

A Report
on
Women in Science,
Engineering,
and Technology
from

The Baroness Greenfield CBE
to the Secretary of State
for Trade and Industry

S E T
F A I R

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contents

Preface

Recommendations The agenda for action **9**

Tables **17**

Chapter one – setting the scene **23**

Chapter two – a business bottom line **27**

Chapter three – the SET career **36**

Chapter four – making the changes **67**

Conclusion **72**

Appendices

A1 – The Current Landscape **I**

A2 – Summary of UK Programmes and Networks **V**

A3 – Summary of scientific education and employment **XI**

References **i**

Acknowledgements **iv**

contents

Figures

Figure 1 **10**

The recommendations are structured around a three-pronged approach

Figure 2 **24**

The model adapted for the strategic approach

Figure 3 **27**

The recommendations are structured around a three-pronged approach

Figure 4 **38**

Flow chart showing typical training and work pathways in science, engineering and technology with identified barriers A–E for the early to mid career woman

Figure 5 **38**

Trends in A–E grades at A level in various scientific subjects in England (source: DfES)

Figure 6 **39**

Changes in the percentage of PhD qualifiers from 1995–2000

Figure 7 **39**

Percentage of professors who are women

Figure 8 **64**

The higher – the fewer: UK women in engineering and technology

Figure 9 **64**

The higher – the fewer: UK women in biosciences (excluding psychology)

Figure 10 **68**

Summary of measures used across the European Union to tackle the under-representation of women (extract from Rees 2002)

Tables

Table 1 **40**

Pressure Points that need to be addressed to engage girls in SET

Table 2 **46**

Pressure Points felt during early career stages

Table 3 **53**

Pressure Points felt during mid career stage

Table 4 **58**

Pressure Points felt during the senior career stage

Table 5 **61**

Extract of women full professors across the world,
European Commission (2000)

In January 2002 the Secretary of State for Trade and Industry, the Rt. Hon. Patricia Hewitt MP, asked me to prepare a high level report outlining a strong and effective approach for the UK on the difficulties for women in science¹, with specific points for action.

She was concerned that women in science are not appropriately represented in all aspects of the scientific career path, in both the private and public sectors, a concern she shares with the Minister for Science and Innovation Lord Sainsbury, the Chief Scientific Advisor Professor David King and the Director General of the Research Councils Dr John Taylor,

There was consensus that something needed to be done, but it was far harder to pinpoint realistic key action points with the potential to be immediately effective.

I was delighted to take up this challenge, as I have a strong personal conviction that any individual should be able to work in science to the extent, and at the level, appropriate for their personal choices, and commensurate with their abilities, but without gender as a constraining factor.

My sights were set on delivering a small number of clear action points to define a new integrated approach.

Our terms of reference were:

- to consider UK activity along with overseas activities and identify priorities for more focused action
- to consider the success and failures of women in science organisations and how they might be more effective
- to consider ways of addressing the apparent blockage of promotion in Higher Education to ensure more women are recognised for their contribution
- to review the outputs of the Women in Science event held at Canada House in May 2000 and comment on whether action is required and
- to advise on what could be done to improve the recruitment and retention of women in SET, increase the number of women in policy making and recognise women's achievement and contribution to SET (historically and currently).

¹Where science is referred to this is inclusive of engineering, technology and information technology

preface

We set out to identify issues and barriers and decided to pinpoint three actions to be taken forward quickly.

An appropriate starting point seemed to be to focus on issues at three different career stages, so three working groups were set up to consider each one.

Firstly, for those starting out, balancing decisions about family or career break with a sustained publication record or gaining experience for career development.

Secondly, being appropriately represented in mid-career on grant panels, on key administration committees and gaining enough management and organisational strategic planning experience.

Thirdly, there was the issue of breaking through the now-notorious glass ceiling.

We have had a series of consultations, both as large general groups, and as more focused groups, with women scientists and other relevant parties with the scientific community: these are acknowledged at the end of the report.

The report is written in the context and knowledge of UK legislation, Government policies and the actions of organisations including employers striving to improve working conditions for men, women and minority groups. Many of these organisations have been involved in discussions for this report.

I am enormously grateful to Professor Teresa Rees, Dr Nancy Lane OBE, and Dr Gill Samuels CBE for heading up working parties respectively into each of these three issues. Also I would like to thank Sylvia Howe of Pfizer for developing the case studies, editing the text and designing the layout. Her contribution has been invaluable.

However, there is one pivotal individual who has made this whole project possible, and who has acted far beyond her original remit as rapporteur. Dr Jan Peters, formerly of the DTI Promoting SET for Women Unit, has been the essential coordinator, source of information, all-round expert, and a still point in a turning world. I am enormously indebted to her for all she has done.

The Baroness Greenfield CBE
November 2002

6

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The under-representation of women in science, engineering and technology

threatens, above all, our global competitiveness. It is an issue for society, for organisations (as strategy and policy-setting agents), for employers and for the individual.

Here we outline the key areas that have been identified in this report and fit them into a strategic framework. This summary also presents outline implementation plans and targets that we believe are important to make an impact on the representation of women in SET.

We are faced with a problem that cannot be tackled with one sweeping action but which requires a pragmatic and consistent approach from the organisations involved in managing and nurturing the nations' scientists and engineers: perhaps a pooling of resources to enable a streamlined and effective approach, with detailed objectives, targets and milestones would be most effective.

Drawing on evidence from employers and the working group discussions, we offer a strategic approach to tackle the issue at the different points at which we believe intervention is necessary to:

- reduce fragmentation of efforts and enable all stakeholders to play an active and effective part in change
- help employers to deliver a change in culture, supporting individual women scientists, engineers, and the organisations who help to manage the skills and workforce for each sector
- stimulate organisational policy implementation to create an inclusive, modern working environment.

Organisational policy and employers exist to deliver front line outputs (research or products) or services to customers. We have therefore structured the recommendations to reflect this arrangement in a pyramid, reversing the normal organisational hierarchical structure (**Figure 1**).

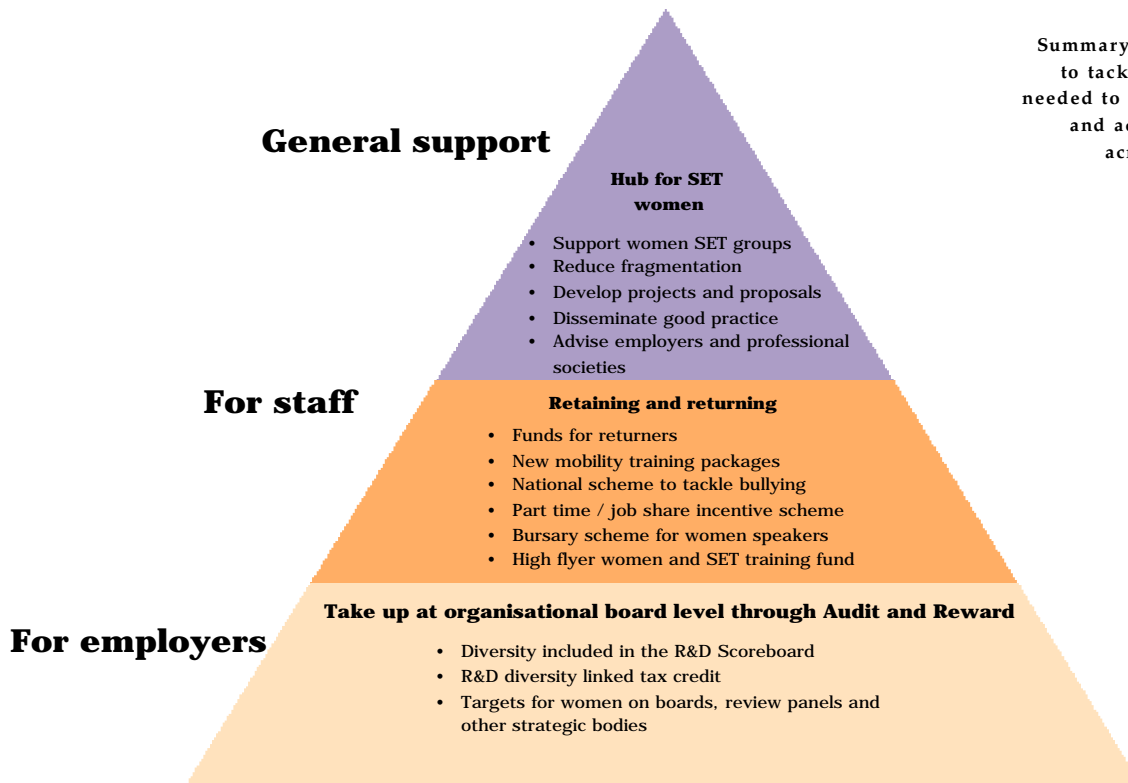


recommendations

the agenda for action

Figure 1

Summary pyramid of measures to tackle the cultural change needed to increase the retention and advancement of women across SET employment.



At the individual level

The Working Science Centre

The problem

It has been estimated that there are some 70 organisations, projects or initiatives in the UK dedicated to increasing the participation of women in SET. Some of these are committees from within professional societies or unions, regional and national membership networks, initiatives or schemes funded by the public and

private sector. Whilst numbers of women studying and working in SET are rising it is unclear how many have been influenced or helped by any of this effort. There are plenty who remain unaware of the level of activity, despite many newsletters and websites; they feel as isolated as if there were no support infrastructure at all. Many programmes rely on the commitment, energy and enthusiasm of a few people

10

working in their spare time whilst managing a busy working life and often family responsibilities. Ideas abound. But proposals take a long time to come to fruition, project management is often neglected and programme delivery and sustainability are hampered by poor resource and competing demands. The end result is fragmentation and programmes that do not realise their full potential; the problem is exacerbated by the lack of time for cross-organisation working and networking.

The DTI Promoting SET for Women Unit has, over its seven-year life, played a key role in developing information sharing, enabling projects and programmes to help stimulate activity and develop a more coherent approach. This has been done by bringing organisations together, facilitating projects such as the *Cracking It* handbook and developing its website to disseminate information. In July 2001 the unit held a meeting of a number of women in SET groups (*Networking the Networks*) to establish their

strengths and weaknesses and the perceived needs for more effective action. Common problems were lack of infrastructure, poor resources (time and funding) and a sense of duplication and lack of effectiveness.

Recommendations

Building on the work of the DTI Unit, in developing partnerships between organisations and helping engage the private sector in funding key projects, data-base centre outside government will enable the plethora of programmes and organisations to be brought together. This Working Science Centre will maintain their identities, and offer sustainability and a focus for industrial funding to deliver an integrated programme that will free the key people and organisations to work in areas where their strengths lie.

The role of the Working Science Centre will be to:

- offer information sharing and support to women in SET bodies and reduce duplication of activities, dissemination and marketing



recommendations

the agenda for action

- act as an information base for the media, head hunters, government, industry and professional societies
- ensure a businesslike approach to project development and management and ensure sustainability of project outputs thus supporting industry and professional societies
- act as a focus for organisations and companies working to get more women in SET careers.

The way forward

A meeting of all projects and initiatives is recommended to help develop the Working Science Centre business plan. Significant input has already been made to the development of this idea by organisations and projects who took part in the consultation. Professional Societies and Institutes also support the development of this central coordinating resource.

In year one: Establish steering board, define the remit, collate and prioritise databases, knowledge base and projects and align them into a strategic plan.

By year three the membership of key networks will be tripled, the membership of women in professional societies will be increased significantly, gaps in the strategic plan will be addressed by new proposals and an integrated marketing campaign focusing on key sectors will commence.

In year five key projects will have been evaluated and ended or extended, for example the mentoring programme, and women will have achieved better visibility. The pool of women for senior posts will have grown substantially. SET returners will be re-evaluated.

Types of organisation that could usefully be part of the Working Science Centre

- Membership organisations such as WES, WIT, WIC, AWiSE, Portia, and Women and Manual Trades
- Project management groups such as WITEC and Let's Twist
- Projects such as Equalitec, the pilot national mentoring scheme, SET experts database, ATHENA, and the WISE Campaign among many others, and the groups that exist across the IT sector.

12

***Addressing retention and returning
at employer level***

The problem

Evidence shows that it is more difficult for women to remain attached to the SET workforce or to return after a significant break and that there are few schemes or mechanisms available for people who have not followed a traditional path. Many training schemes operate up to the age of 25. A number of measures need to be put in place to make late entry (over 25) or returning easier.

Recommendations

Funding for returners

Further funding should be allocated to enable SET-qualified women to retrain and update their skills and knowledge. A fellowship scheme that allows women to study, work on a specific project within a company or undertake research to facilitate a return to academic or private sector employment is urgently needed. It is important to include an element of work experience and management training. This will build

on the excellent work of the Daphne Jackson Trust.

Fellowships should be available on a full or part-time basis and funding could come from within an existing scheme or programme that has allocated monies to SET returners.

New scheme for returners

Developing a new programme, along the lines of the 1980's European Commission professional updating for women course, that might be linked to the sector skills councils or delivered through the Open University and University for Industry.

Part-time/job sharing incentive programme

Increasing the level of part-time working opportunities with SET employers, in particular to ensure that these are available on research programmes and in SMEs. This could be achieved through an incentive programme whereby there is no additional cost for a job share or two part-time posts covering one job. This could be

recommendations

the agenda for action

delivered through consortia of sector skills councils and key employers. An element of the programme would be the development of support in managing part-time workers and job sharing, and a good practice guide.

High flyer development programme

The pool of women with SET qualifications and experience as well as core management skills for senior positions needs to be expanded in order to ensure more women get to senior positions. Large corporations may offer these programmes,

but women employed in smaller organisations may not have access to the right training.

A high flyer training programme with women drawn from employers and professional institutions will deliver core skills for middle managers to prepare them for senior roles.

SET women speakers scheme

The profile of women with SET experience needs to be raised through targets on conference programmes and a bursary fund for women to be able to take up speaking appointments in the UK and overseas.

At policy level

The problem

Many large organisations have formal, flexible working programmes offering a diverse range of options to meet the needs of individuals at different stages of their career. Many SMEs operate less formal, but nonetheless employee-friendly flexibility, others see such programmes as an expensive overhead and continue to operate in a manner that does not achieve work-life balance and continues to

marginalise women by excluding them from decision-making. The low take-up by the research community and key sectors that employ SET-qualified people means that a series of “carrots and sticks” needs to be introduced.

We see the inclusion of diversity measures and programmes in the R&D scoreboard as an important tool in measuring progress. In higher education a similar measure might be in returns

14

to the funding councils demonstrating progress on the implementation of the human resource strategies. Ultimately, a formal statement of progress would be required in annual reports.

Appropriate measures for reporting might be:

- significant numbers of women on all management and strategy-making bodies and a statement of intent and evidence of action to ensure that it happens
- code of good practice signed up to/adopted by all managers and employees
- level of part-time working
- packages of flexibility measures available to employees
- evidence of training in diversity
- childcare policies and schemes
- staff satisfaction surveys
- reporting on the “churn rate” of women employees i.e. number of women recruited/number of women who have left.

Science policy and gender

The problem

The outcomes of scientific research are as important to women as to men, so they need to be equally represented in the science policy-making arena.

We therefore make two separate recommendations to address this:

An advisory group on science

A science, engineering and technology advisory panel to the Chief Scientific Advisor to meet, discuss and be consulted on key scientific issues of the day.

Initially to be 75 per cent women, but at the end of three years this should become a gender-balanced panel.

Implementation panel

We also recommend that an advisory panel be based around some of the individuals who have been involved in the development of this report, to help steer the implementations in the model of the US Committee on Equal Opportunities in Science and Engineering operated by the National Science Foundation. The

15

recommendations

the agenda for action

first remit of this group should be the development of a set of SMARTT² objectives against which progress can be measured and ultimately reviewed in three years'

Tables of targets

In ensuring there is progress on implementation the outcomes that should be expected over the next five years are detailed

in the following tables.

This report should be the subject of a formal review and it would be prudent to ensure that this is undertaken in 2005 by the same group that undertakes the review recommended by Sir Gareth Roberts (2002). This will ensure that gender is firmly at the heart of the science policy agenda.

**Recommendations
for actions and
targets over five
years**

1 year – 2003

1-3 year – 2005

5 year – 2007

Action/target

Action/target

Action/target

**Helping/
Supporting
Women**

Working Science Centre

Centre created and set up with steering board comprising the women in SET associations and societies and other key advisors

- Centre remit defined
- Databases and knowledge base established and functional
- Projects aligned

- Triple membership of sector specific women in SET organisations
- Increase women's membership of professional bodies by x per cent at all grades
- New proposals under way
- marketing campaign focusing on sectors

- Targets will be membership rates
- No. of referrals to professional bodies
- Successful evaluation and extension of mentoring programme

Funding for returners

- Revisit the Maximising Returns recommendations
- Establish Fellowship
- Remove age constraints from schemes such as modern apprenticeships

- Monitoring take-up of funding by returners
- Achieve extra 100 returners through programmes
- Establishment of the research manager post recommended by Maximising Returns and working groups

- Achieve 1500 returners

1 year – 2003**1-3 year – 2005****5 year – 2007****Action/target****Action/target****Action/target****High flyer development programme**

Deliver fund for high flyer development programme to capacity-build number of high flying women in SET programme and start first 25/30 trainees.

- deliver second tranche
- fly-on-the-wall documentary to follow the women

- monitor and evaluate effectiveness of scheme and numbers of women achieving key status.

Employer**Part-time/job sharing incentive programme**

Consortium set up and proposal submitted to DTI

- Delivery of support to companies
- Creation of extra 100 part-time posts in key sectors

- Review of part-time working in SET and research

1 year – 2003

1-3 year – 2005

5 year – 2007

Action/target

Action/target

Action/target

SET women speakers bursary scheme

National women speakers bursary scheme established

- Professional bodies, HEIs and conferences publish statistics of women speakers on websites

- Women scientists and engineers feature in the top 50 most influential women list and have increased media appearances

HR good practice guides

Create sector specific groups to champion good HR, equality and diversity through:

- Six-point good practice cards supported by national campaign tackling culture and bullying
- Identify modern leadership competencies
- Codes of practice

- Undertake employee satisfaction survey
- Double number of SET employers in best company to work for

- Employees have come to accept diversity as a norm
- European Quality Federation Business Excellence Model includes diversity and results show improvement by 30 per cent seen as an add-on



1 year – 2003

1-3 year – 2005

5 year – 2007

Action/target

Action/target

Action/target

Policy

Working group convened to develop diversity element of R&D Scoreboard

- Definition of targets
- Develop baseline

- Working group publish indicators and process for scorecard and pilot scorecard trialled and published.

- Qualification for awards by demonstrating diversity good practice e.g. the Queen's Award – bad employers not eligible

- Diversity scoreboard published

- Company reports include diversity report.

- £x million saved through increased diversity

Women/Equality in SET advisory panel to oversee implementation of report reporting to Science Minister, Chief Scientists and DGRC

- Progress report on recommendations published

- Achieve average 40 per cent on SET advisory boards and panels

- Gender balance (40 per cent) SET advisory panels achieved on all SET advisory bodies and committees

1 year – 2003

1-3 year – 2005

5 year – 2007

Action/target

Action/target

Action/target

Advisory panel of WISE women/people to Chief Scientist convened starting with 75 per cent women

- Advisory board moves to 50:50 gender balance
- 40 per cent target on SET advisory bodies achieved as average
- 40 per cent target on the research funding committees met
- WISE women panel reviewed and steps taken to evolve gender balance
- Progress report published and data considered on progress at conference

- 25 per cent of women board membership in FTSE 100
- 20 per cent of SET faculty professors

Establish baseline attitudinal survey of perception of women as scientists, engineers and technologists

- Repeat attitudinal survey

- Repeat attitudinal survey



1 year – 2003

Action/target

Define and specify qualitative research on scientific culture and impact on men, women and ethnic minority groups to fill in the gaps left by the Roberts report.

1-3 year – 2005

Action/target

- Research funded and underway

5 year – 2007

Action/target

- Research reports

NB an organisation is loosely defined and includes public, private and academia as well as Government – the targets are organisation policy frameworks

***Women in science,
engineering and
technology careers***

are undoubtedly – and increasingly – valued in the workplace. Nevertheless there are issues that continue to impede their progress, and thus neither employer nor employee is getting maximum benefit from women’s skills, experience and commitment.

This report seeks to tackle this under-representation of women in SET at an organisational, employer and individual level.

Attitude, culture and practice in the workplace need to change in the public and the private sector, to reduce attrition at all levels of scientific, engineering and technology-related employment.

The report advocates a coordinated effort from all concerned.

Terms of reference

The purpose of the report will be to:

- consider UK activity along with overseas activities and identify priorities for more focused action
- consider the success and failures of women in science organisations and how they might be more effective
- consider ways of addressing the apparent blockage of promotion in Higher Education to ensure more women are recognised for their contribution
- consider the outputs of the women in science event held at Canada House in May 2000 and comment on whether action is required
- advise on what could be done to improve the recruitment and retention of women in SET, increase the number of women in policy making and recognise women’s achievement and contribution to SET (both historically and currently).

The report should consider the issues, barriers and key areas for action. In particular it should recommend three key actions that could be taken forward quickly.

chapter one

setting the scene

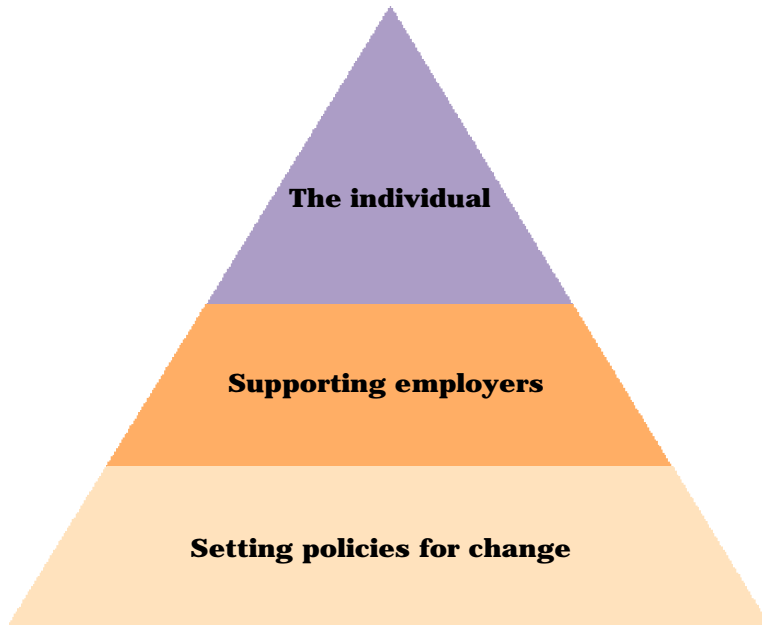


Figure 2 The model adopted for the strategic approach

The consultation

The consultation process was initiated with an open forum. This was followed by two discussion groups and three separate working groups convened to focus on different career stages and examine measures to help women pursue progress and enjoy working in science, engineering or technologically-based jobs. In addition, written submissions were canvassed from women working in SET, from funding bodies and other key employer-led organisations.

A website www.celerity.org.uk was set up to disseminate information and to facilitate

discussion. Contributions were received from research scientists, scientists and engineers in employment and on career breaks from the public and private sectors, as well as those who had trained in science or engineering but subsequently left. The working groups were composed of a mixture of volunteers, self-nominated through the open meeting or the website, and a balance of science and engineering employers (both public and private sector), unions, professional societies and learned bodies, funding bodies and social scientists from a variety of disciplines. Contributors are listed at the end of the report.

Scope of this report

This report seeks to build on the excellent work of recent years and the effort of many committed individuals. The issues discussed are generic across SET employment throughout the UK in the public, private and not-for-profit sectors.

24

Data are presented for higher education for the UK as a whole and for school-level education are, as indicated, only for England, although data for the countries that comprise the UK are now collated centrally on the DTI Promoting SET for Women³ website. Submissions on barriers and successful actions have been canvassed and supplied from across England, Northern Ireland, Scotland and Wales.

The focus of this report is aimed at tackling the retention and advancement of women, to add value to recent efforts and reports in the form of the review by Sir Gareth Roberts (DTI 2002) and Sir John Cassels (DfES 2002) and the changes to the delivery of activities in science, technology, engineering and mathematics for schools in the form of the

new SETpoint⁴ infrastructure.

The implementation plans for the reports of both Roberts (2002) and Cassels (2002) must specifically address the issue of stereotyping, work experience for young women and quality teaching, and ensure specialist careers advice is given specifically to girls and young women.

Ethnic minorities

Women are under-represented in nearly all areas of scientific endeavour, ethnic minority women even more so. For some ethnic minority groups the situation is the same as in the USA where fewer African American men are present than women. It is vitally important that all the measures taken to address the under-representation of women in SET make special efforts to draw more ethnic minority women in as well.

***“The under-representation of women in SET
is not an issue for a single organisation,
but for strategically-aligned efforts
from all relevant stakeholders”***

Lord Browne
Group Chief Executive, BP plc

³ www.set4women.gov.uk/stats/

⁴ The SETpoint network was expanded in 2001 to include SATROs science and technology regional organisations

chapter one

setting the scene

Summary

This report shows how a single body cannot tackle the under-representation of women in SET alone. It highlights how previous efforts have consumed the financial and time resources of many committed individuals who have had a small, but not widespread impact.

Recommendations have therefore been developed to present a succinct and practical programme for action that will give the UK a new strategic framework in which to work, with clear, achievable objectives that can really make a difference.

26

This chapter outlines the approach taken in defining the agenda for action.

Specifically it defines the strategic framework that has been adopted and around which the key actions are made.

Unintentional practices can create a culture that does not favour women.

Why do we need women in science, engineering, and technology?

Increasing demand for scientific and engineering-based skills, and demographic changes⁵ in the UK threaten our productivity, competitive position and level of innovation through a shortage of appropriately-qualified people. This shortage is compounded by the high leakage rate of science and engineering graduates to other sectors such as finance and management consultancy, where their analytical skills are valued.

Attrition is particularly significant for women because there are already fewer entrants. This is further

compounded by the numbers leaving because of cultural discomfort and the difficulty of managing family responsibilities and careers.

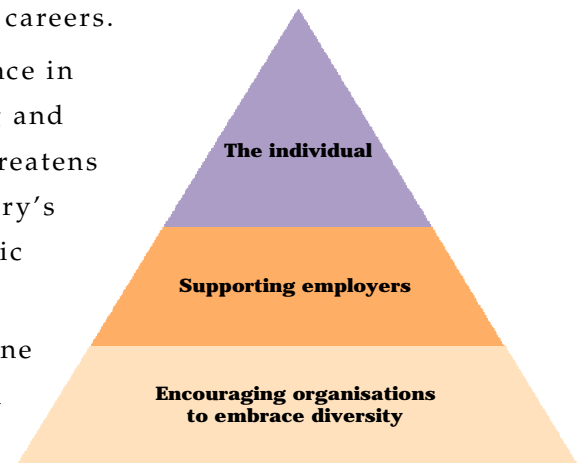
This gender imbalance in science, engineering and technology (SET) threatens to weaken the country's competitive economic position.

This has a bottom-line cost to employers in terms of recruiting and training staff, but also in slowing down their innovation and development of products and services.

It is time to move away from addressing the issue as one that is a problem for women (*The Deficit Model* described by Wajcman (1991)) but one that is an issue for society and for businesses. Accordingly the strategy defines actions at organisational policy level, for employers and for women themselves to ensure that we develop appropriate skills and confidence as well as create a workplace that values their contribution, **Figure 3**.

Figure 3

The recommendations are structured around a three-pronged approach



⁵ increasing demand for elder care will require a greater level of flexibility for a larger proportion of the working population than at present

chapter two

a business bottom line

The key arguments for the inclusion of women in science, engineering and technology

- **Competitiveness** – the UK needs to engage the best people in the pursuit of innovation in SET, to contribute to improving our society and economy, and to maintain our competitive position.
- **Return on investment** – the cost of training people in S, E and T at all levels is high. It is vital that good use is made of investment by retaining as many qualified people in the workforce as possible.
- **Benefit to science** – maximising diversity enhances the quality of S, E and T highlighting different priorities, asking different questions of science, and by bringing more varied perspectives to bear on the direction of the science and the outcomes.
- **Missed markets and skills** – companies are losing out on markets and may be missing out on benefits of SET research

and its application, when women are not represented in the design and development of policies and products.

Overall we must ensure that every woman scientist or engineer has the same career opportunities and rewards as her male counterparts.

How can we achieve a diverse and successful SET workforce?

The progress of women in all sectors of UK society is hindered by traditional family roles, responsibilities and expectations, unequal pay and intangible cultural factors that appear to exclude them from the corridors of power; this constitutes institutionalised sexism.

The tools that can be used to address this include:

- introduction of transparency of pay and promotion procedures

28

“Science is truly collaborative”

- gender balance in the decision-making process
- research to achieve a better understanding of scientific and employment cultures
- increased take-up of work-life balance policies.

Despite efforts over the last 20 years to increase the number of women working in SET there has not been a marked improvement. Efforts to involve more women in SET policy-making are only slowly being realised. A summary of the key reports in this area can be found in Appendix A1 and a summary of some of the UK initiatives and interventions that have been developed can be found in Appendix A2.

A meeting of the women in science and engineering community along with policy makers and other stakeholder groups, *Building on Progress*, was held in July 2000. It defined a vision that has been endorsed by Lord Sainsbury, Minister for Science and Innovation and Professor David King, Chief Scientific Advisor. According to recent reports (Osborn et al, 2000, Athena

2002), overt discrimination is not the prime factor causing women either not to enter, or to drift away from SET careers. Rather, it is the perception and reality of the workplace, coupled with a systematic set of policies and processes that work together to create a culture that excludes or marginalises women.

Sir Gareth Roberts (Roberts, 2002) in his recently-published review addressed key points along the science and engineering supply chain, but he did not address the scientific culture that could be turning more and more men as well as women away from scientific endeavour.

The vision is of:

an environment in UK science, engineering and technology education and employment, research and policy-making in which women contribute to, participate in and share the benefit equally with their male counterparts. To ensure that the UK knowledge-driven economy benefits from the inclusion of the talents of the whole population and that women benefit from the opportunities afforded by it.

chapter two

a business bottom line

What do women perceive to be the problems ?

- Few visible role models and mentors
- Teaching of science and technology
- Lack of transparency for pay and promotion procedures
- Gender imbalance in the decision-making process
- Poor understanding of scientific employment cultures
- Slow setting-up and take-up of work life balance policies
- Intangible cultural factors that appear to exclude them from the corridors of power
- Institutional sexism
- Stereotyping of careers advice
- Lack of knowledge and experience for girls and young women in non-traditional areas of work
- People in relatively senior academic positions employed on short-term contracts remain in paid employment in academic research by continuing to undertake a competitive application process
- The research-based career is predicated around publishing in refereed journals and raising one's profile at key conferences, leaving little time for gaining broader management knowledge and skills that can add value to the professional skills of the scientist or engineer.
- The publication record is heavily compromised by a career break or a (more senior) partner relocating to a new institution
- flexibility and mobility – the cornerstone for promotion
- women having to work harder to convince and persuade their managers that they want and need more responsibility which they see being given to their male colleagues

30

chapter two

a business bottom line

- having to work against the perceptions of what women want and what women can do
- informal practices including rumour, gossip, sarcasm, humour, throw-away remarks, and alliance building, encoded in the organisational culture as images, metaphors, artifacts, beliefs, values, norms, rituals, language, legends, myths and other symbolic gestures

Issues prevalent across UK employment, such as work-life balance, lack of affordable childcare and attitudes towards family responsibilities are reinforced by the paygap and are felt more acutely in SET employment because of the low numbers of women and the sense of isolation that often does not manifest itself until the early thirties.

Poor retention of women staff is not simply an issue of lack of support for maternity leave or childcare facilities.

The situation in Norway and Sweden, where quality childcare is not an issue, still finds a significant imbalance in the representation of women in SET and at senior levels. A more difficult, but equally important issue to tackle covers the workplace culture.

Some of these issues affect men and women, but are felt more acutely by women working in science, engineering and technology. This is partly because of their isolation in being a lone, or just one of few, technically-qualified women, but also because they are more likely to have partners working in similar, demanding roles, which are more senior than those of the men that they work with.

Whilst examining the costs of replacing staff, employers would do well to consider the 18 per cent gender pay gap. The Government introduced the Castle Awards in 2001 to recognise the steps taken by employers to promote equality. The Equal Opportunities

Collected from case studies, interviews and conversations while researching this report. Many of the findings are reported by both men and women

31

chapter two

a business bottom line

The DTI/CBI 'Fit for the Future' campaign has also produced strong evidence for the link between share performance and happy staff

Commission is in the process of developing an Equal Pay Review Model. The evidence about the take-up of work-life balance policies in the SET sectors suggest that there will need to be a stronger push to raise awareness of the issue of a pay gap in organisations where there will be few women.

Organisations and managers must learn to value and use their women employees

The cost benefit of retention, although not immediately obvious, can be very significant:

- Recruitment and training costs, at between £21,000 for a junior manager to significantly higher for a senior manager, with estimates at 100 per cent to 150 per cent of their annual salary (Opportunity Now 2001),
- Loss of intellectual capital and corporate knowledge
- Effectiveness in the post as the new recruit takes time to get up to speed.

Company perception, company performance

A new awareness of the link between being an “employer of choice” and company share price has emerged with the continued government-led campaign on work-life balance. The DTI/CBI *Fit for the Future* campaign has also produced strong evidence for the link between share performance and happy staff.

And yet the take-up of work-life balance policies among science and engineering employers is low.

Of the 100 best companies to work for, there are two pharmaceuticals and one construction employer in the top 50 along with nine IT/electronics firms. Of these, only four are British-owned.

Opportunity Now members who have made significant improvements in changing the workplace culture to reduce bullying and harassment (and have noted a positive impact) include BAE Systems and Cummins Engines.

32

Key benefits that are cited for introducing a more amenable working culture are:

- reduced costs: reduced recruitment, reduced staff turnover, reduced absenteeism and less likelihood of litigation
- increased effectiveness: attracting the best employees, and raising productivity levels, staff commitment, organisational flexibility and innovation.

There is mounting economic evidence for working towards a diverse workforce. It is a combination of drawing from a bigger, largely untapped talent pool, having a technical workforce representative of the market place and reducing costs by increasing retention. For some less enlightened employers there is a need for both measurement and reward to stimulate the take-up of diversity and work-life balance policies.

The Sunday Times *100 Best Companies to Work For* report

“Certainly the companies that make it on to the list have fared better than most during a bumpy year on the stock market. Whereas the FTSE All-Share index fell 15.6 per cent in the year to January 31 2002, the listed companies among our top 100 fell a more modest 5.9 per cent. A study of performance over a five-year period is even more instructive. Share and dividend returns for these companies have shown 25.4 per cent growth year on year over this period, compared with 6.3 per cent for the rest of the All-Share index.

***“Being a great place to work clearly pays
in the long run.”***

Sunday Times March 24th 2002

chapter two

a business bottom line

Research on gender differences In managerial work indicates that female and male managers do not differ greatly in the competencies they possess. However, gender role stereotyping is pervasive, and women are less likely than men to be perceived by both male and female managers as displaying the characteristics of an effective manager.

The fact that women are consistently rated lower on leadership ability by managers has important implications since leadership is a common competency for managers. Criteria for leadership positions may be gender-biased if the more transformational leadership style of women is not valued as equal to the more transactional style of men.

IES Report for Equal Opportunities Commission (1997)

A business bottom line issue

– drawing on only half the talent pool, and addressing only half the marketplace.

SET companies with few women employees are drawing on only half the talent pool and risk addressing only half the marketplace.

Companies which fail to retain women employees are incurring significant losses in terms of recruitment and training costs. Money is wasted unnecessarily, with new employees underperforming whilst on a learning curve as well as eroding the intellectual capital and corporate knowledge base. The links between company perception and performance are becoming increasingly well-established.

Retain staff, reduce costs

It is not just that women are not drawn to working in SET jobs, but that often when they get there, they find their capabilities underused and become frustrated by the lack of challenge; ultimately they leave.

Underestimating the work that women can and want to do is a common mistake made by managers whose preconceptions about so-called male and female skills may be unfounded or misplaced.

US research in the 1980s involved sending closely-matched CVs, academic papers, theses etc to academic

34

appointment committees, with male and female names randomly assigned.

When a woman's name was associated with the paperwork the committees consistently assessed it as of lower worth, recommending appointments to lower level posts or ascribing lower grades to the work.

Summary

This chapter highlights some of the growing body of evidence supporting the need for measures that make working life not just better for women with children, but better for everyone, for women without children, for men and importantly for employers. Whatever the sector drivers (excellence, profit, competitiveness, performance),

it is increasingly important to have the whole of the talent pool to choose from.

If we are to increase the attractiveness of SET environments to women, to reduce the number of women who leave their chosen SET career, and to ensure that after a career break women want to return, then it is important that we tackle the issue by addressing the workplace culture in the public and private sector.

We set out to examine, at different career stages, where the problems lay, and what mechanisms could be put in place. Discussion groups were held with a diverse range of people and organisations that covered the public and private sectors as well as intermediary organisations that included trade unions, professional societies and sector based trade bodies.

“And inevitably because the management of the industry has been predominantly white and male and Anglo-Saxon, those people have recruited and promoted in their own image.

“...this is a real strategic business issue – not just personal belief – we have to apply a business approach...”

**Lord Browne, BP,
June 2002**

chapter three

the SET career

This chapter examines the SET career pathway model and identifies the pressure points that cause the attrition or lack of advancement of women.

Women are the single biggest, most undervalued and underused human resource

1993 Government White Paper, *Realising Our Potential*

A series of case studies of women in SET are presented alongside information and data from the UK, Europe and USA.

More detailed data and statistics are available in Appendix A3 and on the DTI *Promoting SET for Women* website. The slow progress in attracting women with an appropriate level of education into a SET career is based on

- continued lack of information
- few visible role models and mentors
- pedagogy of science and technology
- little hands on experience

coupled with stereotyping of careers advice and lack of knowledge and experience for girls and young women in non-traditional areas of work.

Research undertaken for the Equal Opportunities Commission, Rolfe (1999) and Skelton and Hall (2001), Matthews (2001), *Women and Manual Trades*, published by the DTI in the conference report *Jasmine wants to be a Joiner* (2001) as well as the DTI for the *Go For It!* poster campaign (published as the *Get With It* report in 2001) shows that efforts must be made. Training and an information resource to teachers and careers advisors, and perhaps to develop a specialist careers advisory service in SET consistent with one of the recommendations of the Roberts Report are needed.

Scientists' and engineers' skill development and employment follows a well-defined path, represented in **Figure 4**. The route to employment, and ultimately to remaining attached to the labour force, differs from professions such as law and medicine because there

36

is no formal requirement for registration to practise.

The careers of women in science and engineering have often been compared to a leaky pipe: at each level of seniority, fewer women than men make it to the next level.

Education

More SET-qualified women

Girls are continuing to gain a higher level of scientific literacy at GCSE and A level than ever in terms of both percentage and number. Significant steps have been made, particularly in A level Chemistry, **Figure 5**, where they are now achieving 50 per cent of A–E passes. In physics the proportion achieving A–E grade passes remains around 20 per cent, with the numbers of boys achieving A–E grade falling by 1.6 per cent over the last five years.

The importance of physics in a range of work areas makes this an area for concern that was addressed by the Roberts Report and the recent conference held by the International Union of Pure

and Applied Physics (IUPAP).

This body sponsors all the major physics conferences and ran the first international conference on Women in Physics, in Paris in March 2002.

Over the past 20 years the number and percentage of women gaining degrees in biology and chemistry has increased steadily, but in 2001 the data suggests there has been a worrying end to this trend that needs to be closely monitored. However the trend for men has been a steady fall over the last five years in all science and engineering subjects. This underlies the concern in the Roberts Report about the supply of scientists and engineers for the future.

In 1996 12 per cent of 6040 higher degrees (masters and doctorates) in engineering were achieved by women compared to 16 per cent of 6570 in 2000. This is discipline-dependent: in electrical and electronic engineering the proportion undertaking higher degrees has increased to 18 per cent and 16 per cent respectively.

chapter three

the SET career

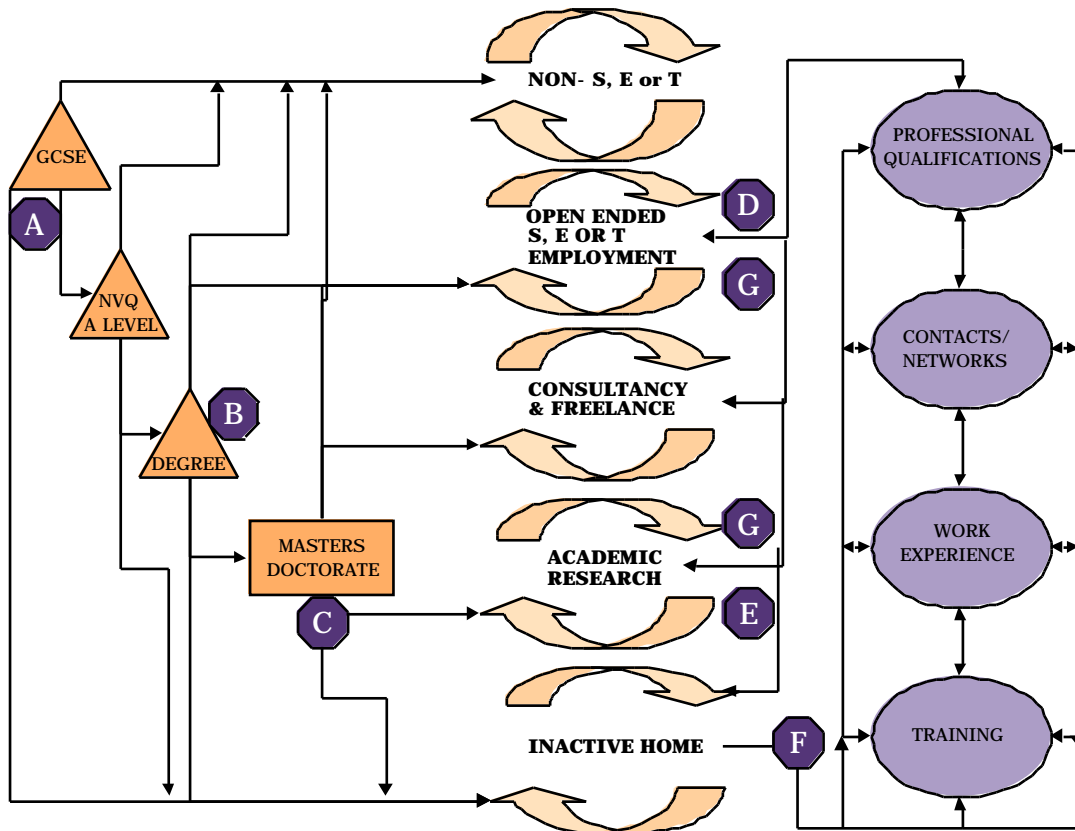


Figure 4
Flow chart showing typical training and work pathways in science, engineering and technology with identified barriers A to E for the early to mid career woman

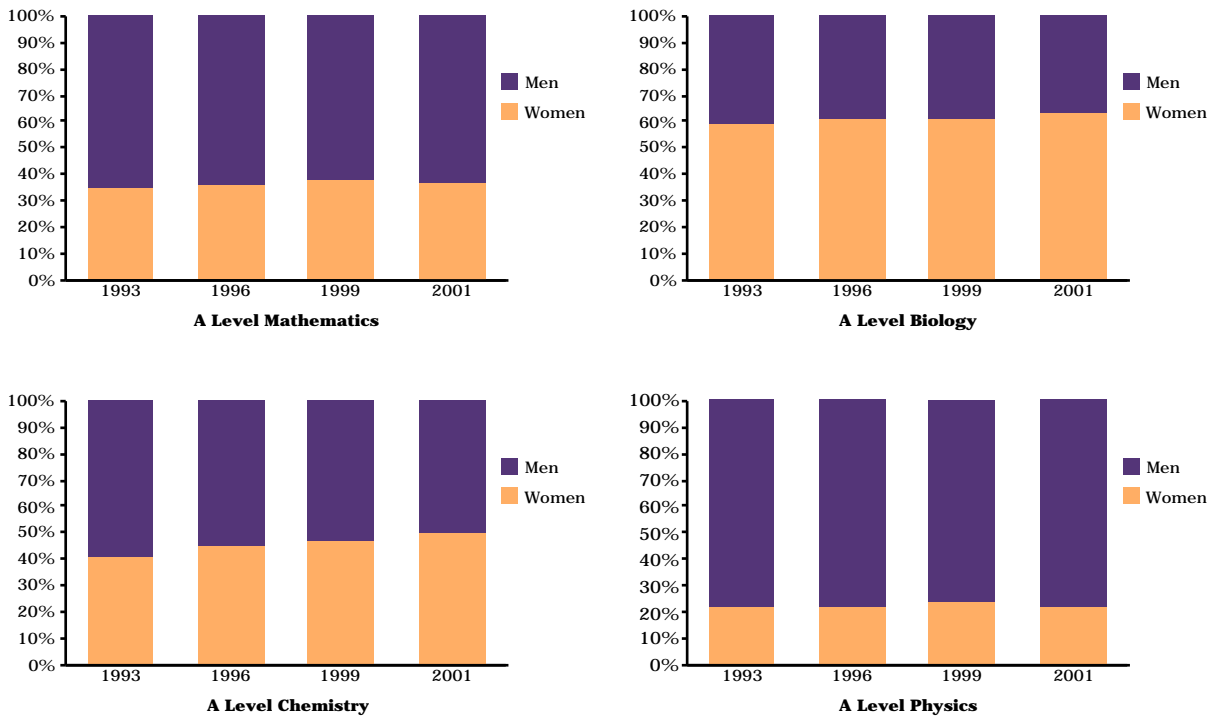


Figure 5
Trends in A-E grades at A level in various scientific subjects in England (source: DFES)

In 2000 29 per cent of post-graduate qualifications in computer science were awarded to women (a higher proportion than at first degree level) compared to 22 per cent in 1997. The number of women achieving a PhD in chemistry and biosciences has increased steadily over the years 1995 to 2000. The most significant change is in engineering and technology, where there has been a large increase in numbers of men and women, and the proportion of women has almost doubled, **Figure 6**.

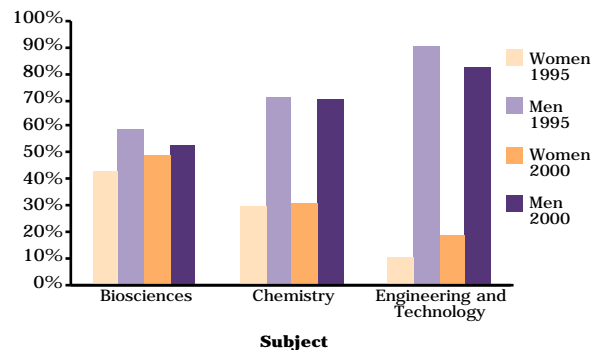


Figure 6
Changes in the percentage of PhD qualifiers from 1995 to 2000. (Percentages are plotted as the numbers are significantly different between disciplines).
Source: HESA
Detailed data is available in Appendix A3.

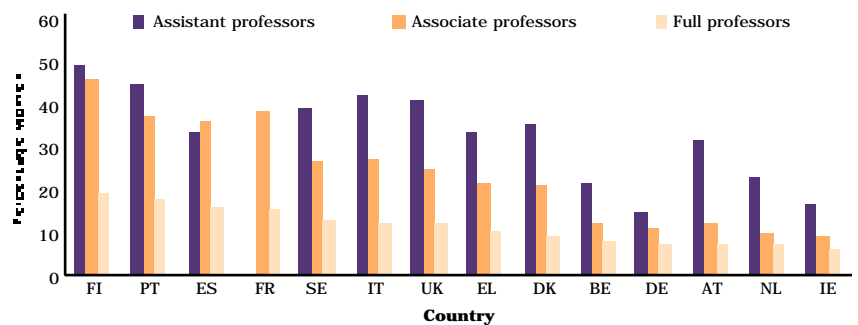
Figures from the USA

The trends in the USA are similar to the UK. There are increasing numbers of women entering higher education and gaining SET degrees. There is also a gender pay gap. The most recent published data in the USA is up to 1997, but the Committee on Equality in Science and Engineering is about to publish its biennial report on the status of women and ethnic minority women in science and technology that will have data up to 1999. The data from the National Science Foundation can be found on their website

country	Category of professors		
	Full professors	Associate professors	Assistant professors
BE	7.2	11.1	20.7
DK	8.2	20.3	34.4
DE	6.3	10.2	14.2
FI	9.9	21.0	32.2
ES	14.9	35.1	32.7
FR	14.5	37.7	
IE	5.1	8.2	15.9
IT	11.6	26.4	41.3
LU	-	-	-
NL	5.9	8.8	22.1
AT	6.2	11.2	30.8
PT	17.0	38.0	44.0
FI	18.3	44.9	47.5
SE	11.9	25.4	37.8
UK	11.6	24.0	40.0

Figure 7
Women & Science
Percentage of professors who are women by level of seniority (head count)
EU-15, 1999

Exceptions to the reference year:
EL, PT: 1997; ES, IE, AT: 1998;
Estimations from FTE data: NL
Source of data ETAN report: PT



www.nsf.gov/sbe/srs/
www.nsf00327/access/figlist.htm

The pressure points that need to be addressed to draw more young women towards a rewarding SET career are summarised in **Table 1**. These are included for completeness and to support the need for

chapter three

the SET career

joined up and sustained efforts by all those who are working with schools. Evidence shows that integrated programmes that include hands-on, role models and mentoring, along with high profile and appropriate marketing (i.e. modern and using an advertising-led approach) are most effective. A good example is the work in Canada at

Ottawa University's electronic engineering department and e-skills-UK's work on the image of the IT profession: working with popular DJs and girls' magazines to excite and appeal to girls through a range of activities including an exciting programme of computer clubs. The IBM EXITE programme brings together summer schools and mentoring.

Table 1

Pressure points that need to be addressed to engage girls in SET

Qualification/ experience level	Factors exacerbating attrition
Post compulsory i.e. post GCSE, A level and NVQ	<ul style="list-style-type: none"> ● Stereotyping by teachers, parents and friends and stereotypical careers advice ● Lack of visibility of women scientists/engineers and low contact with role models reinforced by low media presence of women. ● Peer pressure and the lack of linkage between science, engineering and technical jobs seen as being of benefit to society (girls rank this highly when considering careers) ● Antipathy toward science and technology in general
University/college – SET/technical qualification	<ul style="list-style-type: none"> ● Low self-confidence and low skills awareness ● Pedagogy and gender bias in examples used in class ● Few role models in lecturing staff ● Modifying behaviour to “fit in” with male expectations ● Work experience can be off-putting
Late Starters*	<ul style="list-style-type: none"> ● Limited access to funding and lack of knowledge about options ● Low availability and high cost of childcare (UK is one of the worst in Europe) ● Ageism and stereotyping limit choices

* A late starter is defined as someone who does not embark on the career path straight from school, but perhaps has a family early or tries a different career first



Summary of SET education

Overall we have seen an increase in the number of women undertaking SET study and training as well as an improvement in the gender balance on all courses.

Additionally more women are now undertaking higher degrees in a greater proportion than taking undergraduate study, although this should be measured against a significant increase in the numbers of women undertaking post-16 study and declining numbers of men studying science and engineering.

Women's scientific employment

Data on women's UK scientific employment are available from an analysis of the UK Labour Force Survey presented in the DTI *Maximising Returns* report (2002). But it is not possible to drill down into the data to look at specific sectors or at private sector research because the numbers of women are too low. And whilst data exists in abundance for the higher education sector through the Higher Education Statistics

Agency (HESA), and for public sector research, very little information is available about women's employment in the private sector research as the gender variable is not collected during the UK Business R&D survey. Nor is it statistically sound to subtract higher education data (from HESA) from LFS data. Further information might be available pending the outputs of the National Statistics pilot study of this year's Business R&D survey in which it is being tested whether it is feasible to collect a gender variable. If it is feasible the next survey will not be carried out until 2004.

The European Commission Women in Science Unit in 2002 embarked on a new study to investigate the participation of women in research in the private sector across Europe. Individual large employers have undertaken internal studies and one sectoral survey has been undertaken by a collection of pharmaceutical companies. However the data is not in the public domain. The only other source of significant employment data is collected

chapter three

the SET career

CASE STUDY:

National Science Foundation of the USA

“All NSF’s research and education programs must be directly involved in broadening participation. Hence, NSF will promote diversity by embedding it throughout the investment portfolio.

“The outcomes of NSF’s sustained investment in research, education, training and human resource programs will be...a more inclusive and globally engaged SMET enterprise that fully reflects the strength of America’s diverse population.”

The NSF has been working to address the challenges faced by equal opportunities for a considerable period of time. The Committee on Equal Opportunities in Science and Engineering (COESE), based within the Office of the Director, was established in 1980 by Congress to encourage the participation of under-

represented groups in SMET [science, maths, engineering and technology] fields. It is a congressionally mandated advisory committee to the NSF. Its role is to provide advice to the Foundation concerning the implementation of equal opportunities in science and engineering and to advise on policies and activities to encourage the full participation of women, minorities and other groups currently under-represented in scientific, engineering and professional fields. Committee membership consists of eminent scientists and engineers from academia and the private sector. The Committee recommendations are based upon increasing opportunities for women, minorities and persons with disabilities to help eliminate the shortage of scientific and technical workers. COESE reports to the President biennially. The Education and Human Resources Directorate (EHR) supports education and

42

training activities at every level, informal education, research on teaching and learning, human resource development, and development of research capabilities. EHR is the focal point for NSF efforts to promote diversity. (FY 2001 Request: \$729.01 million). Additionally there are a number of programs that exist in the science programmes directorates, for example the Geosciences Directorate has a diversity strategy.

A series of measures have been implemented across NSF to work towards parity in the workforce. The tools used to increase the participation of women and other minorities in SET are:

Professional Opportunities for Women in Research and Education (POWRE) program announced in 1997 to achieve professional growth, role models in SET among disabled, ethnic groups and those with a career break. The aim was to develop scholarship and leadership among women in SET. POWRE grants lasted from between 12 and 18 months and ranged

from \$13,000 to \$150,000 each. This program closed down a year before the new ADVANCE program was brought in, and has been incorporated into the new program.

The ADVANCE program provides awards for both women and organisations and includes: Fellows awards, Institutional Transformation awards and Leadership awards. Through these awards NSF seeks to improve the climate for women in academic leadership and to facilitate women's advancement to the highest ranks of leadership.

www.nsf.gov/home/crssprgm/advance

An example of one of the ADVANCE program awardees is the University of Washington that offers the Transitional Support Program for faculty members dealing with difficult life changes and the visiting scholars program.

The Program for Gender equity in Science, Technology and Engineering and mathematics (PGE) is dedicated to changing factors that have discouraged the

chapter three

the SET career

Pfizer undertook a study in UK R&D of their women technical staff in 1992 and repeated it in 2002. They have used the information to help evolve their human resource strategy and to ensure that they are not biased against any group of people.

early and continuing interest in STEM, and to developing further interest, knowledge and involvement of girls and women in these fields. It will affect this change in education, academic and professional climates through increased awareness of the interests, needs and capabilities of girls and women; promoting

instructional materials and teaching methods for increasing interest, retention and achievement in STEM disciplines and increasing availability of student enrichment resources including mentoring.
www.ehr.nsf.gov/EGR/HRD/pge.asp

by MORI for the Engineering and Marine Training Authority (EMTA). Useful as this is, it is not a compulsory survey and returns are not high.

Women's employment in SET-related jobs has increased by nearly 30 per cent between 1992 and 2000 – from 50,000 to 65,000. Men's employment in SET-related jobs has increased from 344,000 to 404,000 (17 per cent) over the same period.

Stage one: first steps on the ladder

The statistics and quantitative data in *Maximising Returns* show that only 33 per cent of SET-qualified women choose to work in a related job, the others choose a diverse range

of careers that include finance and management accounting as well as marketing and sales in non-technical disciplines. Those who do pursue a SET career often find that there are invisible pressure points – issues that seem to make progression tough although they don't initially manifest themselves as important issues. The pressure points that are encountered that discourage, or make it uncomfortable, for women to enter or stay in science, engineering or technology are summarised in **Table 2**.

Morley (1999 and 2002 in the ATHENA conference report on new research on women,

chapter three

the SET career

After a degree in electronic engineering (first female student at both technical college and then university) Tessa joined a major electronics company as a design engineer. She worked with an international team of world-class engineers.

“I didn’t know it was possible for work to be so exciting,” she says.

After her second son she found it difficult to return to work at the level she wished so undertook a European Union-funded course, *Professional Updating for Women*, which was excellent, and helped her change direction into European semi-conductor sourcing.

“I loved the work but my family responsibilities were seen as a distraction from working long hours, and yet I was better qualified than all of them.”

Eventually she decided to move on and now works in a related field but away from the applied work she loved.

“It is never too late to do anything,” she maintains, but is keen to see companies practice what they preach and for middle managers to take seriously the issue of work-life balance.

science and higher education) outlines how gendered power gets relayed in a range of informal practices including rumour, gossip, sarcasm, humour, denial, throw-away remarks and alliance-building. The gender hierarchy becomes encoded in the organisational culture as images, metaphors, artefacts, beliefs, values, norms, rituals, language, legends, myths and other symbolic gestures.

Isolated, these nebulous encounters are difficult to recognise or do anything about, and they sound trivial to a third party; they are nevertheless a form of bullying and harassment, and whilst some women ignore or do not notice them, for others they are wearing and offensive.

Women in SET also find the issues prevalent across UK employment such as work-life balance, lack of childcare and attitudes towards familial responsibilities are reinforced by the pay gap and are felt more acutely in SET employment because of the low numbers of women and the sense of isolation that often does not manifest itself until their early thirties.

Most often women do not complain of overt discrimination, but of having to work harder, to convince and persuade their managers that they want and need more responsibility which they see being given automatically to their male colleagues. They are having to work against the perceptions of what women want and what women can do. Women in SET enjoy their work and want to contribute to success and do well.

45

chapter three

the SET career

Case Study

After a chemistry degree at Swansea, Jane started work with a major agrochemical company as an analytical chemist working on evaluating pesticides, on the graduate entry scheme.

The work place was young, vibrant and good fun, with plenty of women at junior grades – but with hindsight, only a few women in senior positions. Nine years and various field studies later, she became team leader, managing several scientists. Her area of expertise and interest was different from that of her line manager (male) who delegated well to her. She feels she benefited from early responsibility. Eighteen months later, she took a year’s maternity leave and returned to work two and a half days a week, to work beside another team leader with a small number of competent staff to manage. This worked well.

After her second maternity leave – another year – she returned for 10 hours a week for two years. The family moved when her husband’s job did, and now after four years’ break from work, she is happy as a teacher’s assistant in a primary school. She will consider teaching, when she has time to train; going back to science is not an option as she doesn’t want to go back to the bench and there are few science employers where she now lives.

Table 2
Pressure Points felt during the early career stages

Qualification/Experience level	Factors exacerbating attrition
Further study – post PhD i.e. post doc level	<ul style="list-style-type: none"> ●Lack of transparency of appointments process ●Large per cent male PhD supervisors with tendency to “protect” women ●Lack of understanding how higher education system works
Employment in industry	<ul style="list-style-type: none"> ●Lack of access to networks ●Few role models ●Low confidence
Generic	<ul style="list-style-type: none"> ●Sexual harassment/bullying/continual teasing – often subtle and even unintentional ●Lack of empathetic people to talk to-mentoring needed ●Gender imbalance begins to assert itself if not already encountered resulting in lack of access to networks and “clubs”. ●Lack of training and Continuing Professional Development (CPD) ●Ancillary skills development needed ●Gender pay gap

46

Tackling research careers in academia

The academic career path is clear for only a few. A number of uncertainties differentiate employment in this area from the private or public sector research establishments: people in relatively senior positions are employed on short term contracts and only remain in paid employment in academic research by continuing to undertake a competitive application process. This affects the whole career path for research scientists and there has been much discussion on the subject of late. The EU Fixed Term Directive that came into effect on 1 July 2002 may go some way to improving the retention of women.

The academic research-based career is predicated around publishing in refereed journals and raising one's profile at key conferences, leaving little time for gaining broader management knowledge and skills that can add value to the professional skill-set of the scientist or engineer.

A study funded by the Wellcome Trust and the Research Councils *Who applies*

for research funding? was published in 2000 as an independent report and has been followed up by a number of measures and new fellowships.

A workshop held by The Wellcome Trust in 2001 explored career issues in academic research and published a report, *Radical Thinking, Creative Solutions*.

The Government and UK funding bodies are currently considering the recommendations in the report by Sir Gareth Roberts. The outcome of the 2002 Spending Review is awaited before any key announcements are made. The Equality Challenge Unit was set up in 2001 to address equality issues across higher education employment.

Academia is acknowledged to have a poor track record in terms of human resource management, offering few training options, and the English Higher Education Funding Council now requires all institutions to have a HR policy and implementation strategy. The Scottish Funding Council (SHEFC) is also taking some initiatives.

chapter three

the SET career

SET Women in Academia

The issue of the academic career path for women in SET research is particularly acute. Despite a few annual fellowships from the Daphne Jackson Trust, The Wellcome Trust and The Royal Society, that offer flexibility and mobility (the cornerstone for promotion), the publication record is heavily compromised by a career break or a more senior partner relocating to a new institution.

Evidence of gender bias in the peer review process in Sweden forced the UK research establishment to undertake a quick assessment of UK practices. No evidence of gender bias was found, but fewer women than expected applied for research funding and, importantly, for lower amounts than their male counterparts. This was followed by a study into why fewer women applied for research money and has spawned fellowships, workshops and debate (Blake and La Valle 2000).

The ATHENA project has developed a good practice manual over its three-year lifespan. The challenge is now to embed that good practice into every higher education and research institutions.

Key issues for the early SET career

Short term contracts

Short-term contracts make it difficult for women to sustain a career and manage a family. The EU Fixed-term Directive will have some impact on this profile. In contrast there are few short-term contracts in industry and where they exist, people are paid consultancy rates.

Age of first permanent appointment

In academia the age at which a post graduate moves into their first permanent position is likely to be the late twenties or early thirties, a time when they are also thinking of starting a family; this stage of life can be especially disruptive for women. There also appears

48

to be a lack of transparency in these appointments, which tend to be driven by the need to fill a research post quickly. In industry the first permanent post is often 21 or earlier.⁶

Part-time working

Large employers in industry and public sector research establishments have embraced part-time working as a means of helping staff manage family responsibilities and workplace attachment. In contrast there are few research or teaching posts in higher education for part-time workers and reports from the few that do it of a lack of respect and perceived low commitment.

Student debt

The difference in salaries between industry and academia and the late age of first appointment has an impact on students, who graduate with significant debt levels. More frequently golden hellos are being reported in the private sector. The academic

research community cannot compete and hence loses high-calibre researchers.

Student debt is also likely to have a double impact on women who are more likely than men to become detached from the workplace for a period of time. Research by the Cabinet Office has shown that women's incomes over a lifetime suffer because of caring responsibilities and for "being female".

Double couples

The tendency for women to have a partner who is older (and hence likely to be more advanced in their career) and from the same or similar discipline means a woman is more likely to follow her partner to a new location, to the detriment of her own career.

Academic accreditation

Progress in SET research is defined by success in competitive funding and subsequent publication of work. The difficulty of becoming

Three years after graduation, engineers in 2001 earned an average £24,500, computer scientists £25,500 and those in ITEC earned an average £22,900. This compared with £20,250 among their peers.

Women employed within ITEC earned £21,999 and engineers earned £22,500 compared with £20,250 among their peers.

EC(UK) Register News
No. 4 – 2002 graduate
survey
[www.engc.org.uk/
register_news/april](http://www.engc.org.uk/register_news/april)

⁶ This will provide protection for workers such as researchers employed on fixed-term contracts. Universities will only be allowed to employ staff on fixed-term contracts for a maximum of four years, unless they can demonstrate strong grounds for continuing to use this form of employment contract.

chapter three

the SET career

eligible to apply for funding seems to hold women back and also impedes their career progress. The accreditation of research, largely delivered through analysis of publication rates and access to conferences and the subsequent networking, adds another barrier faced by women by allowing them less access to key figures in the community. By missing conferences and perhaps being less able to travel they are unable to build effective relationships with colleagues and important external organisations and people. Both of these accreditation criteria can conflict with part-time working or job-sharing.

Mobility for career development

Mobility is an important element of research training through experiencing different labs, different parts of a company and different sectors. Whilst early in the career this can be welcomed and exciting, later on it can be more difficult, especially for women with other responsibilities and working partners. Although since September 11th 2001 industry appears to be making much greater use of IT to keep in touch globally, the higher education system has yet to gain widespread access to this technology.

“There are no part-time jobs and no job share schemes. I have two young sons and am out of work, largely due to the cost of childcare. I fear my career is at an end, as I don't think I will be able to rejoin the full-time, long-hours culture.

I have been described as outstanding and a problem solver, but I feel I have been forced out of my profession because I am 20 years too early in wanting a family and a career.

I have had to listen to offensive jokes at industry dinners, been asked illegal personal questions at job interviews, seen the issue of women almost wilfully ignored by my professional institution, journal and employers, been talked about unpleasantly behind my back by my superiors when I first became pregnant, and read salary surveys which tell me women in my profession are routinely paid up to 35 per cent less than the men. A massive culture change needs to take place and there are many decent men who would be willing to participate. Few in positions of power even recognise that a problem exists.”

“The technicians used to tease me incessantly, good humouredly, but after a while it got really tedious. The only way to get my jobs done for me was to smile and humour them. So I was determined to show them. I wouldn’t run off and have babies.

“I would use my PhD, and I have. They were nice guys really, just set in their ways:

“There’s no point letting you girls do PhDs – you only run off straight after and have babies’”

Web contribution

Key areas to tackle

There needs to be commitment to change at the top of the organisation and a full implementation plan with strong leadership and appropriate training involving addressing take-up of diversity and dignity at work among SET employers. Additionally, further progress will be seen through:

- take up of membership of professional bodies by women
- funding for late entrants in the form of post 25-year-old training packages, funding for returners with industry or other appropriate work experience
- mentoring programmes
- SET career path re-evaluation
- raising the profile of the contribution of women to the organisation.

chapter three

the SET career

Stage two: mid-career

Women in the middle stages of their career are likely to have to juggle the decision of whether to have a family or not and when they have one, to balance work and their external responsibilities.

It is at this stage of career that being connected to the right networks and developing an understanding of how an organisation works and where decisions are made is vital to progression.

The key pressure points during this phase are summarised in **Table 3** and at **Figure 4**.

Despite the perceived progress which undoubtedly has been made, particularly in senior management, recent research by Singh (2001) shows that there is gender stereotyping in the attitudes towards women.

Despite the existence of good systems and a commitment to change at the top of some organisations, breaking through to the ranks of middle management is proving hard, as one respondent who works for an organisation committed to diversity explains below.

Ruth works as a sales manager in a large IT company with a commitment to change and diversity; her career has always been in IT sales and sales management.

Her family did not affect her career in any way, but one company admitted that if she had told them at the interview that she had a child they would not have given her the job.

She says she has not experienced any harassment at work at all but her career rise is now hampered by some obstacles she has encountered. She doesn't enjoy working in a macho environment with no respect for work-life balance; she resents the assumption that she is not tough enough; and feels that she has to prove herself repeatedly, whereas male colleagues seem able to rise off the back of one success.

52

Table 3

Pressure points felt during the mid career stage

Qualification/ experience/level	Factors exacerbating attrition
1 Moving up the research ladder	<ul style="list-style-type: none"> ●Coffee time/lunch time banter and talk and end of the day discussions at work or at the pub, when women often have other responsibilities, can lead to exclusion
2 Gaining management experience and knowledge of the broader business issues	<ul style="list-style-type: none"> ●Applying for research funds – lack of support ●Appointment panels with gender imbalance ●Short term contract prevalence; break in publication record ●Marginalisation of women and minority groups occurs systematically
1 Returning after a break	<ul style="list-style-type: none"> ●Location and mobility issues can make it difficult to re-enter ●Childcare cost and availability
2 Work-life balance	<ul style="list-style-type: none"> ●Lost contacts and low confidence can make approaching companies hard ●A skill and knowledge gap is likely to have formed in subject area as well as the need for IT skills to be updated and there are few training schemes targeted at the skilled scientist/engineer ●Few part-time jobs in SET and they hold low credibility. ●Perceived low commitment ●Low pay and often low value work

A number of other people who submitted inputs via the website and in discussion commented that they continually have to prove they are up to the job.

Other women have had to pluck up the courage to say, “that’s not what I want” to counter their manager’s assumptions of their needs as an engineer/scientist who happens to be a woman.

“I was the first female manager for the area and I’m pleased to say that I was shown nothing but respect & cooperation from the team.

“The days were long & demanding – 12 hours were the norm. I was also on call one week in every four.”

Christine, Biologist working as a middle manager for large water company

Key areas to tackle

In all organisations

Problem: stereotyping

Organisational awareness of the needs of the individual emerges as something that is necessary to effect cultural change.

Unintentional stereotyped views of people's aspirations and capabilities because of who or what they are need to be countered, to ensure that change becomes embedded all the way through the management structure.

Progress

This needs to be supported by training of all personnel. In addition to staff satisfaction surveys, for which many benchmarking tools exist (*Fit for the Future* (2002) and *Opportunity Now* (2001, 2002)) it is important that if an organisation is to become an employer of choice they should publicise their progress against the policies they have in place. Staff surveys at BP and Pfizer show that increasingly work-life balance is important for men as well as women.

In small to medium-sized enterprises (SMEs)

Problem: reluctance to accept part-time working

Many large private sector organisations and the public sector have strong diversity policies in place, but the higher education sector and SMEs are making slow progress. In particular there is a general reluctance about accepting part-time workers: it is either "too expensive" and "difficult to manage" as one SME reported when questioned for this study or as several respondents have stated, part-time work is not valued and the commitment of the post holder is regarded with suspicion.

Progress

There has also been discussion about whether it is possible to undertake research part-time. As several high-profile scientists have pointed out when this was put to them "how many research papers are single-authored? Science is truly collaborative".

Efforts are therefore needed to help smaller organisations understand the medium term impact of loss of staff through cultural pressures and to help them implement measures to address them.

In academia

In academia maternity terms and conditions for all researchers should be standardised across the UK and EU. The research career should be carefully examined and research grants should come with an attached percentage for recruitment costs to ensure transparency of appointment.

Importantly we should re-examine how laboratories work and consider the possibility of creating a full-time research manager post, mentioned in the DTI report *Maximising Returns* (2002), but also building on the model that used to exist within public sector research laboratories.

The lack of progress of women and the low take-up of good HR practice should be examined thoroughly. If progress is not seen by 2003 stronger action that links funding for facilities and research to good HR practice should be made.

***“I have to
prove myself
constantly.
It’s
exhausting!”***

**Woman middle
manager Engineering**

Julia is working as a research fellow in pharmacology at major research university on a five-year contract.

She finished her PhD in pharmacology and biochemistry at 22 and was a serious career scientist, not having her first child till she was 35. She loved her work, enjoying learning and its creativity, and feels privileged to be working in the field. However when she suggested that she work part-time she met a lot of resistance.

“I was a very serious career scientist, and I have been sidelined because I had a family. As academic jobs are based on publications not on teaching ability, I have not been short listed for lecturing jobs for which I was told I was a very good candidate. I haven’t published enough, of course, and after two lots of maternity leave you can’t remain high-profile.

“If I had my time again, I would make sure that I was part of a bigger group, ideally headed by someone sympathetic to my situation. I would then be able to co-apply for project grants and co-supervise PhD students. I think the University needs to have dedicated mentors and appraisers for women working part-time who could advise them through a potentially tricky part of their career.”

55

chapter three

the SET career

Problem: the shortage of skilled women

Progress

Women need to be made aware of the need to gain experience of management and organisational strategy and encouraged and offered the opportunity to do so, for example, through

membership of and active participation in professional societies and in employer management planning committees. We also need to widen the pool of talented women with the right management experience to accede to high levels. When

Felicity studied electronics and acoustics at university, the only place that did this subject when she applied. A high achiever at school, she graduated with a First, and has worked in television ever since – she is now 31, without a family, but with a “salvaged” relationship.

Her first experience at a major TV company was not quite what she expected:

“I arrived with a first class degree and a good track record, but my boss gave me coordination and documentation to do, traditionally something women are perceived to be good at, instead of very technical projects. I stuck to it for a while, and then got up

the confidence to ask for a change.”

Her career has moved forward in leaps and bounds as a result:

“It’s a demanding, challenging field and fairly well paid too. It ought to be open to men and women with ability. In an area where women are in such a minority we have to work and be imaginative to make it really open.”

Working now at the BBC where women make up seven per cent of engineers, she praises the corporation: she feels that it has ideals about the encouragement and support of diversity and about valuing people, and is working towards them. It is aware of its responsibilities, she says.

56

*“The higher up you go,
the more macho it gets”*

looking for key individuals for committees and review panels we should not underestimate the wisdom and sense that younger people can bring to the discussion. This is an important training tool.

Problem: measuring and monitoring success and communicating appreciation

The benchmark of success should reflect an organisation’s priorities. For example in academia we measure success on publication, not on core skills or competencies such as teaching, management or administrative duties.

Progress

If key activities such as student welfare accord a bonus, or are seen to be core skills, men might gravitate towards these tasks as well as women. The take-up of gender issues within total quality procedures and in reporting and reward mechanisms through greater uptake of Investors in People for example is extremely important for success.

Our challenge is not getting women accepted in the field but avoiding stereotypes – you are a woman, therefore in a multi-disciplinary implementation team, you must be the nurse or the junior member. We have a number of young women coming through, but in very specialised areas – whether they will achieve any of the emerging senior generic health informatics posts that are being created now or not is yet to be seen; they are very competent to fill them at the appropriate time.

Senior woman in health informatics

57

chapter three

the SET career

“You don’t need a white coat, your own Bunsen burner or even a beard to be a scientist”

Julia Goodfellow,
Chief Executive,
Biotechnology and
Biological Sciences
Research Council,
The Guardian, May
2002

Stage three: senior women in science and engineering

The glass ceiling

Many women who have made it to the top have had supportive bosses or simply breezed past potential career blockages, totally focused on where they were going.

The glass ceiling is so called because it is a transparent but nevertheless real barrier caused by systems and processes, the societal constraints and stereotyping experienced by women.

The discussion groups felt that the pressure points that were likely to hold back a woman from senior positions were common for industry and academia, (if in academia the woman had managed to navigate the short-term contract situation) as evidenced

One male participant in one of the discussion groups commented:

“I have never seen any signs of this glass ceiling. I don’t believe there is such a thing.”

by the attendees at the various panel discussions.

The key pressure points are summarised in **Table 4**.

There have been some significant high-level appointments of women in the world of academia since the beginning of 2002 that include the first Chief Executive for one of the UK Research Councils, two new women Vice-Chancellors, the appointment of the Dean of Science at Bath University and Head of Electronics and Computing and

Table 4
Pressure Points felt during the senior career stage

Qualification/ Experience/level

Senior positions

Factors exacerbating attrition

- Lack of contacts and networks
- Banter and unintended exclusionary remarks
- Patronage of the gentlemen’s club variety in meetings
- Lack of experience of broad areas of expertise covering resource and strategy issues

“Is it us who allow problems to arise? I went in with my eyes open, and did not expect special treatment, although I never wanted to be a pseudo-man either!”

Ellen is a Nigerian chemical engineer who, after working for companies such as ICI and the CWS (Cooperative Wholesale Society), runs her own consultancy, working with six medium-sized companies. She came to Britain with her now ex-husband, both already qualified with a first degree. They did their Masters at UMIST (she finished hers in a year) and while she was studying, she had her two children.

“I knew I wanted children, and I took a long hard look, a long way back, at what I wanted out of my career. It was clear that I had to have children before I started working so that I would be able to spend lots of time with them, so that when I was ready to work, I was ready to work. I didn’t want to do all this studying and then not be able to compete, nor did I want special treatment.”

She admits it wasn’t always easy, but would advise any women going into science and technology to think long and hard about what they want out of it and what they are going to put in. Having made her decisions early “it gave me an edge, in terms of confidence, and allowed me to be flexible.”

She enjoys her subject, enjoys interacting with people, and the opportunity to use all her skills – her consultancy allows her to combine the science and the people and make a genuine impact on the workplace.

of Physics at Southampton University. And a number of professional Institutions have appointed their first woman President: the Institution of Chemical Engineers and the Institute of Biology. The new Chief Executive of the Institute of Physics is also female. Several women scientists and

engineers were acknowledged in the 2002 Queen’s Birthday honours list. And yet in the recent Financial Times’ list of 50 most influential women, there were no scientists or engineers. In 2000 there was one female professor in civil engineering, three in electrical, electronic and computer engineering and

59

chapter three

the SET career

There is still very little awareness at MIT, or elsewhere, of the gendered nature of academic rules: how criteria of evaluation, timing expectations, conventions of authorship – to name but a few – help men more than women... Lasting equity requires rethinking these institutional rules, which evolved for a different demographic group, in order to ensure that they do not systematically disadvantage women, or men in dual career partnerships.

Despite this, the women faculty report a significant improvement on the status and report that they have been amazed by the progress and changes in their own professional lives as a result of the work described in the overview report.

**MIT Report on the Committees on the Status of Women Faculty,
March 2002**

four mechanical, aeronautical and production engineering professors compared to 790 men representing one per cent of the total.

Although the number of women professors in these disciplines has increased, so has the number of men. Despite 47 per cent of bioscience graduates being female in 1970 and rising to 60 per cent in 2000, only nine per cent have reached professorial status.

The low representation of women in senior positions in academia is common across the world with few, discipline-based exceptions such as physics in Italy and Portugal,

and IT in a number of European countries (DfES 2001).

The plots in **Figures 8 and 9** on page 64 illustrate the attrition at each stage. It is most striking in the biosciences, where at undergraduate level there are over 50 per cent women. This trend is the same across the European Union. In fact, in a review of the levels of women professors across a number of countries by Husu, in the Athena Report (2002), reproduced from Osborn (2000), of which an extract is reproduced in **Table 5** on page 53, few countries have broken the 10 per cent barrier. Cranfield University in 2001

60

Table 5: Women full professors across the world
Source: extracted from Osborn et al (2000)

Country	Year	Percentage of women among full professors
Turkey	1997	21.5
Finland	2000	20.0
Australia	1997	14.0
USA	1998	13.8
France	1998	13.8
Canada	1998	12.0
Sweden	1998	11.0
UK	1997	9.5
Germany	1998	5.9

published a report on female directors in the top 100 companies. In the top 10 companies, there were five SET companies and the percentage of women on the board ranged from 15 per cent to 25 per cent. Vinnicombe and Singh (2001) discuss the perceptions of forthright behaviour of men and women and how a woman is described as being aggressive whereas the same behaviour in a man is seen as a positive

attribute. The career success cycle, based on this research is based around personal strengths, visibility, mentor support, visibility, opportunities for challenge, visibility, higher tier support, and more visibility.

The role of the professional society

Membership of a professional body or society can be important in reinforcing the status of the scientist or engineer as a professional.

“If we want the best women to be part of leadership at every level we won’t succeed if we tolerate those tired old phrases: ‘I’m not sure it will be in her best interests to be promoted at the moment.’ ”

Lord Browne
June 2002

“I was an extremely shy and retiring young woman. I don’t understand how I took some of the risks I did – but I clearly knew what I wanted to do... I suffered the usual lack of confidence, but I had enough people around me in my career who said “yes, you can” and believed in me”.

Female engineering professor

chapter three

the SET career

Daphne is a senior woman who has never taken time off to be a full-time mother. She had her first child while working in a university and her second whilst at a policy research institute, and does not pretend that it was by any means easy juggling the demands of work and family.

She chose to work in academia rather than in industry or in a government institute because she hoped that that environment would allow her flexibility:

“If you really want to combine family and work, you have to have determination and be able to juggle your hours, and where you have to be when. This has been absolutely crucial. At a university you are judged by what you produce which is not very compatible with having children. It doesn’t make it easy, but it makes it possible.”

A meeting of professional societies and learned bodies, held during the consultation process, revealed common difficulties in translating high percentages of student membership into full membership and of low numbers of women who achieve fellow status.

Even at the Institute of Biology, women make up only six per cent of Fellows and the first woman President was appointed in 2002. There was agreement about the need for concerted effort and shared action.

Key recommendations from the meeting

- raising the profile of women at events through a national bursary scheme for women speakers

- specific training for skills development in influencing and negotiating
- enabling access to publications at low or no cost during career breaks
- further mentoring for students and members, perhaps tapping into the DTI-funded mentoring pilot scheme under way with the Women’s Engineering Society and the Association for Women in Science and Engineering.

Many societies would welcome support in tackling diversity issues and in understanding what needs to be done to attract more women members.

62

Preparing for leadership

Key leadership qualities

The Institute of Management has undertaken research to determine what makes a good leader, how leadership is perceived and experienced by those who follow and what qualities and skills are needed in a dynamic world.

The qualities perceived to be necessary for leadership are those that are admired in current leaders, namely knowledge and ambition.

These qualities seem to be most closely related to the qualities needed for promotion, particularly in large organisations. In the Institute's study, over two-thirds of respondents said that there was a mix of formal and informal training within their organisations.

If women in science and engineering are not well networked, have not made good links within their organisation or their ability and desire for promotion is under-estimated by their managers they will

find it difficult to move on.

The Institute recommends:

- systematic and consistent frameworks for reward and promotion and for developing leadership potential
- establishing a regular leadership audit using 360 degree appraisals at all levels
- introducing mentoring across a broad spectrum of organisations
- identifying opportunities for leadership outside the normal management framework that offer recognition and reward
- encouraging learning among leaders themselves
- recognising perpetual challenge of fairness and transparency in recruitment and promotion
- building training and development programmes to enable managers to apply new thinking to how they work and interact.

Best practice leadership

Ensure the organisation has a vision, mission and strategy that are known and understood

Oversee the setting of demanding but realistic targets

Set an example by generating an open, communicative management style

Champion a culture conducive to learning and continuous improvement

Distribute leadership responsibilities along with necessary authority, training and resources

Fit for the Future website

63

chapter three

the SET career

Figure 8

The higher – the fewer:

UK women in engineering and technology

Source: HESA

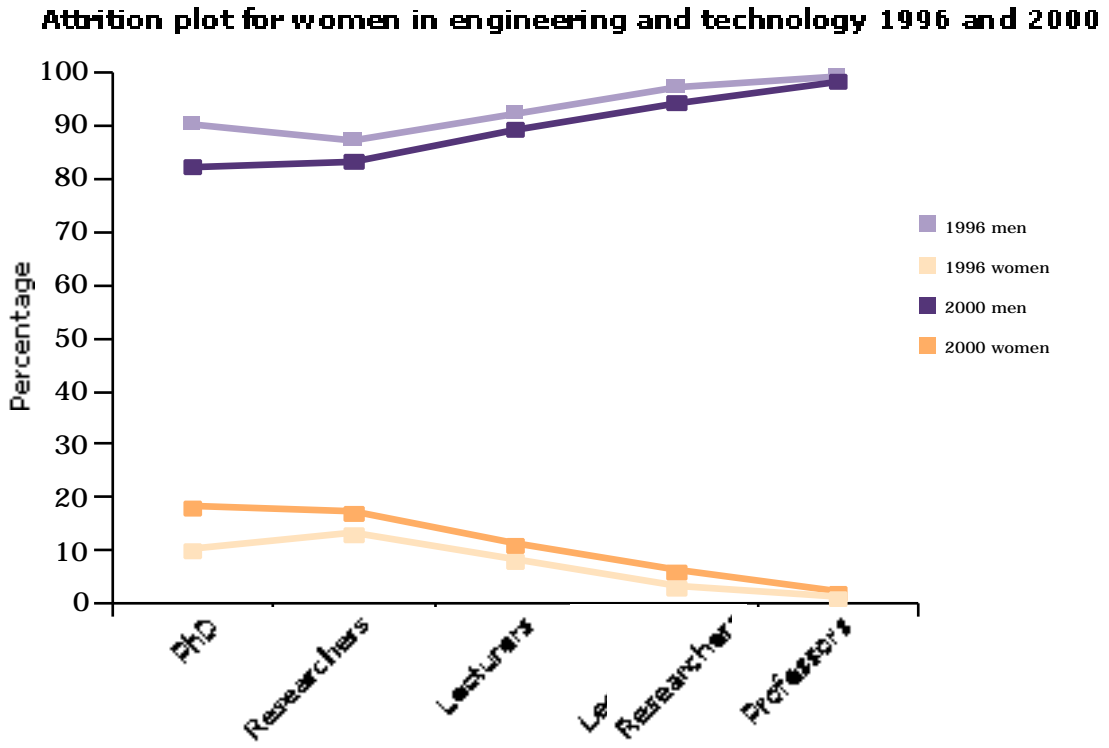


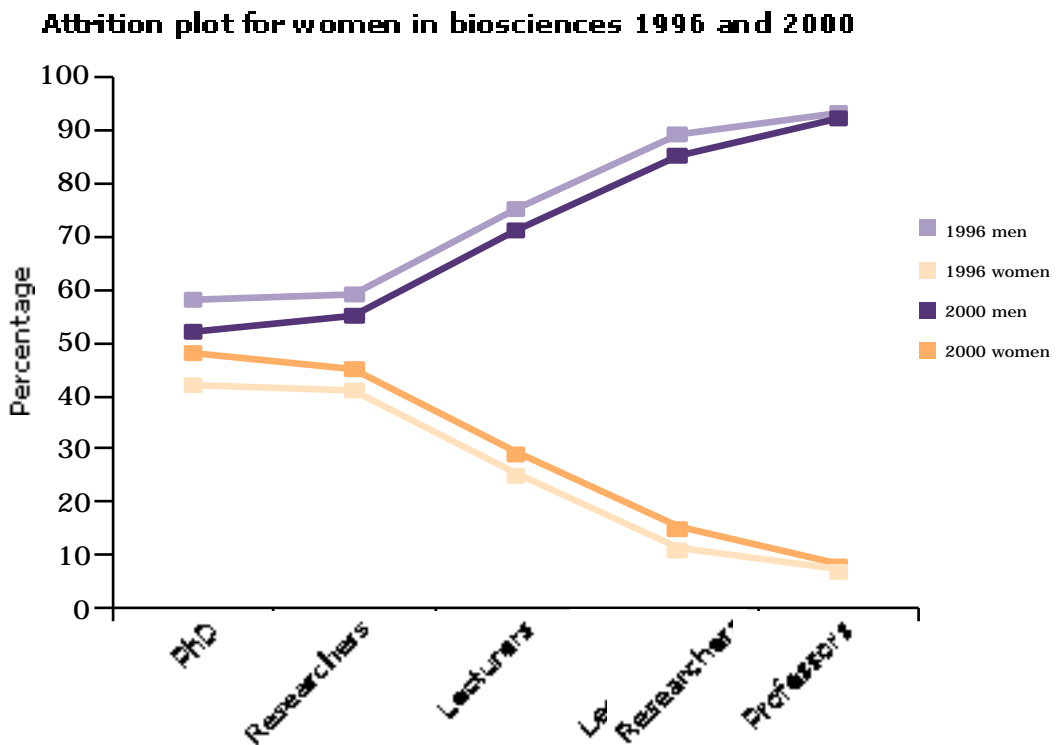
Figure 9

The higher – the fewer:

UK women in biosciences (excluding psychology)

Source: HESA

The above dataset excludes psychology as the high percentage of women in this discipline obscures important trends



Some women juggle a demanding career with a family, but others have decided to pursue a career instead.

Exclusionary comments still abound. One was reported by a senior women academic who happened to be the only female member of a senior international committee in April 2002:

“And [committee member] here will add some glamour to the discussion”

The chairman making introductions

A recent report by Catalyst (2002) on women in leadership shows that 52 per cent of women respondents do aspire to top leadership.

Key areas to tackle

Problem: gender balance on senior boards and committees

Progress

Government is making good progress and the Research Councils have worked towards a goal of 40 per cent by 2005. There is some way to go, but

the initially tough-looking target is within sight.

This practice needs to be promulgated through all funding body committees and the supply chain, and Government should take a lead by asking organisations they fund to have a gender-balanced management or advisory group or evidence that they are proactively working to effect one. Frequently all that is needed in these situations, to quote a senior figure during this consultation is a “bunch of people with good sense and some knowledge”. *The Fit For the Future Campaign* (sponsored by the DTI) board is composed of two women and 15 men.

In the case of some public bodies there are cases where review groups are brought together. It has been suggested by a number of respondents that there ought to be a requirement to bring younger, but nonetheless bright and “excellent” people to the discussion table in order to create a more diverse review team.

“It was very positive. I was able to talk and interact with someone who was friendly and can give advice and support...”

“It definitely helped my confidence. It was great to talk to someone.”

Imperial College student
who benefited from the
mentoring scheme

⁷ www.setwomenexperts.org.uk

chapter three

the SET career

“I have no time for silly comments where men try and undermine me.

“I dismiss them with a sweeping ‘oh come on boys’ or remark

‘thanks for the thought, now can we get on with the business?’”

Senior Director,
private sector

Appointment of senior women

Problem: headhunters’ gender bias

The appointment of senior people is often done through referral of contacts to headhunters. It is important that targets are set for headhunters to produce a diverse pool of candidates. It is too easy to say “there are none available”.

Progress

Headhunters must be required to provide evidence that they have tried their best to achieve a balanced recruitment pool. The SET Women Experts Database⁷ is a good starting point for locating senior women, but if it is to be used to its full potential it must be managed in a more sustainable manner than currently.

Data and information on women in small and medium-sized enterprises

Problem: change at the top does not always mean at the top of a multinational or a senior figure in policy making

It might refer to the managing director in an SME. Information on the numbers of women engaging in the exploitation of research outputs and in hi tech spin-out companies is needed. And should be monitored. If few women are taking the step to set up a company we need to understand what the blockages are and to work to help them navigate them. In particular in the biotech sector and construction there is a high number of small, privately-owned companies.

Progress

Women need to know about business start-up schemes. They should be more heavily marketed to women, with information about eligibility.

66

***This chapter considers
the toolkit available***

to challenge the status of women across SET, summarising actions from across Europe, the USA and Canada.

Many small-scale initiatives have been used across the world to change the proportion of women in science and engineering. There is no one country that can claim it has developed a simple answer to the issue of women in science and engineering. Significant strides have been made in Canada following the so-called Montreal Massacre⁸ in 1980, but the recent round of appointments of new professors has been disappointing.

Gender should be specifically considered in key government reports such as those by Roberts (2002) and Cassels (2002), rather than being left for a separate review.

The results of gender mainstreaming policies have yet to be evaluated, but to date there has been little evidence of this in UK government policies relating to SET. A summary of some of the key UK initiatives

to get women into SET can be found in Appendix A2.

The European Commission Women in Science Unit has developed a number of measures to stimulate Community-wide action including setting up the Helsinki Group, a trans-national network of civil servants from 30 European countries to network and share good practice. A benchmarking report summarising the key measures that have been adopted has recently been published (Rees 2002) and a synopsis of the key measures are presented in **Figure 10**.

The mandate of the Helsinki Group is to promote discussion and exchange experiences on measures and policies devised and implemented at local,

***The most successful
measures have been
those that are sustained,
part of a strategic plan
and hence integrated
into a series of other
measures, rather than
being stand-alone
special measures just
for women.***

⁸ The shooting of 14 women in the engineering school at the Ecole Polytechnique which led to the creation of the Canadian Committee on Women in Engineering (CCWE 1992)

chapter four

making the changes

regional, national and European level to encourage the participation of women in scientific careers and research. It is also charged with providing national sex-disaggregated statistics and developing gender-sensitive indicators in order to monitor the participation of women in European research.

There is considerable diversity among the [member] countries in terms of scientific infrastructure, equality measures and the climate for women pursuing scientific careers. Common factors include a lack of gender

balance in decision-making about science policy and among those who determine what constitutes good science.

Many countries have instituted positive action measures to support women in science. These include supporting networks of women in science, encouraging the development of role model and mentoring schemes and, in some cases, establishing targets and quotas. A few countries have experimented with earmarking academic chairs, research funds and prizes for girls and women in science.

Figure 10

Summary of measures being used across the European Union to tackle the under-representation of women

Legislation

Gender mainstreaming is the term for the systematic integration of gender equality into all policies and programmes, and into organisations and their cultures. Gender mainstreaming tools include legislation. A few countries have legislation to ensure gender balance on public bodies such as funding councils. Some also insist upon a gender balance on university and research institutes' academic and scientific committees.

Sex disaggregated statistics

Sex-disaggregated statistics are another gender mainstreaming tool. The national statistical profiles of Helsinki Group members are rich data sources on the position of women in science in all 30 countries. They show how sex-segregation is a feature of scientific careers in all the countries. The nearer the top of the academic hierarchy, the fewer the women. Indeed, universally, women are just a tiny minority of people in top scientific jobs. ▶

68

Research to understand institutional discrimination

Gender studies is an important research area to create a better understanding of the complexities and subtleties of direct but more particularly indirect and institutional discrimination.

Modernising human resource management processes

This is being developed through transparency in recruitment and promotion processes, awareness-raising and equality training, and the use of gender mainstreaming experts to advise on gender-proofing policies and practice.

Take the male-centredness out of science

A few countries identified gender-proofing the pedagogy of science education to address biases in how science is taught.

Implement work-life balance measures

Measures to facilitate a work/life balance are also crucial. While there is a wide recognition of this as an issue, progress on addressing it is patchy. Measures reported include good employment practices and programmes targeted at women returners to accommodate their re-entry to scientific careers after a period at home with childcare responsibilities.

Evaluate scientific research to ensure it considers the gender dimension

A project that ignores the gender dimension, where it is a legitimate variable upon which to focus attention, compromises its scientific rigour. Tools should be developed and used to evaluate and monitor positive action and gender main-streaming measures designed to promote gender equality in science and scientific careers.

Source: Rees (2002)

69

chapter four

making the changes

Key areas to tackle

The breadth of organisations that have been actively interested and involved in the discussions during the preparation of this report underlines the need for action.

A joined-up approach

For seven years there has been a unit within OST that has focused on stimulating action and developing good practice and there has been recent progress in developing projects and pilots that involve a broad range of organisations with formal collaborations. This work should be built upon and the infrastructure developed. The aim will be to increase the effectiveness of the small, independent voluntary and charitable organisations. They will thus be enabled to develop a joined-up approach, to gain gearing on their scarce resources and to offer a real service and resource to other organisations. They can act as focal points for good practice, to sustain effective programmes and to identify new areas for action through discussion with key partners.

An emerging suggestion from the working groups and web input has been for some form of non-governmental support infrastructure (ie the Working Science Centre) that builds on expertise, knowledge and resources (both person-based and financial) to deliver effective programmes.

Key functions envisaged

- 1.** Support and through information provision to the professional societies and employers
- 2.** Administrative support to the diverse groups managing the functional work of communication, websites, journals and other general information dissemination among active groups and development of stronger regional collaborations
- 3.** A central resource that can deliver projects and develop new proposals in partnership with the public and private sector.

70

Further details of the implications of such a body are presented in the recommendations.

Effective profile-raising and marketing

In addition there is a need for collaboration to ensure that good work from one organisation can spread across to others. An effective marketing campaign must be orchestrated that works with the Science Media Centre to increase the profile of women

scientists and technologists and increase the frequency with which they are quoted and featured in the media.

In addition efforts need to be made by the organisations that act as gatekeepers for the professions to develop continuing professional development and to ensure that women are both asked and able to deliver on high-profile speaking engagements at conferences and prestigious institutions globally.

conclusion

This report came about in answer to a request from the Secretary of State, who recognises that a real problem exists for women in SET careers.

The problem is not just a social and cultural one, although inequity should be addressed in all its forms, but also economic, and as such cannot be ignored. If Britain is to remain a nation with successful and developing businesses of all sizes, it *must* make the most of its workforce.

No longer can the – often unintentional – barriers that are put up along the career path of women in science, engineering and technology be left to stand.

Many women ignore them and plough on anyway, but it can be a lonely furrow, with the personal costs very high. This report highlights the most obvious obstacles and recommends specific ways of circumventing them. Clearly, these suggestions will carry a price tag. We have, however, left it to the staff of the DTI itself to cost out the different projects and to the politicians to allocate appropriate budgets.

Although there remains much to be done, it cannot all be swept away as a result of this one report, however well-founded and well-researched. But the process can begin, and so we make three main recommendations:

- 1 A Working Science Centre** to provide an infrastructure for women in SET, organisations, networks and initiatives. It will reduce duplication of activities, and act as a focus for the media, headhunters, government, industry and professional societies. It will be aimed at raising the profile and the numbers of SET women at all levels, and at ensuring sustainability of projects, by working with all stakeholders.

72

- 2 **A returners' scheme** along the lines of the EC's professional updating for women course, that could be linked to the sector skills councils or delivered through the Open University and University for Industry.
- 3 **Raising the status of diversity** by including gender on the existing R&D scoreboard, requiring formal reporting on the diversity measures adopted by SET employers.
- 4 **A part-time/ job-sharing incentive programme**, with advantages for employers (for example, tax breaks/funding) to help them deliver change. It is also targeted at encouraging more women to take up and return to careers in SET, interrupted (or likely to be) by external responsibilities.

The report takes a new approach, one which is positive, business-orientated, and above all practical. It does not blame, it encourages, and calls for the public and private sector to commit to getting the culture right in SET to foster a working environment in which diversity and equality thrive beside innovation and quality. Following the Roberts' publication, *SET for Success*, which deals with the supply of scientists and engineers in the UK, it addresses the issues preventing businesses and academia making the most of the skills, experience and talents of women in SET.

We hope that by proposing specific measures, however modest and incomplete, we will start to affect the national mindset, so that the greater yet less specific cultural and social problems of women in the scientific workplace will come more to the fore.

73

A1 *The current landscape*

Policy framework

In 1993 the Government White Paper, *Realising Our Potential*, highlighted the importance of SET for the country's economic growth, and recognised that women are the country's single biggest most undervalued and under-used human resource.

In 1994 *The Rising Tide* report presented 14 recommendations following an evaluation of the situation in the UK.

Subsequently the Promoting SET for Women Unit was set up in the Office of Science & Technology with the remit of orchestrating and facilitating action.

In September 1995 the fourth World Conference on Women was held in Beijing, China. 17,000 governmental and non-governmental participants represented a watershed in the move for equality.

The unanimous adoption of the Beijing declaration and *Platform for Action* by 189 countries, offered a comprehensive plan to enhance the social economic and political empowerment of women. A significant number of

recommendations and strategic objectives are relevant to women in SET specifically paragraphs: 69, 72, 75, 79, 82, 150, 175, 178, 181, 189, 190, 192, 195, 246, 249, 253 and 256.

The 1999 Hansard web debate on women and science concluded that women and SET were still a low policy priority and that little positive action was being taken to effect real change.

Excellence and Opportunity, the 2000 Science and Innovation White Paper, made a number of specific recommendations regarding women and their participation in SET:

- The initiation of a study of the numbers of women returning to SET after a career break and the barriers they face (published in January 2002 as *Maximising Returns*).
- A target to achieve 40 per cent [on average] membership on SET-related advisory bodies and boards by 2005.
- An international comparative study on women in information technology, electronics and communications



appendices

education and employment (published as *Careers and Courses in ITEC* in November 2001).

- Work experience taster days for 15–16 year old girls in non-traditional areas of work.

The number of girls and women taking up SET areas of study over the last 10 years has risen. However, even in disciplines such as biology where significantly more girls and women have chosen to follow courses (to the extent that they are now in the majority), this has not translated into many more women in senior positions. Data from 2001 shows a worrying halt to the steady progress in numbers.

This is reiterated by Osborn et al (2000) who find:

“a lack of women in top jobs in science throughout the EU to the point that:

under-representation of women threatens the goals of science in achieving excellence, as well as being wasteful and unjust.”

In January 2002, the DTI published the report from the Returners study, *Maximising Returns*. A summary of the data is presented in Appendix A2.

In addition the Labour Force Survey Analysis that was undertaken separately by Warwick University Institute for Employment Research was also published and will provide a useful benchmark on the employment of women in SET related occupations for graduates. At the launch of these reports the Secretary of State announced a new drive for a campaign with greater impact.

Equal pay

The 1970 Equal Pay Act gave women the legal right to be paid the same as men.

Despite this, the gap between average hourly earnings for men and women working full-time in the UK is 18 per cent. When you include part-time workers, this is the widest of any state in the European Union. There are complex reasons why the gap in earnings persists when women do as well or even better than men in terms of educational achievement. Issues such as sex discrimination in pay systems, a concentration of women in low-paid jobs, and the fact that women still take prime responsibility for childcare and



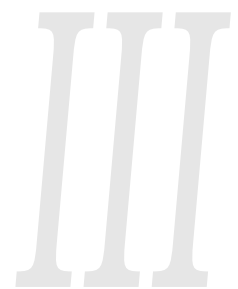
as such have badly-paid, part-time jobs all play a part.

Recent evidence shows the situation in SET sector is no different. The *Bett Report*, published in 1999, showed that an inequality exists in the pay of men and women employed within SET higher education and that, even at professorial level, women earn an average of six per cent less than men. Worryingly, a recent AUT report has shown that the pay gap has actually widened in the past five years. On average women academics earn 16 per cent less than men, up from 15 per cent in 1995. The figures are even worse for women in Scotland and Wales. This problem is an international one: both the ETAN report and the MIT study showed that women professors were systematically underpaid and had less laboratory space than their male colleagues. Women SET graduates are also more likely to be employed as lower-paid technicians than men, and more likely to be employed in science rather than engineering and technology, where the present and predicted employment growth and reward is greater. The Equal Opportunities

Commission has an equal pay task force.

www.eoc.org.uk/html/equal_pay_taskforce.html

In the public sector (especially education) national scales (subdivided by grade) and agreements operate. Scales are incremental, providing automatic annual increases, and are revised annually for inflation. Entry level on appointment is normally to the bottom point of a grade scale but can be varied according to the current salary level of candidate or market forces. Postgraduate salaries start at £19,600 and the senior academic/manager scale rises to £43,000. Independent salaries are determined above that figure. Merit increases (i.e. an additional increment) can be awarded within all scales. Fellowships may operate their own scales with arbitrary annual increases (usually very generous). Some also provide for enhancement for post-doctoral appointments in science subjects, of one, two or three additional scale points, dependent upon the location of the employing institution.



appendices

The private sector tends to operate pay bands based on a rate for the job, which may be reviewed frequently to check competitiveness. Other rewards

for long service include longer leave and recurring financial awards, and bonuses for exceptional performance.

IV

A2 Summary of UK programmes and networks

This appendix provides an overview of some of the networks and initiatives that have been referred to in the writing of this report. It does not claim to be comprehensive, and should not be treated as such.

Programmes and initiatives

Athena

The Athena Project is a UK-wide initiative. The project's aim is the advancement of women in science, engineering and technology (SET) in higher education (HE). To achieve this, Athena works with the institutions to develop, share, encourage and disseminate good practice through a series of development programmes, an Athena award in 2003, and a series of local academic women's networks.

www.athena.ic.ac.uk

Computer clubs for girls

All-girl computer clubs are being set up in schools, in a joint project between e-skills and industry, supported by the DfES and DTI. The clubs are aimed at girls aged between eight and 14, and help create a virtual learning environment in which they can develop hard and soft skills. The aim is to

encourage more young women to take up Information and Communications Technology (ICT) as a career.

Cracking it!

A comprehensive handbook, that tackles the issues surrounding encouraging more girls and women to consider careers in science and engineering. £10.99 (including postage and packing).

To borrow this book for four weeks, contact WISE, Training Publications Ltd, 3 Finway Court, Whippendell Road, Watford, Hertfordshire, WD18 7EN

DTI Promoting SET for Women Unit

The Unit's work programme has focused on fact-finding, good practice and facilitating action through awareness-raising and helping to develop new initiatives. Originally set up for two years it soon became evident that the under-representation of women in SET



would not be quickly resolved. The unit is now working to a three-phase strategic plan, and has a public commitment from the Secretary of State for Trade and Industry until 2007, with the aim of increasing the participation of women to a level where intervention is no longer needed. They have a three-phase work programme.

Phase 1

Fact finding, development of pilot projects and good practice dissemination

Phase 2

Development of the women in the SET community and key initiatives to deliver change and implementation of a mainstreaming approach

Phase 3

To monitor, evaluate and report on progress and continue to support the external infrastructure as long as necessary.

Equalitec

Equalitec aims to develop a website to bring together global best practice in the field of recruitment and retention of women in ITEC (Information Technology, Electronics and Communications). This site will provide tools for companies

and HEIs looking to find information and resources in order to widen diversity in these areas. International best practice in mentoring, recruitment and retention programmes, work experience for women in ITEC and networking opportunities online will be included in the site. www.equalitec.com/

IT image campaign

Research by MORI for e-skillsUK NTO recently identified a number of negative perceptions of IT that were preventing employers attracting, recruiting and retaining the people they need. A coordinated campaign is under way to re-brand this image, highlighting the more positive and exciting aspects of the industry. A number of employers have responded to the research by agreeing to commit to action defined in the e-skills Employers Charter.

National pilot mentoring programme for women in SET

A collaborative pilot programme being led by the Women's Engineering Society in partnership with the Association for Women in Science and Engineering and



supported by the DTI and employers, this programme will offer training for men and women who mentor women scientists and engineers across the public and private sector.

Portiaweb

Portia and the PortiaWeb Project have been in place since 1998, when 71 women's organisations participated in the Getting Connected workshop sponsored by the DTI. The outcome was a website designed for women, by women, that acts as a gateway to all aspects of education and employment in SET. www.portiaweb.org/

WITEC UK

WiTEC (Women in Science, Engineering and Technology) is a well-established European network with coordinators in 12 European countries. WiTEC UK is based in Sheffield Hallam University and is funded by European Union and National funding bodies such as the DTI to undertake projects which aim to redress the balance of women studying and working in science, engineering and technology. www.shu.ac.uk/witec/

Women Into Science and Engineering Campaign

WISE aims to:

- enable people to find out more about the fun and excitement of science, engineering and technology
- encourage them to think about a career in SET
- help them explore the many different opportunities that are on offer.

When WISE started its work in 1984 only seven per cent of engineering graduates were female.

By the turn of the millennium, that number had more than doubled to 15 per cent. Many factors have contributed to this change, but WISE has played an important role, raising awareness of the possibilities of SET for girls and women.

www.wisecampaign.org.uk

Women SET experts database

The European Database of Women Experts in SET was originally developed in 1997 as the first initiative of its kind in Europe to be used to raise awareness of the skills and



appendices

knowledge of women in science, engineering and technology.

www.setwomenexperts.org.uk/

DTI provided funding for WiTEC to update the database in order to ensure that it continues to be a valuable tool for the media, governmental bodies such as the European Commission, school teachers and others who are keen to locate and refer to women who are respected figures in their fields for their views, experience, expertise and as role models for society.

Networks

Networks are essential. Many of these networks support women at all stages of their education and careers and networking between the various networks allows women to share experience and information and, importantly, spread good practice.

Association for Women in Science and Engineering (AWiSE)

AWiSE is a national organisation with a central office in London and branches in the regions. AWiSE promotes

SET for girls and women and covers all the sciences and technologies across a range of levels.

African-Caribbean Network For Science and Technology

Ishango House
447 Chester Road
Old Trafford
Manchester M16 9HA

AfricanNetwork@compuserve.com

British Federation of Women Graduates

Promotes women's opportunities in education and public life, working as part of an international organisation to improve the lives of women and girls.

The Daphne Jackson Trust

The Trust is the foremost women returner's scheme in the country.

Let's Twist

A partnership designed to widen the participation of women in education and employment in engineering, construction and technology, and to mainstream good practice in teaching and learning for women in non-traditional areas.



Local Women's Academic Networks in SET

Sponsored by the ATHENA Project, the Local Women's Academic Networks in SET (LAWNS) are regionally-based networks of women working in SET in higher education, research establishments or industry and the professions. They work to raise the profile of women and to improve women's career development. Each LAWN has its own agenda – some are based around speaker programmes, others focus on mentoring and networking.

National Association of Women Pharmacists (NAWP)

An independent organisation within the profession and represents women in pharmacy. Mission is to enable all women pharmacists to realise their full potential and raise their profile by being educationally, socially and politically active. Local branches of NAWP offer fellowship with other pharmacists; some branches also provide informal networking and mentoring and may organise locum work in their area.

ResNet, University of East Anglia

Established with funding from Athena in 1999, ResNet is a network for women researchers at the UEA and Norwich Research Park. Aims to raise individual awareness, provide a forum for common concerns and encourage women to consider careers in science.

ResNet offers a programme of local and regional events and workshops and gathers evidence on career development for women in SET. Contact Helen Green or Ruth Goodall, Centre for Staff and Educational Development, University of East Anglia, Norwich NR4 7TJ.

Women and Manual Trades

Provides advice, information and support to women working, training or wishing to become involved in manual trades.

Women Chemists' Network

Offers assorted services for women chemists.

Women's Engineering Society

WES is the major network in promoting the education, training and practice of engineering among women.



appendices

It provides regional and university groups, an annual conference and membership opportunities, as well as expert speakers for schools and expert advice for policy makers.

Women Returners Network

Chelmsford College
Moulsham Street
Chelmsford
Essex CM2 0JQ



A3 Summary of scientific education and employment

Girls are continuing to gain a higher level of scientific literacy at GCSE and A level. Significant steps have been made, particularly in A level Chemistry, Figure A1 where they are now achieving 50 per cent of A–E passes.

In physics the news is not so good. The proportion remains around 20 per cent, with the numbers of boys achieving A–E falling by 1.6 per cent over the last five years. The importance of physics in a diverse range of work areas makes this an area for concern that was addressed both by the Roberts report and also the IUPAP conference on women in physics recently.

Compulsory level education (pre-16)

- All students study a balanced science curriculum containing biology, physics and chemistry between the ages of 5 to 16. Double science at GCSE is a solid grounding from which students can go on to study any science subject at A level;
- Girls continue to outperform boys at GCSE science. The difference in GCSE physics is however only one per cent compared to 15 per cent in English;
- In 2001, about 24,000 girls achieved A*–C grades in GCSE

Computer Studies, compared to 32,000 boys.

Post compulsory (16 plus) A level

- Between 1995 and 2000 the number of boys awarded an A level in physics fell by 1.6 per cent. Over the same period, there was an increase of 8.7 per cent in the awards made to girls. However, there is still a major gender divide to overcome with three times more boys awarded physics A level than girls in 2000.
- Over the same period, there has been an increase of 22.9 per cent in chemistry A levels awarded to girls (from 12,000 to



16,600) while there has been a 1.9 per cent decrease for boys. The number of Chemistry A levels awarded to girls and boys is now almost equal.

- In 2001, about 4,000 girls achieved an A level in Computer Science, compared with just over 13,000 boys;
- Women taking ICT subjects perform well in education;
- in 2001, at GCSE, 60.5 per cent of girls achieved grades A*-C in Information Technology compared with 53.9 per cent of boys; in 2001, 87 per cent of female candidates successfully gained an A-level in IT compared to 83.4 per cent of male candidates.

Degree level

Over the past 20 years the number and percentage of women gaining degrees in biology and chemistry has increased steadily, but in the last year there has been a worrying end to this trend that needs to be closely monitored. However the trend for men has been a steady fall over the last five years. This underlies the cause for concern in the Roberts' Report on the supply

of scientists and engineers for the future.

- In 1996 women earned 38 per cent of the 4140 first degrees awarded in chemistry and 52 per cent of the 13820 degrees in biosciences (59 per cent including medicine and dentistry).
- By 2000 women earned 40 per cent of the 3430 first degrees in chemistry and 60 per cent of the 18480 degrees in biosciences (63 per cent including medicine and dentistry).

Within higher education, women make up only a fifth of computing graduates and this has declined slightly since 1994 despite the fact that they form the majority of university graduates generally.

Higher degree level

In 1996 12 per cent of 6040 higher degrees (masters and doctorates) in engineering were achieved by women compared to 16 per cent of 6570 in 2000. This is discipline-dependent: in electrical and electronic engineering the proportion undertaking higher degrees has increased to 18 per cent and 16 per cent respectively.



In 2000 29 per cent of post-graduate qualifications in Computer Science were awarded to women (a higher proportion than at first degree level) compared to 22 per cent in 1997. (Source: HESA)

Doctoral level qualification

- The number of women achieving a PhD in chemistry and biosciences has increased steadily over the years 1995 to 2000;
- The number of doctorate qualifiers in biological sciences (excluding psychology) in 1995 was 985, of whom 42 per cent were women, and by 2000 this had increased to 1300, of whom 48 per cent were female;
- The number of doctorate qualifiers in chemistry in 1995 was 730, of whom 29 per cent were female and by 2000 this had increased to 910, of whom 30 per cent were female;
- In engineering and technology women are now undertaking higher degrees in a greater proportion than at under-graduate level;
- In 1995 the number of doctorate qualifiers was 1325, of whom 10 per cent were female. This had increased

considerably by 2000 when the number of doctorate qualifiers was 1705 of whom 18 per cent were female.

Overall we have seen an increase in the numbers of women undertaking S, E or T study and training as well as an increase in the gender balance. Additionally more women are now undertaking higher degrees than the proportion taking undergraduate study. Although this should be tempered against a significant increase in the numbers of women undertaking post 16 study and declining numbers of men studying science and engineering.

Women's SET employment

Two recent reports provide a comprehensive synopsis of women's SET employment, the Maximising Returns and the technical report to support it, both available from the DTI publications orderline or on-line at the Promoting SET for Women website. A number of bullet points from this work are presented below.

- Number of people of working age with degrees (in any subject) has risen from 3.5 million in 1992 to 5.4 million in 2000;



- The number of SET graduates in the working age population has increased from 1.1 million in 1992 to 1.3 million in 2000;
- The proportion of SET degree holders relative to other subjects has declined from 32 per cent of all graduates in 1992 to 25 per cent in 2000;
- The employment rate of male SET and non-SET graduates is very similar at about 91 per cent.

Numbers of women in SET employment

- The number of women of working age with SET degrees has risen from 240,000 in 1992 to 290,000 in 2000. The total for both men and women has increased from 1.1 to 1.3 million over the same period;
- Between 1992 to 2000 the number of female SET graduates employed in SET occupations rose from just under 50,000 to nearly 65,000;
- One-third of women SET graduates entered SET occupations in 2000 compared to 50 per cent of men;

- 25 per cent of all women SET graduates are employed in SET occupations compared to around 40 per cent of men;
- Number of women in computing has increased from about 14,000 in 1992 to around 19,000 in 2000.

ICT employment

- In the last five years, the number of people in ICT jobs has risen by over 50 per cent, far faster than the UK workforce as a whole at seven per cent. The workforce in ICT supply and services companies has almost doubled (92 per cent growth). Current estimate of number of ICT professionals in the UK is about 1.2 million;
- The number of women in ICT jobs is actually declining. The proportion of women in ICT jobs has fallen to 22 per cent, compared with 25 per cent in 1995. In software engineering jobs, women account for only eight per cent of the workforce;
- Recent survey for Cisco shows that in Europe women account for only six per cent of Internet networking professionals.

Key facts and figures on scientific employment

Data on women's scientific employment are available from the UK Labour Force Survey. The data presented were assimilated for the *Maximising Returns* report. Whilst data exists in abundance for the higher education sector through HESA, the Higher Education Statistics Agency, and for public sector research, very little information is known about women's employment in private sector research as the gender variable is not routinely collected during the survey. However some progress has been made and a pilot study is being conducted during 2002 in which gender will be collected. Isolated, large employers have undertaken internal studies and one sectoral survey has been undertaken by a collection of pharmaceutical companies. However the data is not in the public domain. The only other source of significant employment data is collected by MORI for EMTA. However, useful as this is, it is not a compulsory survey and returns are low.

Women's employment in SET related jobs have increased by nearly 30 per cent between 1992 and 2000 from 50,000 to 65,000.

Women's progress in employment in academia

In 2000 there was one female professor in civil engineering, three in electrical, electronic and computer engineering and four mechanical, aeronautical and production engineering professors compared to 790 men, representing one per cent of the total. Although the number of women professors in these disciplines has increased, so has the number of men. Despite 47 per cent of bioscience graduates being female in 1970 and rising to 60 per cent in 2000, only nine per cent have reached professorial status.

The situation in academia is common across the world with few discipline-based exceptions such as physics in Italy and Portugal and IT in a number of European countries.

NOTE: the above dataset excludes psychology



Opportunities for part-time working in SET

The extent of part-time working is higher in the general female labour market compared to women SET degree holders who are employed in SET or non-SET occupations. For instance, in 2000 44 per cent of employed women were working part-time compared to 17 per cent of women SET degree holders who were employed in SET occupations and 25 per cent who were employed in non-SET occupations. Over the 1992–2000 period female part-time rates have generally remained stable and it is likely that the fluctuations occurring amongst women SET degree holders is due to sampling errors. However, over the period part-time rates were significantly lower amongst women SET degree holders who were employed in SET occupations.

Returning to SET employment from a career break

● There has been an average of about 5,000 women SET graduates returning to SET employment per year during the latter part of the 1990s;

- In 2000 economically inactive female SET graduates provided a pool of approximately 50,000 potential returners;
- About 24,000 women SET graduates returned to employment in 2000; about a third of them returned to SET occupations. [note: the figures for 2000 happen to be significantly higher than for the average over the period studied];
- Between two thirds and three quarters of women with SET degrees, who were not working at the time of the LFS interview, had been out of employment for at least two years and almost 40 per cent have been out of employment for at least five years.

So there is a pool of available women who do return, but as the Max returns report said... few obvious mechanisms to help them get back.

Membership of professional societies and learned bodies

- Despite 65,000 women working in S, E and T only a few thousand are members of professional bodies and Women in SET organisations
 - Royal Society – 3.7 per cent of Fellows are women, but 35 per cent of funding goes to women;
 - Royal Academy of Engineering only 15 Fellows are female out of a total of 1200;
 - Institute of Biology – only 5.9 per cent of Fellows of the Institute of Biology are women;
 - Chartered Institute of Building Surveying Engineers (CIBSE) – one per cent of members are women.
-

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acknowledgements

This section acknowledges the contributions from organisations and individuals who provided specific input by attending the working groups and offering case studies. A number of individuals have provided extra time and effort to draft pieces of text, develop ideas or provide their expertise without which this report would not be so broad nor robust.

Note

Submissions and case studies via the website are not listed as some contributors wished to remain anonymous or it has not been possible to seek consent to publish names.

Discussion fora

100 people attended a seminar and open discussion forum at the DTI on 13 March and two high level meetings were held at the Royal Institution on 24 and 25 April.

Meeting of the Professional Societies and learned bodies

A separate meeting was held of the professional membership societies and institutes covering a wide range of disciplines and the learned bodies representing the high echelons of science and engineering. The meeting discussed the representation of women in these organisations and individual measures being taken. The meeting summary covered the actions that might be taken to share good practice and understand the issue more fully. These have all been taken into account in the development of key actions.

acknowledgements

Working Group Attendees/Correspondents

We are particularly grateful to those who gave up their time to take part in the working groups or to provide written input and comment on the working group ideas:

Anneli Aitta (Daphne Jackson Trust Fellow)	Gillian Gehring (Sheffield University/Women in Physics Group)
Jeremy Allen (DTI)	Judith Glover (University of Surrey, Roehampton)
Barbara Bagilhole (Loughborough University)	Julia Goodfellow (BBSRC)
Marie Noelle Barton (WISE Campaign)	Keith Gore (L'Oreal)
Stephany Biello (Glasgow University)	Janet Greenwood (Engineer and mother, not employed)
Sarah Blackford (Society for Experimental Biology)	Dot Griffiths (Imperial College)
Anne Canteilo (eskills UK)	Joyce Hill (Equality Challenge Unit)
Rachel Carol (John Innes Institute)	Alison Hodge (Qinetiq/Institute of Physics)
Jackie Carpenter (Women's Engineering Society/Energy 21)	Sylvia Howe (Pfizer)
Trudy Coe (EA)	Norma Jarboe (Opportunity Now)
Valerie Ellis (Prospect)	Jennifer Kaheil (UEA)
Trish Ellis (University of Surrey)	Viv Kendon (Imperial College)
Wendy Fisher (Open University)	Joanna Kennedy (Arup)
Barbara Gallani (Institute of Physics)	Julia King (Rolls-Royce)



acknowledgements

Marina Larios
(Inova Consultancy)

Audrey Linton
(Women and Equality Unit,
DTI)

Judith Maconochie (GSK)

Pumima Madhvi (OST)

Ann Marks
(Women in Physics/teacher)

Joan Mason (AWISE)

Linda Miller (IRS Research)

Yvonne Newey
(Organisational change
consultant)

Pat Nuttall (NERC)

Rachel Overton (BBC)

Helen Pask (Royal Society)

Sarah Peers
(Women's Engineering Society)

Yasmin Robson
(Research Physicist)

Sandi Rhys Jones
(Rhys Jones Consultancy)

Sandra Rickwood
(Scientist and mother)

Teresa Schofield (EMTA)

Carys Siemieniuch
(Loughborough University)

Rebecca Sinnatt (IBM)

Sue Smith
(Daphne Jackson Trust)

Valerie Snewin
(Wellcome Trust)

Jane Sutton
(Royal Academy of
Engineering)

Kate Ward
(Women's Science Forum and
Management consultant)

Julie Warwick (Wellcome Trust)

Juliet Webster

Natalie Wiseman (Ford)

Jenny Woolley
(Daphne Jackson Trust)

Gill Yourston (IBM)



Organisational Support and Involvement

The diversity of perspectives and opinions that have been sought in the preparation of this report is demonstrated through the range of organisations to whom contributors belong:

At Large Media, ATHENA Project, BBC, BBSRC, BNFL, Cardiff University, Cartesian Limited, CCLRC, Cisco Systems, Confederation of British Industry, Construction Industry Training Board (CITB), Department for Education and Skills, Department of Trade and Industry, East Lancashire Careers Project, EDS, Energy 21, Engineering and Marine Training Authority, Engineering Council UK, EPSRC, Equality Challenge Unit, ESRC, Evaluation Associates, Ford Motor Company Ltd, Foundation For Science and Technology, Geological Society of London, Goldman Sachs International, HEFCE, HEFCW, Higher Education Equality Challenge Unit, IBM UK Ltd, IMIS, Imperial College, Institute of Physics, Institute of Physics and Engineering in Healthcare, IRS Research, Kingston University, Knowledge Management Centre, L’Oreal UK, Loughborough University, Manchester University, MRC, NERC, Nesta, Nettev Plc, Newtec, ONS, Open University, Opportunity Now, Oxford University, People Science and Policy, PERA, Pfizer, Portia Ltd, PPARC, Professional Family Woman’s Network, Prospect, Research Fortnight, ResNet, Rhys Jones Consultants, Rolls Royce Plc, Royal Academy of Engineering, Royal Free and University College Medical School, Royal Institution, Science Media Centre, Science Year, Science’s Next Wave, SECTpoint Hertfordshire, SECTpoint Scotland North, SHEFC – Gender Equality Co-ordinator, South East Essex College, Synaptica Limited, Techfest – SECTpoint Scotland North, The Academy of Learned Societies for the Social Sciences, The Back to Work Company, The British Computer Society, The British Institute of Non-destructive Testing, The Chartered Institution of Building Services Engineers, The Chartered Institution of Water and Environmental Management, The Consultancy Company, The Daphne Jackson Trust, The Daycare Trust, The Engineering and Technology Board, The Geological Society of London, The Institute of Biology, The Institute of Energy, The Institute of Marine Engineering, Science and Technology, The Institute of Measurement

acknowledgements

and Control, The Institute of Physics, The Institution of Chemical Engineers, The Institution of Civil Engineers, The Institution of Electrical Engineers, The Institution of Fire Engineers, The Institution of Highways and Transportation, The Institution of Incorporated Engineers, The Institution of Lighting Engineers, The Institution of Mechanical Engineers, The Institution of Mining and Metallurgy, The Institution of Railway Signal Engineers, The London Mathematical Society, The Open University, The Royal Academy of Engineering, The Royal Institution, The Royal Institution of Naval Architects, The Royal Society, The Royal Society of Chemistry, The Science Council, The Society of Chemical Industry, The Wellcome Trust, TPRU Birkbeck College, UCL, University of Bath, University of Cambridge, University of East Anglia, University of Glasgow, University of Loughborough, University of Oxford, University of Southampton, University of Surrey, Wellcome Trust, WISE Campaign, Women and Equality Unit, Women's Engineering Society, Women's National Commission, Women's Science Forum.



