and recruit the most talented young people in or wishing to enter the engineering profession, and to import their skills and expertise. Consequently the BEST Programme enjoys the participation of a broad cross-section of industry across its component schemes.

A selection of BEST scheme case studies is shown below. To find out more about the BEST programme visit www.raengbest.org.uk.

Smallpeice Trust Courses

Smallpeice courses are residential courses at UK universities for students in years 9-13. Hannah Pearlman attended Haberdashers' Aske's School for Girls and at 14, jumped at the chance to go on a Smallpeice course when her mother discovered an advert in an engineering journal.

She says "I was not sure (at the age of 14) whether I wanted to look at engineering as a future career. However, since that time I have attended two engineering skills and careers courses, one engineering management course and I am currently participating in the Smallpeice gap year.

Having done so many courses I feel that Smallpeice has been a major influence on my life and that the Trust is responsible in many respects for my continuing interest in engineering. Not only did the courses give me an insight into engineering, and how much fun it could be, but also how diverse the engineering field is. The combination of practical and life skills has extended my capabilities for the future and the courses also look great on a CV. The gap year is one of the most exciting things I have ever done! The chance to learn a language and get work experience at the same time is a unique and valuable opportunity that will continue to benefit me long after I have finished the course.

Apart from attending Smallpeice courses, I have also been involved in a number of other engineering-related projects including working as Assistant Engineer on a Tall Ship which, although hard work, was an amazing and unforgettable experience.

I have recommended Smallpeice courses to many people and will continue to

do so. Anyone with the faintest interest in engineering should take part in one of the Smallpeice courses at an early stage. The experience may help you decide if engineering is for you. However if you are anything like me then the courses will get you hooked! I am going on to study Mechanical Engineering with Automotive at Warwick University in September. However, before that I will be going on one of the Smallpeice residential courses, not as a student this time, but as a supervisor – I feel very proud that I can now give something back to an organisation that has helped and supported me so much so far. Furthermore I hope to be a respected role model for many other young engineers of the future."

www.smallpeicetrust.org.uk

Headstart

Headstart courses are 3-4 day residential courses held in UK university engineering departments, for year 12 students.

Ella-Mae Molloy



Ella-Mae Molloy

Ella-Mae Molloy attended her Headstart course at Loughborough University in 1999 while studying A-Levels in mathematics, further mathematics, physics, systems & control technology and general studies at Baines School in Poulton-Le-Fylde, Lancashire.

Headstart proved to be crucial, helping with important career decisions and her direction for future study. As often the case with numerate students, she had considered a career in accountancy: however, Headstart provided so much information about science and engineering that she enrolled on a Systems Engineering course at Loughborough University during the following year. Studying Systems Engineering gave Ella-Mae a sound training in many diverse fields of engineering, including electrical and electronics, mechanical systems, mathematics, computing and software, system dynamics and control, and human factors.

Now in her final year at Loughborough, preparing for a PhD in Systems Engineering, Ella-Mae will focus on combining human factors and mathematics, looking at the mathematics of team behaviour with potential applications to accidents, disaster investigation and forensic engineering. A recent work placement with the Civil Air Accident Investigation Branch (part of the Dept of Transport) fuelled her enthusiasm and provided useful work experience. Ella-Mae has been selected by NOISE (New Outlooks in Science and Engineering) as one of ten role models raising the profile of science and engineering, encouraging young people to consider the wide range of careers. All the role models are involved in groundbreaking study and research, passionate about the impact their area of science and engineering has on everyday life. In addition to being a keen supporter of Headstart, she is a Science and Engineering Ambassador for STEMNET, working with young people in local schools.

"I want to dispel the stereotypes, as many people still seem to have a fixed view about women and engineers in general. As one of only 5 girls on my degree course, I have to show others that you can achieve whatever you want to achieve."

www.headstartcourses.org.uk

Engineering Leadership Advanced Awards (ELA)

ELAs help ambitious and inspiring engineering undergraduates who want to become leadership role models for the next generation of engineers to undertake an accelerated personal development programme. They will acquire the skills needed to fulfil their potential, moving into an engineering leadership position in industry soon after graduation. Around 30 awards are given annually to MEng students in the UK who show potential to be leaders of the UK engineering industry.

Jane Kendall



Jane Kendall MEng

Jane Kendall received her ELA in March 2004. Jane studied Engineering Science at Oxford University, graduating in 2006 with a First Class MEng degree. Jane has made use of her Award to study French at the Education First School in Nice and traveled to Kenya for a work placement at the Jomo Kenyatta University of Agriculture and Technology (JKUAT), where she produced a laboratory experiment for undergraduates in Production Engineering. The remainder of her funding enabled Jane to accept a six-month work placement at Tripelay in Paris, a biomedical start-up company.

With reference to her experience in Kenya, Jane commented:

"I feel I have benefited from my time at JKUAT in many ways... I have gained some technical knowledge and more importantly problem solving experience... Working with people from such a different background was occasionally difficult and I have learned from dealing with that... I have a lot of respect for the people in the Mechanical Engineering Department at JKUAT and am very pleased to have had the opportunity to work with such talented and friendly people."

Jane accepted a permanent position in 2007 with Shell Exploration and Production. During her first year, she worked as a commissioning engineer on the Starling Project: the connection of a gas condensate field to the Shearwater platform in the Central North Sea. Jane has also worked as a rotating equipment engineer, supporting four North Sea platforms with planned and preventative maintenance and general technical issues.

Jane is also taking part in the Academy's Executive Engineers' Programme which provides training for engineering graduates who intend to advance their careers rapidly (although not exclusively) via the route to Chartered Engineers (CEng).

Sainsbury Management Fellows Scheme

The Sainsbury Management Fellows (SMF) Scheme was founded by Lord Sainsbury of Turville in 1987. The organisation aims to help the country's top engineers acquire the business knowledge and skills that will take them into the boardrooms of Britain's blue chip companies or set up enterprises; ultimately improving the economic performance of the UK.

Each year 10 young engineers are awarded one year's funding to study at the world's top business schools. Once they have completed their MBAs, the SMFs join a network of like-minded individuals who provide excellent contacts and resources which they can draw upon in their future careers. It is expected that award holders will go on in due course to become senior managers and leaders in UK industry. There have already been 260 SMFs, many of whom have gone on to achieve high profile success.

Uma Rajah



Uma Rajah

A recent addition to the SMF network is Uma Rajah, a trained engineer who was awarded an SMF bursary and graduated from the INSEAD Business School in 2006. Whilst at INSEAD, Uma founded Wigadoo, an internet start-up company, with two fellow students.

The idea came about following the failed organisation of a canoe trip which left one of the students out of pocket. Wigadoo makes arranging tickets, events or trips with friends simple by removing the risk of people dropping out of social arrangements at the last minute or forgetting to

pay the organiser. Uma and her co-founders launched the company in June 2008, and so far it has been well received, with positive reviews in the press and great feedback from users.

Commenting on how the SMF bursary has benefited her, Uma says:

"Without the SMF I couldn't have even contemplated setting up a company straight out of business school. Not having to worry about graduating with a huge burden of debt has meant that I have been able to go in the direction which I wanted to, and given me the freedom to set-up Wigadoo."

Another great benefit of the scheme is the networking opportunities it provides. Many of the other SMFs are internet entrepreneurs, and I have received invaluable advice from them on a range of business issues."

Research Fellowship Scheme

Research Fellowships enable high-quality engineers to develop their interests in academic research as part of a successful career. They are aimed at outstanding researchers from all branches of engineering who are about to finish their PhD or have up to three years Post-Doctoral research experience. The scheme provides funding for five years to encourage researchers to remain in academia. In addition to the direct financial support, the scheme offers:

- freedom to concentrate on basic research in any field of engineering
- time to establish a reputation and record
- the services of a mentor (a Fellow of the Academy) to offer advice and to facilitate industrial links as the research progresses
- restricted teaching and administrative duties

Dr Huda El Mubarek



Dr Huda El Mubarek
RAEng/EPSRC

Dr Huda El Mubarek has been the first Sudanese-born female engineer to receive a joint RAEng/EPSRC Research Fellowship in May 2005.

Microchips found in PCs, laptops, mobile phones and MP3 players are all made of circuits comprising millions of transistors. Dr El Mubarek pioneered a technique that produces faster transistors, which has led to a world record in commercial bipolar transistors in collaboration with ST Microelectronics. This achievement attracted great interest from both local and international media.

"This prestigious Fellowship has enabled me to lead further studies in my novel research area by giving me both national and international recognition as a distinguished independent researcher.

The Royal Academy of Engineering Research Forums offer great networking opportunities with distinguished engineers from very diverse engineering backgrounds. A wealth of knowledge is also gained from listening to the presentations of leading researchers from diverse research fields. This opens the way to exciting multidisciplinary collaborative research."

As a Royal Academy of Engineering and EPSRC Research Fellow, Dr El Mubarek has gone on to win the NESTA Crucible 2006 Fellowship. She has also been awarded an EPSRC First Grant and is progressing as an academic at the University of Manchester.

"What I found most useful to me personally is the great flexibility and family friendly nature of the scheme, which has enabled me to balance my family life as a mother with my leading research career. The beauty of this scheme is that it is managed by a very friendly team at the Royal Academy of Engineering. One feels a part of a family."

7. Contact details

For further details of the Academy's Diversity in Engineering activities, contact:

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The Royal Academy of Engineering

As Britain's national academy for engineering, we bring together the country's most eminent engineers from all disciplines to promote excellence in the science, art and practice of engineering. Our strategic priorities are to enhance the UK's engineering capabilities, to celebrate excellence and inspire the next generation, and to lead debate by guiding informed thinking and influencing public policy.

The Academy's work programmes are driven by three strategic priorities, each of which provides a key contribution to a strong and vibrant engineering sector and to the health and wealth of society.

Enhancing national capabilities

As a priority, we encourage, support and facilitate links between academia and industry. Through targeted national and international programmes, we enhance – and reflect abroad – the UK's performance in the application of science, technology transfer, and the promotion and exploitation of innovation. We support high quality engineering research, encourage an interdisciplinary ethos, facilitate international exchange and provide a means of determining and disseminating best practice. In particular, our activities focus on complex and multidisciplinary areas of rapid development.

Recognising excellence and inspiring the next generation

Excellence breeds excellence. We celebrate engineering excellence and use it to inspire, support and challenge tomorrow's engineering leaders. We focus our initiatives to develop excellence and, through creative and collaborative activity, we demonstrate to the young, and those who influence them, the relevance of engineering to society.

Leading debate

Using the leadership and expertise of our Fellowship, we guide informed thinking, influence public policy making, provide a forum for the mutual exchange of ideas, and pursue effective engagement with society on matters within our competence. The Academy advocates progressive, forward-looking solutions based on impartial advice and quality foundations, and works to enhance appreciation of the positive role of engineering and its contribution to the economic strength of the nation.

