



House of Commons
Science and Technology
Committee

**Women in scientific
careers**

Sixth Report of Session 2013–14

Report, together with formal minutes

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Science and Technology Committee

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Contents

Report	<i>Page</i>
Summary	3
1 Introduction	5
2 Background	7
Why gender diversity matters	7
The economic case	7
The business case	7
Gendered research	9
The leaky pipeline	10
Government funding and support for diversity in STEM	12
The Athena SWAN Charter	15
3 Gender perceptions in STEM careers	18
Recruitment to STEM jobs	19
Progress and promotion	20
Research funding	22
Publication	23
Working patterns	23
Improving diversity and equality	24
Diversity and equality training	24
Role models and mentoring	26
4 Practicalities of an academic career	29
Early career instability	29
Short term contracts	29
Time away from research	33
Non-research activities	33
The Research Excellence Framework (REF)	34
Maternity	36
Balancing career with family	39
Career breaks	40
Careers advice and support	42
Destinations of leavers	44
5 Conclusions	48
Conclusions and recommendations	49
Formal Minutes	54
Witnesses	55
Published written evidence	56

Summary

Many attempts have been made to improve the under-representation of women in science, technology, engineering and mathematics (STEM) careers in the UK. Yet currently only 17 per cent of STEM professors are women. It is astonishing that despite clear imperatives and multiple initiatives to improve diversity in STEM, women still remain under-represented at senior levels across every discipline. One compelling reason to tackle this problem is that the UK economy needs more STEM workers and we cannot meet the demand without increasing the numbers of women in STEM.

There is no single explanation for the lack of gender diversity in STEM; it is the result of perceptions and biases combined with the impracticalities of combining a career with family. Scientists often consider themselves to be objective and unbiased, yet studies have shown that scientists are susceptible to the same biases as the rest of the population. Therefore we have recommended that diversity and equality training should be provided to all STEM undergraduate and postgraduate students. It should also be mandatory for all members of recruitment and promotion panels and line managers.

Early academic STEM careers are characterised by short term contracts, which are a barrier to job security and continuity of employment rights. This career stage coincides with the time when many women are considering starting families, and because women tend to be primary carers, they are more likely than men to end their STEM career at this stage. We call on the Government to work with the higher education sector to review the academic career structure and increase the number of longer-term positions for post-doctoral researchers. We have found that what benefits women benefits everyone in the STEM workplace.

Emphasis is often placed on inspiring young girls to choose science, which is commendable, but such efforts are wasted if women are subsequently disproportionately disadvantaged in scientific careers compared to men. The Government recognises the importance of gender diversity in STEM, but its efforts appeared to be largely focused on encouraging girls to study STEM, with little focus on enabling them to stay and progress in STEM careers. We were disappointed that BIS spending dedicated to improving diversity in STEM was virtually halved in the 2010 Spending Review and we recommend that the Government should monitor the effects of its policies on cutting and “mainstreaming” diversity funding.

1 Introduction

1. The scientific profession has been slow to open its doors to women and history offers many examples of women scientists whose work and contributions were unfairly overlooked, for example Rosalind Franklin's contribution to determining the structure of DNA in the 1950s.¹ Gender diversity in science and engineering has improved somewhat since then, but contentious attitudes towards women in science still remain and many practical barriers hinder women's progression in scientific careers. The under-representation of women in science has been explored in-depth and there are numerous organisations and initiatives striving to improve gender diversity in science, technology, engineering and mathematics (STEM) study and careers. However, despite the attention that the topic has received, it has been estimated that "it will take 50 or 80 years before we get gender equality if we just keep doing the same thing, hoping that the pipeline will produce more women" scientists.² Currently only 13 per cent of all STEM jobs in the UK are occupied by women.³ The loss of women at later stages of a career pathway is often referred to as "the leaky pipeline" (see paragraph 10).

2. There are many routes into a STEM career, and we have previously highlighted the importance of vocational training and education.⁴ In addition, many STEM workers are employed in industry. However we focused this inquiry on academic careers because "the main route of entry [into STEM careers], particularly into senior specialist roles or academic positions, remains through the [higher education] route".⁵ In addition, the Business, Innovation and Skills (BIS) Committee published its Report on *Women in the Workplace* in June 2013, which examined STEM in a wider exploration of workplace equality and diversity.⁶ Many of the BIS Committee's findings were relevant to STEM industry but academic careers have unique characteristics. With the intention of complementing the work of the BIS Committee, we announced our inquiry on *Women in STEM careers*, focusing on the retention of women in academic STEM careers, on 25 June 2013, and sought written submissions on the following questions:

- a) Why do numbers of women in STEM academic careers decline further up the career ladder?
- b) When women leave academia, what careers do they transition into? What are the consequences of scientifically trained women applying their skills in different employment sectors?

¹ The Nobel Prize for the discovery of the structure of DNA was awarded to Francis Crick and James Watson; for other examples see also "6 Women Scientists Who Were Snubbed Due to Sexism", National Geographic Online, 19 May 2013, <http://news.nationalgeographic.co.uk/news/>

² Q 90 [Clem Herman]

³ Women in Science, Technology, Engineering and Mathematics: from Classroom to Boardroom *UK Statistics 2012*, p.1 Wise Campaign Online, <http://www.wisecampaign.org.uk>

⁴ Science and Technology Committee, Seventh Report of Session 2012–13, *Educating tomorrow's engineers: the impact of Government reforms on 14-19 education*, HC 665

⁵ WSC 79 [Government] para 12

⁶ Business Innovation and Skills Committee, First Report of Session 2013–14, *Women in the Workplace*, HC 342

- c) What should universities and the higher education sector do to retain women graduates and PhD students in academic careers? Are there examples of good practice?
- d) What role should the Government have in encouraging the retention of women in academic STEM careers?⁷

We received over 90 written submissions and took oral evidence from 13 witnesses including academic researchers, diversity and equality groups, universities, research and funding councils and the Government. We would like to thank everyone who submitted oral or written evidence to our inquiry, particularly those who shared their personal experiences of STEM careers.

3. This report concentrates on STEM careers but also highlights the need for a holistic approach to tackle gender diversity, which includes STEM education. Chapter 2 outlines why gender diversity in science matters. Chapter 3 explores how gender perceptions affect the retention of women in STEM careers and Chapter 4 covers the practicalities of an academic research career. Chapter 5 contains our final conclusions.

⁷ Science and Technology Committee, Women in STEM Careers, Press Release, 25 June 2013, www.parliament.uk/science

2 Background

Why gender diversity matters

The economic case

4. The Coalition Government has “committed to work together to tear down the barriers to social mobility and equal opportunities in Britain, and build a fairer society”.⁸ It considers that “no one should be held back because of who they are or their background” nor should they “be defined simply by these characteristics”.⁹ The Government’s December 2010 report on *The Equality Strategy – Building a Fairer Britain* stated that “inequalities matter to all of us” and that “failure to tackle discrimination and to provide equal opportunities, harms individuals, weakens our society and costs our economy”.¹⁰

5. The UK needs to address a shortage of skilled scientists and engineers: in our 2012 report on *Educating tomorrow’s engineers*, we highlighted estimates that around 820,000 science, engineering and technology (SET) professionals will be required by 2020.¹¹ The Society of Biology stated that “increasing women’s participation in the UK labour market could be worth between £15 billion and £23 billion [1.3 – 2.0 per cent of GDP], with STEM accounting for at least £2 billion of this”.¹² In Scotland, it has been estimated that “a doubling of women’s high-level skill contribution to the economy would be worth as much as £170 million per annum to national income”.¹³ The economic case for diversity in science has been recognised by the Government: in July 2012, Rt Hon Dr Vince Cable MP, Secretary of State for Business, Innovation and Skills, stated that “women [...] make up less than a fifth of all employees in the science sector” and that “there’s no way we can generate the number of scientists and engineers the economy requires without addressing this situation”.¹⁴ Simply put, **the UK economy needs more skilled scientists and engineers and this need will not be met unless greater efforts are made to recruit and retain women in STEM careers.**

The business case

6. The 2002 Report *SET Fair: A Report on women in Science, Engineering and Technology (SET)* identified gender diversity in science as a “business bottom line issue” and highlighted that “SET companies with few women employees are drawing on only half the

⁸ Government Equalities Office, *The Equality Strategy – Building a Fairer Britain*, December 2010, p.6

⁹ Government Equalities Office, *The Equality Strategy – Building a Fairer Britain*, December 2010, p.6

¹⁰ Government Equalities Office, *The Equality Strategy – Building a Fairer Britain*, December 2010, p.8

¹¹ Science and Technology Committee, Seventh Report of Session 2012–13, *Educating tomorrow’s engineers: The impact of Government reforms to 14-19 education*, HC 665, para 9

¹² WSC 74 [Society of Biology] para 1

¹³ *Tapping all our Talents. Women in science, technology, engineering and mathematics: a strategy for Scotland*, April 2012, Royal Society of Edinburgh, para 3

¹⁴ Department of Business, Innovation and Skills, *Vince Cable delivers speech on UK science, openness and internationalisation*, Press Release, 12 July 2012

talent pool and risk addressing only half the marketplace”.¹⁵ Gender diversity is perceived to improve workplace culture; a 2010 study of public attitudes and perceptions about diversity by the Government Equalities Office found that diverse organisations were “more able to deal with problems in a holistic manner compared to institutions with limited diversity”.¹⁶ University College London (UCL) stated that:

The most tangible and immediate effect of improving diversity is seen in organizational culture. [...] A diverse workforce might also contribute to the diversity of research aims, approaches and findings. This is not to say that women will have inherently different research interests, but that different people will bring different perspectives to research.¹⁷

The Medical Schools Council and Dental Schools Council stated that “there is a business case for mixed gender teams” and that because “diversity of knowledge and social capital in teams is vital in production of new ideas”, having a “lack of women may have a significant impact on the robustness of policy decisions and research innovation”.¹⁸ UCL Engineering stated that “the diversity of thought leadership and problem solving brought by having more women on a team is well documented in business terms” and that “academia needs to be more creative about retaining these women for the benefit of other staff and also students”.¹⁹ Increasing the proportion of women at professorial and other senior levels in academia is considered to have a positive impact on both men and women. UCL stated that “the presence of women professors not only has a significant positive effect on the confidence and self-esteem of female students, but also on that of male students who develop leadership abilities and emotional wellbeing as a result”.²⁰ A joint written submission from Oxford Research and Policy and Katalytik stated that “many institutions have found that implementing good working practices benefits all staff [...] whereas bad working practices tend to adversely affect women more than men”.²¹ In short, “what benefits women benefits men too”.²²

7. Gender diversity does not universally bring rewards for business. A 2013 Government literature review on *The Business Case for Equality and Diversity* stated that “studies appear to have found evidence that firms have reaped business benefits from equality [and] diversity, but not all firms in all contexts at all times”.²³ The review found that “how diversity is managed is also crucial: if appropriately, it can bring benefits to business, if poorly, it can increase costs”.²⁴ In June 2013, the Royal Society published an “invitation to

¹⁵ *Set Fair: A Report of Women in Science, Engineering and Technology from The Baroness Greenfield CBE to the Secretary of State for Trade and Industry*, November 2002

¹⁶ WSC 29 [UCL] para 12; The Government Equalities Office (2010), *Representation of women in business and government: Public attitudes and perceptions*, Government Equalities Office, 12 March 2010

¹⁷ WSC 29 [UCL] para 16

¹⁸ WSC 64 [Medical Schools Council and Dental Schools Council] para 6.2

¹⁹ WSC 59 [UCL Engineering] para 20

²⁰ WSC 29 [UCL] para 13

²¹ WSC 65 [Sean McWhinnie, Oxford Research and Policy, and Jan Peters, Katalytik] para 31

²² WSC 44 [Imperial College London], para 8

²³ Department for Business, Innovation and Skills, BIS Occasional Paper Number 4, *The Business Case for Equality and Diversity*, Jan 2013, p.vi

²⁴ Department for business, Innovation and Skills, BIS Occasional Paper Number 4, *The Business Case for Equality and Diversity*, Jan 2013, p.vi

tender for research into two questions relating to the business case for diversity in the scientific workforce”.²⁵ The two questions were “What evidence is there that establishes the business case for diversity in the scientific workforce?” and “Are diverse teams more likely to do good science?”²⁶ The research would “consist of a literature review and key interviews looking at the economic case for diversity” and would “establish the difference diversity makes to science, looking at optimum group size and diversity in relation to a range of productivity measures”.²⁷ The announcement of this project provoked some debate in the media about the need for a business case when solid moral arguments already existed for improving diversity.²⁸ **Gender diversity in STEM can bring business benefits if well managed. The business case for diversity in science is being reviewed by the Royal Society and we expect that its findings will highlight how STEM organisations can maximise the business benefits of diversity in the workforce.**

Gendered research

8. UCL stated that the “differential access of women and men to leadership in the higher education sector [...] influences the nature and process of knowledge production and the ways in which they can influence discourses and practices”.²⁹ Portia Ltd stated that “the historical absence of women in research—as participants, as subjects, and as beneficiaries—has resulted in science having more evidence for men than for women, and in the ‘male’ being accepted as the norm in study design, and in the application and communication of research”.³⁰ For example, Portia Ltd explained that “nearly all that is known about the effects of environmental pollution is based on studies involving men, but overwhelmingly, pollutants affect women and men differently”.³¹ Portia’s *A-Z of Why Gender Matters in R&D* highlights other examples of where gender bias in science has had adverse consequences.³² For example:

- a) there are no female crash dummies, even though women’s and men’s anatomy differs, women have, for example, less muscle around the neck and upper torso and experience greater risk of injury as a result;
- b) our understanding of pain starts with the male rat model;
- c) calculations of radiation dosage are based on an absorption model of a middle aged man; and
- d) in most anatomy books the majority of images are of a man’s body.³³

²⁵ Royal Society, *The business case for diversity in the scientific workforce*, Invitation to Tender, June 2013, <http://royalsociety.org/policy/>

²⁶ Royal Society, *The business case for diversity in the scientific workforce*, Invitation to Tender, June 2013, <http://royalsociety.org/policy/>

²⁷ Science in Parliament Vol 70 No. 4, *Leading the Way: Diversity at the Royal Society*, Autumn 2013

²⁸ The Independent, *Sparks fly over Royal Society gender study*, 30 June 2013

²⁹ WSC 29 [UCL] para 10

³⁰ WSC 13 [Portia Ltd] para 2

³¹ WSC 13 [Portia Ltd] para 2

³² Portia, *A-Z of Why Gender Matters in R&D*, 2012-2013, <http://www.portiaweb.org.uk>

³³ Portia, *A-Z of Why Gender Matters in R&D*, 2012-2013, <http://www.portiaweb.org.uk>

A 2013 European Commission report on *Gendered Innovations: How Gender Analysis Contributes to Research* provided further examples:

In engineering, for example, assuming a male default can produce errors in machine translation. In basic research, failing to use appropriate samples of male and female cells, tissues, and animals yields faulty results. In medicine, not recognizing osteoporosis as a male disease delays diagnosis and treatment in men. In city planning, not collecting data on caregiving work leads to inefficient transportation systems.³⁴

Portia Ltd explained that:

When researchers do pay attention to biological and social differences between women and men, stunning discoveries follow. For example, muscle-derived female stem cells have better regenerative properties than equivalent male cells, and the metabolic profiles of women and men are distinctly different.³⁵

It stated that “findings such as these have huge implications for diagnosis and therapy, and for health economics”.³⁶ The Commission stated that: “thirty years of research have revealed that sex and gender bias is socially harmful and expensive” and that “gender bias also leads to missed market opportunities”.³⁷ It recommended that “the current generation of researchers needs to learn how to exploit the creative power of sex and gender analysis in their research design”.³⁸ In addition, the Open University suggested that “UK Research Councils should follow the example of the Irish Research Council and require all research bids to include a statement on sex-gender dimensions and implications of the research proposal”.³⁹ Research Councils UK (RCUK) has published a statement on its “expectations for equality and diversity” but it does not include encouragement to consider the gender dimension of research.⁴⁰

9. We suggest that the national academies, learned societies and research funders review how gender analysis can improve research findings within different STEM disciplines and formulate guidance on the matter. Research funders should encourage the consideration of gender dimensions of research from funding applicants.

The leaky pipeline

10. The Open University explained that “the pathway to an academic research career typically starts with a PhD followed by a number of short-term research contracts prior to gaining a permanent academic/research post”.⁴¹ The leaky pipeline describes the “gradual

³⁴ European Commission, *Gendered Innovations: How Gender Analysis Contributes To Research*, 2013, p 8

³⁵ WSC 13 [Portia Ltd] para 3

³⁶ WSC 13 [Portia Ltd] para 3

³⁷ European Commission, *Gendered Innovations: How Gender Analysis Contributes To Research*, 2013, p 8

³⁸ European Commission, *Gendered Innovations: How Gender Analysis Contributes To Research*, 2013, p 41

³⁹ WSC 102 [Open University] para 8

⁴⁰ Research Councils UK, *RCUK expectations for equality and diversity*, January 2013, <http://www.rcuk.ac.uk>

⁴¹ WSC 22 [Open University] para 10

loss of women working at each career stage following postgraduate training, from Postdoc to Lecturer, Senior Lecturer and Professor”.⁴² Academic research careers are competitive and many men and women do not reach senior positions. Dr Bryn Jones, Visiting Fellow at the School of Physics, University of Bristol, stated that “we train a very large number of people to PhD standard” although there are “a much smaller number of research assistant posts” and “the number of permanent positions is very small”.⁴³ The Academy of Medical Sciences highlighted that “women are still less likely than their male colleagues to advance to senior positions in academia [...] despite their growing numbers in undergraduate and postgraduate courses since the 1970s”.⁴⁴ As a result, universities “lose a substantial proportion of the pool of talented staff available to them”.⁴⁵ Although women make up 44.5 per cent of academic staff across higher education institutions (HEIs) in the UK, only 20.5 per cent of professors are women.⁴⁶ Women are under-represented at professorial levels across academic research careers in all STEM disciplines (typically 17 per cent although there is variation between disciplines).⁴⁷ The WinSET Committee at the University of Nottingham stated that “it is important to differentiate between the STEM⁴⁸ subjects” because “the points in the pipeline which are critical for women’s proportionality do vary from subject to subject”.⁴⁹ For example:

in psychology the pipeline leakage is most acute when going from senior lecturer to professor and until this career point there is a very good representation of women, whereas in the chemical sciences there is a steady decline in gender proportionality from undergraduate to professorial level, with a slight increase in the rate of leakage at the point of going from PhD students to post-doctoral researchers.⁵⁰

11. In some STEM disciplines, the under-representation of women is a result of girls and women choosing not to study the subjects that lead to STEM careers. In others, women may be well represented at early stages of study and career but fail to be retained and to progress to senior levels. For example, Sarah Dickinson, Manager of the Athena SWAN Charter, Equality Challenge Unit, explained that “in specific areas like chemistry, [...] it is a retention issue, whereas in engineering and physics it is a recruitment issue”.⁵¹ Although this Report focuses on retention rather than recruitment, we recognise that poor retention of women scientists has implications for the recruitment of girls and women – these issues are explored later in this Report.

⁴² WSC 28 [Academy of Medical Sciences] para 2

⁴³ Q 8

⁴⁴ WSC 28 [Academy of Medical Sciences] para 2

⁴⁵ WSC 48 [Royal Astronomical Society]

⁴⁶ Higher Education Statistics Agency, *Free Online Statistics – Staff: Statistical First Release 185*, 2011–12

⁴⁷ WSC 104 [Scienceogram UK]; WSC 79 [Department for Business, Innovation & Skills (BIS) and the Northern Ireland Assembly] para 6

⁴⁸ STEM is Science, Technology, Engineering, Mathematics and Medicine.

⁴⁹ WSC 40 [WinSET Committee, University of Nottingham]

⁵⁰ WSC 40 [WinSET Committee, University of Nottingham]

⁵¹ Q 75

Government funding and support for diversity in STEM

12. The UK Resource Centre for Women in Science, Engineering and Technology (UKRC) was established in 2004, following the 2002 *SET Fair* report.⁵² The UKRC provided “practical help and support to girls and women in SET, including those thinking of a career in SET and those taking a career break”.⁵³ Following the 2010 Spending Review, the Government’s *The allocation of science and research funding 2011/12 to 2014/15* stated that “from April 2011, funding for the UK Resource Centre for Women in Science, Engineering and Technology (UKRC) will not be renewed”.⁵⁴ The Government’s rationale for ceasing to fund the UKRC (which has since become incorporated into Women in Science and Engineering – or WISE) was that:

The Government’s approach to tackling lack of diversity in STEM careers is to encourage diversity in the STEM workforce by raising awareness of different STEM careers and embedding and mainstreaming equality and diversity through a number of the programmes we fund, and those of the partners with which we work.⁵⁵

It considered that “better value can be realised through these broader activities and through better direction of existing diversity projects”.⁵⁶ In the same 2010 funding allocation, the Government stated that diversity initiatives also “include the work of STEMNET and the STEM Ambassadors to encourage a diverse STEM pipeline; the National Academies’ fellowships; Research Councils’ PhD and fellowships awards; and the Big Bang Fair, and National Science and Engineering Competition”.⁵⁷ However we note that many of these initiatives target STEM education in schools and do not tackle diversity in academic careers: STEMNET, the Big Bang Fair and the National Science and Engineering Competition are all largely aimed at school children.⁵⁸

13. In its written submission to this inquiry, the Government explained that “BIS funds the Royal Society and Royal Academy of Engineering to lead a programme of work, in partnership with the professional institutions, industry and others, aimed at understanding and addressing issues of diversity in the STEM workforce”.⁵⁹ The Women in Science Engineering and Technology (WiSET) group stated that “the curtailing of the central role of the UKRC was too soon for mainstreaming”.⁶⁰ The Royal Society of Chemistry stated that the UKRC “provided a single, immediately identifiable source of information, support and advice for women in STEM, and their employers” and suggested that a similar

⁵² National Archives, Department for Business, Innovation and Skills (2010), UK Resource Centre for Women (UKRC), <http://webarchive.nationalarchives.gov.uk>

⁵³ Vitae, *Greenfield Report*, <http://www.vitae.ac.uk>

⁵⁴ Department for Business, Innovation and Skills, *The allocation of science and research funding 2011/12 – 2014/15*, Dec 2010, p.54

⁵⁵ WSC079 [Government] para 7

⁵⁶ Department for Business, Innovation and Skills, *The allocation of science and research funding 2011/12 – 2014/15*, Dec 2010, p.54

⁵⁷ Department for Business, Innovation and Skills, *The allocation of science and research funding 2011/12 – 2014/15*, Dec 2010, p.54; HC Deb, 21 Dec 2010 : Column 1262W

⁵⁸ Figures for these and other “mainstreamed” activities that have received Government funding is at WSC 105 [Government supplementary]

⁵⁹ WSC 79 [Government] para 9

⁶⁰ WSC 60 [WiSET] para 5.2

organisation should be re-created, “should the Government be unable to demonstrate that the current mainstreaming of diversity through alternative BIS funded programmes matches the success delivered by the UKRC”.⁶¹ Similarly the Science Council considered that the leadership of the Royal Society and Royal Academy of Engineering “must acknowledge and engage with the very large numbers of other organisations working to increase the numbers of women in the STEM workforce”.⁶² Table 1 and Figure 1 show Government funding for diversity programmes over the last two spending reviews.

Table 1: Diversity activities funded by BIS between 2008 and 2015, in cash terms⁶³

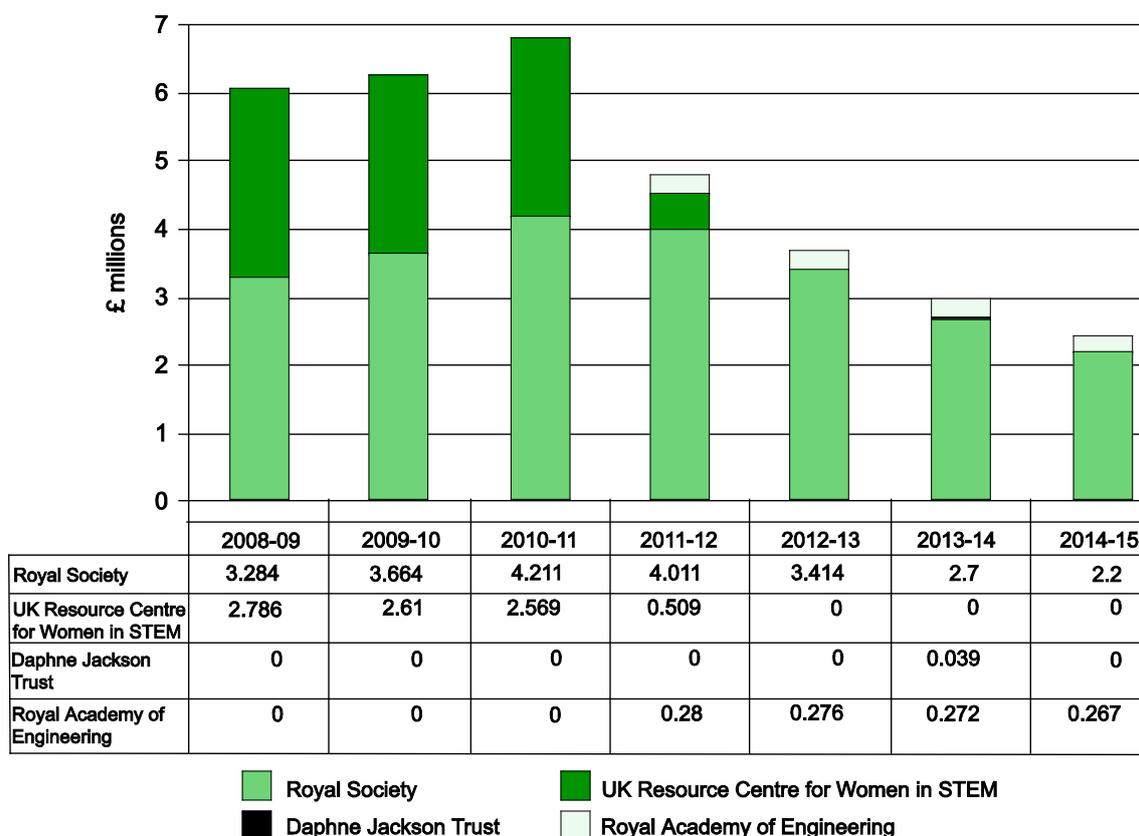
	Financial Year						
	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
	£ k	£ k	£ k	£ k	£ k	£ k	£ k
Royal Academy of Engineering	0	0	0	275	276	277	278
Royal Society	2,992	3,430	4,045	3,941	3,414	2,754	2,291
UK Resource Centre for Women in STEM	2,538	2,443	2,468	500	0	0	0
Daphne Jackson Trust	0	0	0	0	0	40	
Total in cash terms	5,530	5,873	6,513	4,716	3,690	3,071	2,569
Total in real terms⁶⁴	6,070	6,274	6,780	4,800	3,690	2,972	2,467

⁶¹ WSC 72 [Royal Society of Chemistry] para 43

⁶² WSC 86 [Science Council] para 5.1

⁶³ WSC 105 [Govt supplementary]: funding provided by the Department of Health to the Equality Challenge Unit is not included

⁶⁴ Cash terms figures were provided by BIS and converted to real terms by the House of Commons Library

Figure 1: Diversity activities funded by BIS between 2008 and 2015, in real terms⁶⁵

When we asked David Willetts MP, Minister of State for Universities and Science, why UKRC funding was cut, he responded that “it was a tough decision” and that “there was a view that some of the work could be done by the Royal Society or the Royal Academy of Engineering and more mainstreamed”.⁶⁶ The Minister accepted that the total amount of Government funding for diversity in science had been substantially reduced.⁶⁷ He stated that “there is still a lot of work under way, so it is not as if we gave up on the cause; we have been very energetic on the cause” and highlighted the Vitae concordat, Athena SWAN and the work of the Royal Society and the Royal Academy of Engineering.⁶⁸ **Although we accept that difficult financial decisions had to be made by the Government in the 2010 Spending review, it is disappointing that spending dedicated to improving diversity in science was so significantly reduced. While we have no concerns about the quality of the diversity programmes of the National Academies, we have not been assured that they could have the same reach and impact as the UKRC had.**

14. The Government should monitor the effects of its policies on mainstreaming diversity funding. If it transpires that cutting UKRC funding and mainstreaming has had a detrimental effect on the retention of women in STEM careers, the Government should increase diversity funding.

⁶⁵ Cash terms figures were provided by BIS and converted to real terms by the House of Commons Library

⁶⁶ Q 178

⁶⁷ Q 179

⁶⁸ The *Vitae Concordat to support the career development of researchers* is an agreement between the funders and employers of researchers in the UK, setting out the expectations and responsibilities of each stakeholder in researcher careers, <http://www.vitae.ac.uk/>; See paragraph 15 for Athena SWAN; Q 180

The Athena SWAN Charter

15. Several publicly funded initiatives exist to improve gender diversity in science.⁶⁹ However, the Athena SWAN Charter appears to be the most comprehensive practical scheme aimed at improving academic STEM careers. It is “a scheme that recognises excellence in science, engineering, technology, mathematics and medicine (STEMM) employment for women in higher education”.⁷⁰ It was founded in 2005, with the first awards conferred in 2006.⁷¹ The Charter is run by the Equality Challenge Unit (ECU), a charity “which works to further and support equality and diversity for staff and students in higher education across all four nations of the UK, and in colleges in Scotland”.⁷² The ECU is funded by the four funding councils of the UK as well as Universities UK and GuildHE.⁷³ The Athena SWAN Charter receives additional funding from the Royal Society, the Biochemical Society, the Department of Health and the Scottish Funding Council.⁷⁴ To become a member of the Charter, a university (or research institute embedded within it) must accept and promote the six Charter principles, which are that:

- a) Addressing gender inequalities requires commitment and action from everyone, at all levels of the organisation;
- b) A change in cultures and attitudes across the organisation is required to tackle the unequal representation of women in science;
- c) The absence of diversity at management and policy-making levels has broad implications which the organisation will examine;
- d) The high loss rate of women in science is an urgent concern which the organisation will address;
- e) The system of short term contracts has particularly negative consequences for the retention and progression of women in science, which the university recognises; and
- f) There are both personal and structural obstacles to women making the transition from PhD into a sustainable academic career in science, which require the active consideration of the organisation.⁷⁵

The ECU explained that “once Charter signatories, universities and their STEMM departments are encouraged to submit for Athena SWAN Charter recognition awards at Bronze, Silver or Gold level”.⁷⁶ There are currently 94 members of the Charter.⁷⁷ There are

⁶⁹ For example see <http://societyofbiologyblog.org/links-day-diversity-in-science/> for a list of major initiatives

⁷⁰ WSC 51 [Equality Challenge Unit]

⁷¹ Athena SWAN Charter, *History and principles*, <http://www.athenaswan.org.uk/>

⁷² WSC 51 [Equality Challenge Unit]

⁷³ WSC 51 [Equality Challenge Unit]; The four funding councils are the Higher Education Funding Council for England (HEFCE), the Higher Education Funding Council for Wales (HEFCW), the Scottish Funding Council (SFC) and the Department for Employment and Learning in Northern Ireland.

⁷⁴ WSC 51 [Equality Challenge Unit]

⁷⁵ WSC 51 [Equality Challenge Unit]

⁷⁶ WSC 51 [Equality Challenge Unit]

⁷⁷ WSC 51 [Equality Challenge Unit]; For the full list see Athena SWAN, *Members list*, <http://www.athenaswan.org.uk>

currently 58 HEIs with a total of 259 awards between them.⁷⁸ In July 2011, the Chief Medical Officer, Professor Dame Sally Davies outlined “her intention that all medical schools who wish to apply for NIHR⁷⁹ Biomedical Research Centres and Units funding need to have achieved an Athena SWAN Charter for women in science Silver Award”.⁸⁰ We considered whether other research funders should require universities to hold Athena SWAN awards in order to qualify for funding. Professor Dame Julia Higgins, Royal Society, stated that:

medical grants are given to whole departments. The research councils give grants to individuals or to small groups of individuals, often across two or three departments or two or three universities. If that requirement were there, it would preclude a very large part of the system from even applying. [...] Moreover, it would completely flood the ECU. They would not be able to deal with that many applications.⁸¹

She also stated that “the great success of the SWAN awards has been that they have been voluntary” and they “have appealed to the one thing that academics have, which is a huge sense of competition”.⁸² Dr Leslie Thompson, Research Councils UK (RCUK), stated that “the research councils, following the lead of NIHR, decided not to go down the route of mandating Athena SWAN, but talked to the sector about the issues of diversity broadly, not just women, and produced a statement”.⁸³ The RCUK *Statement of Expectations for Equality and Diversity* states that those in receipt of Research Council funding are expected to:

- a) promote and lead cultural change in relation to equalities and diversity;
- b) engage staff at all levels with improving the promotion of equality and diversity;
- c) ensure all members of the research workforce are trained and supported to address disincentives and indirect obstacles to recruitment, retention and progression in research careers; and
- d) provide evidence of ways in which equality and diversity issues are managed at both an institutional and department level.⁸⁴

It would not be practical to mandate that applicants for research funding must hold Athena SWAN awards, although we commend the Chief Medical Officer for taking this step with some NIHR funding streams. We recommend that all public research funders should require applicants and recipients to demonstrate that they are taking steps to improve equality and diversity. Each research funder should publish and disseminate this expectation and what actions will be considered sufficient to meet this criterion.

⁷⁸ Athena SWAN, *Current award holders*, <http://www.athenaswan.org.uk>

⁷⁹ National Institute of Health Research

⁸⁰ Equality Challenge Unit, *Chief Medical Officer links gender equality to future funding*, 18 August 2011, <http://www.ecu.ac.uk>

⁸¹ Q 60

⁸² Q 60

⁸³ Q 148; Research Councils UK, *Statement of Expectations for Equality and Diversity*, 17 Jan 2013

⁸⁴ WSC 23 [RCUK] para 3

16. The NIHR announcement led to a rapid increase in Athena SWAN applications which had already been “gaining momentum”.⁸⁵ The ECU stated that “this is a very welcome step, and one that provides an opportunity for medical schools and higher education institutions to take the lead on creating gender parity”.⁸⁶ The University of Cambridge School of Clinical Medicine's Athena SWAN Governance Group highlighted the need for “improved resourcing of the Equality Challenge Unit” as “the exponential increase in applications by universities and their constituent departments for recognition of efforts in increasing support for women in STEMM has in no way been matched by adequate expansion of the ECU”.⁸⁷ When we asked the Minister about increasing Government support for Athena SWAN, he responded:

I cannot say anything about funding at the moment. [...] It is part of the problem of success; everybody is so desperate to get an Athena SWAN award that they are quite hard-pressed to get through the volume of work. I cannot make any commitment at the moment, but if they need help, I am sure we would want to try to help, if we could.⁸⁸

17. The Athena SWAN Charter is a comprehensive scheme that is widely supported across academia. With increasing demand, the Equality Challenge Unit may require additional resources and the Government should respond positively to any such request.

⁸⁵ Q 60 [Sarah Dickinson]; also WSC 79 [Government] para 32

⁸⁶ Equality Challenge Unit, *Chief Medical Officer links gender equality to future funding*, 18 August 2011, <http://www.ecu.ac.uk>

⁸⁷ WSC 24 [University of Cambridge School of Clinical Medicine's Athena SWAN Governance Group] para 16f

⁸⁸ Q 189

3 Gender perceptions in STEM careers

18. Gender perceptions and biases may be present throughout all stages of STEM study and career. Gender patterns in subject interests have been shown to be socially constructed, not biologically based.⁸⁹ These social constructs start influencing children at a young age. The Targeted Initiative on Science and Mathematics Education stated that “by age 14, most girls have already come to see science careers as ‘interesting but not for me’”.⁹⁰ Factors influencing the views of children, parents and teachers include:

- a) stereotypes, for example, “70% of people around the world associate being a scientist with being a man”;⁹¹
- b) a lack of knowledge about STEM careers, often coupled with a lack of female role models.⁹² Both girls and boys are more likely to aspire to STEM when their families “possess substantial ‘science capital’, i.e. science-related qualifications, ‘know how’ and contacts”;⁹³
- c) a strong popular perception among students and parents that particular STEM careers, particularly those in the physical sciences, are masculine;⁹⁴
- d) girls reporting lower self-confidence in their abilities despite no differences in actual abilities or attainment. This is “exacerbated by the ‘brainy’ image of STEM held by the majority of young people”;⁹⁵ and
- e) Sexism, such as differential expectations and encouragement for girls to continue with STEM. There is some evidence of “teachers favouring boys and perceiving them to be ‘better’ (and more ‘naturally able’) at science than girls, even where attainment data indicate otherwise”.⁹⁶

The Government “funds STEMNET to run the STEM Ambassador programme which raises awareness amongst children and young people of the range of careers that science and technical qualifications offer”.⁹⁷ Although not a central part of this inquiry, we are aware that the STEM Ambassador Scheme is very well regarded.⁹⁸ We have also previously recommended that engagement with industry should be a core requirement of teachers’

⁸⁹ Archer, L., Osborne, J. & DeWitt, J. (2012). *Ten Science Facts & Fictions: The Case for Early Education about STEM Careers*, London: The Science Council.

⁹⁰ WSC06 [TISME] para 2.2

⁹¹ WSC13 [Portia Ltd] para 12

⁹² WSC 75 [Girlguiding] para 7

⁹³ WSC06 [TISME] Summary point 7

⁹⁴ WSC06 [TISME] Summary point 6

⁹⁵ WSC06 [TISME] Summary point 5

⁹⁶ WSC06 [TISME]; Archer, L., Osborne, J. & DeWitt, J. (2012): *The Case for Early Education about STEM Careers*, p.8, London: The Science Council. See also Institute of Physics, *Closing Doors: Exploring gender and subject choice in schools*, Dec 2013

⁹⁷ WSC 79 [Government] para 50

⁹⁸ For example, written evidence to Engineering inquiry ev 71 (SEMATA), School Science practicals inquiry, ev 48 (British Science Association)

Continuing Professional Development as this would improve the provision of STEM careers advice to students.⁹⁹ **We encourage the Government to work with the STEM community and schools to tackle gender stereotypes in education, particularly at primary level. In addition, we re-iterate the importance of engagement with STEM industry being part of teachers' CPD.**

19. University College London (UCL) commented on the continuation of gender stereotypes into academia whereby “the assumed identity of an academic in STEMM tends to be linked to masculinity”.¹⁰⁰ Once in a STEM career, women may encounter attitudes that hinder their progression to senior levels. Plymouth Marine Laboratory stated that “the ‘glass ceiling’, a term often used in the corporate world, can also exist in the scientific environment, with scientific leadership dominated by males”.¹⁰¹ The leaky pipeline itself reinforces existing views about women in science; UCL added that “the decline in female scientists through the academic pipeline reinforces the assumption and stereotypes surrounding science and gender” and might “put off young women and girls from choosing science subjects at school, A level and University”.¹⁰² Role models and mentoring are further discussed in paragraphs 33–39.

Recruitment to STEM jobs

20. The British Pharmacological Society highlighted that “many women in STEM suffer bias due to expectation, in that the potential for a woman to take maternity leave or to require flexible working in future can impact the judgement of interviewers”.¹⁰³ The British Medical Association stated that “academic appointment panels [...] are often wholly male due to the lack of women in senior positions” and that “despite equality training and guidelines, unconscious bias means that panels frequently have a tendency to choose appointees like themselves”.¹⁰⁴ This type of bias in an environment dominated at senior levels by men may mean that “many successful candidates will be male”.¹⁰⁵ Bias against women in recruitment is not solely perpetrated by men. Studies have demonstrated that both men and women can be unconsciously biased towards preferring male candidates in STEM. A 2012 study led by Yale University, in which 127 science faculties from research-intensive universities “were asked to rate the application materials of a student—who was randomly assigned either a male or female name—for a laboratory manager position” showed that “both male and female professors rated the male applicant as significantly more competent and preferable to hire than the (identical) female applicant”.¹⁰⁶ The study also found that “they also offered the male applicant a higher starting salary and additional career mentoring support”.¹⁰⁷ Similar bias exists in the UK, for example, Bournemouth

⁹⁹ Science and Technology Committee, Seventh Report of Session 2012-13, *Educating tomorrow's engineers: the impact of Government reforms on 14-19 education*, HC 665, para 86

¹⁰⁰ WSC 29 [UCL] para 2

¹⁰¹ WSC 17 [Plymouth Marine Laboratory] para 7

¹⁰² WSC 29 [UCL] para 18

¹⁰³ WSC 50 [British Pharmacological Society] para 5

¹⁰⁴ WSC 85 [British Medical Association] para 8

¹⁰⁵ WSC 55 [Newcastle University] para 2.8; see also WSC 64 [Medical Schools Council and Dental Schools] para 4.5.2

¹⁰⁶ WSC 13 [Portia] para 14

¹⁰⁷ WSC 13 [Portia] para 14

University highlighted that “in terms of applications for jobs and promotion, when CVs are judged blindly women fare better on average, but when names are included, men have the advantage”.¹⁰⁸

21. The effects of gender bias cannot just be mitigated with simple measures such as ensuring that recruitment and interview panels include women. Dr June McCombie, representing the Institute of Physics, acknowledged that this could place “an extra load” on women scientists because “you cannot physically have a woman on every single committee and every single appointments panel in the university because there simply are not enough”.¹⁰⁹ However she added that “there is no doubt that the majority of women involved see this as something they should do in order to [...] make sure that committees [...] are less influenced by unconscious bias and inaccurate evaluations”.¹¹⁰ Sarah Dickinson, Equality Challenge Unit (ECU), stated that:

People are coming up with some interesting initiatives. If you do not have enough females in a department, they are taking females from other departments or bringing in female HR representatives to ensure that there is a gender balance. In terms of committees, it is things like deputising roles or shadowing roles, so there is a great opportunity for early career women to get the opportunity to sit on a committee and shadow so that it adjusts the gender issues.¹¹¹

Another option, suggested by Clem Herman, Open University, was to “anonymise applications so that you do not clearly see the gender”.¹¹²

Progress and promotion

22. The Medical Schools Council and Dental Schools Council stated that “students can be biased in their perceptions of leadership, with medical school students of both genders reporting that men generally make better leaders”.¹¹³ UCL stated that “the skills or abilities that people think they need in a leader or a manager are also connected to a normative masculine identity, and women who display these skills are often judged negatively because they are perceived to be presenting stereotypically masculine traits” yet “conversely, women who don’t display these traits may be viewed as unsuitable for the role”.¹¹⁴ In addition, “women suffer because men find it easier to deal with men as leaders seeing them in their own image and as potential equals”.¹¹⁵ Perceptions matter because, as Dr Bryn Jones explained, “there is a very strong hierarchy within university research structures” which makes “support from established academics of critical importance in the career opportunities available to junior researchers”.¹¹⁶ He provided the following examples:

¹⁰⁸ WSC 96 [Bournemouth University] para 2.11

¹⁰⁹ Q 79

¹¹⁰ Q 79

¹¹¹ Q 79

¹¹² Q 114

¹¹³ WSC 64 [Medical Schools Council and Dental Schools Council] para 4.5.3

¹¹⁴ WSC 29 [UCL] para 2

¹¹⁵ WSC 18 [Valerie Bevan and Mark Learmonth] para 15

¹¹⁶ WSC 54 [Dr Bryon Jones] para 2.6

- a) Applications for fellowships “generally need to be approved by universities, giving university departments decisive roles in determining which individuals are able to apply for fellowships”;
- b) Researchers on fixed-term grant funded contracts are, “in very many cases”, prohibited from applying for research grants;
- c) PhD students and research assistants “are normally granted access to data and to facilities through established academics”, who decide which individuals are given access to “the best data, the best facilities and the best projects”;
- d) Entry into research collaborations is often dependent on nomination by established academics who are already members; and
- e) Junior researchers normally require grant holders (established academics) to release funding for them to travel to conferences “at which they might get themselves noticed by potential future employers”.¹¹⁷

Dr Jones concluded that this could “lead to a selection in favour of certain individuals, and a selection against women, ethnic minorities and people from economically disadvantaged backgrounds”.¹¹⁸ Highlighting that this issue could hinder men too, he stated “pushy, loud or articulate individuals are more likely to be noticed by established academics” and “junior researchers who are quiet, shy, reticent or polite can be denied opportunities regardless of their abilities as researchers”.¹¹⁹ Dr Jones acknowledged that “it is dangerous to generalise about personality types and gender”, but stated that “an aggressive pushiness may be more common among men than women, which may help some types of men to get essential career support from established academics”.¹²⁰ The University of Manchester stated that “unconscious bias also extends to matters including lack of invitations to speak at seminars or international conferences—such invitations are important to promotion”.¹²¹

23. Women scientists may also perceive promotions as undesirable. The British Medical Association explained that “men are more likely to put themselves forward for leadership/senior positions than women” and that “for a complex set of reasons, women are more hesitant to apply for promotions”.¹²² On the basis of internal promotion data, the National Physical Laboratory (NPL) concluded that “once a female got to the promotion panel there was a 100% success rate”.¹²³ NPL added that “this is not the case for male candidates and might suggest that women wait until they feel completely ready before applying for promotion”.¹²⁴ The Medical Schools Council and Dental Schools Council also considered that “women tend to wait until they meet all the criteria for promotion, whereas men tend to be more speculative in their applications” and that “consequently, women are

¹¹⁷ WSC 54 [Dr Bryn Jones] paras 2.6-2.7

¹¹⁸ WSC 54 [Dr Bryn Jones] para 2.9

¹¹⁹ WSC 54 [Dr Bryn Jones] para 2.10

¹²⁰ WSC 54 [Dr Bryn Jones] para 3.2

¹²¹ WSC 14 [University of Manchester] para 3.7

¹²² WSC 85 [British Medical Association] Para 20

¹²³ WSC 43 [NPL] para 4

¹²⁴ WSC 43 [NPL] para 4

less likely to submit themselves for consideration for promotion without encouragement or mentoring”.¹²⁵ The University of Manchester added that “women often perceive that aggressive political skills are required at the top of the career ladder or in positions of authority” and they “may not want to adopt this style of leadership”.¹²⁶ The Athena SWAN Committee at the Institute of Health and Society (IHS), Newcastle University, stated that it had “discovered a perception among younger female members of the IHS staff that a period of maternity leave has to be ‘made up’ before they can compete on equal terms with men”.¹²⁷

24. Interestingly, the skills that are normally considered essential to leadership are undervalued in academia: ScienceGrrl stated that “non-research skills (e.g. leadership, mentoring, pastoral care, teaching, project/lab management) appear to be largely ignored” in career advancement.¹²⁸ This can be a gender issue as “anecdotally [...] more women than men take on so-called ‘soft’ responsibilities”.¹²⁹ The STFC WiSTEM Network stated that:

Evaluation of success in STEM jobs typically relies heavily on ‘quantity’ [...], technical ability and intellectual rigor, but often fails to formally highlight and recognise facets of ability which have a significant impact on actual performance. For example, academic scientists spend a considerable proportion of their time communicating (in articles, at conferences and seminars), networking, writing grant proposals, supervising students, managing staff, teaching and—increasingly—performing public outreach activities and working on the commercial exploitation of their findings.¹³⁰

How non-research activities are valued in academia is further explored in paragraph 51.

Research funding

25. Securing research funding is vital to academic success. The University of Oxford stated that “grant-awarding processes themselves may not be free from bias” and that “even if the allocation process is bias-free, evidence shows that women are less likely to apply for funding; apply for smaller amounts of funding for a shorter duration; and wait longer after rejection before applying again”.¹³¹ Because of this, women tend to “progress more slowly up the career hierarchy, reducing the number of women in senior positions”.¹³² Portia Ltd similarly stated that “fewer women than men apply for research grants—in numbers that correlate to how many women are present at professorial levels” and that “when women do apply, they are minimally but systematically less successful than men in being awarded a grant, even in fields where they are well represented, such as Life Sciences and Social

¹²⁵ WSC 64 [Medical Schools Council and Dental Schools Council] para 4.2.1

¹²⁶ WSC 14 [University of Manchester] para 3.8

¹²⁷ WSC 32 [Athena SWAN Committee, Institute of Health and Society (IHS), Newcastle University] para 1.3.1.3

¹²⁸ WSC 49 [ScienceGrrl] para 13

¹²⁹ WSC 49 [ScienceGrrl] para 14

¹³⁰ WSC 90 [STFC WiSTEM Network] para 5.6

¹³¹ WSC 42 [University of Oxford] para14

¹³² WSC 42 [University of Oxford] para14

Science”.¹³³ The Open University (OU) stated that “current research suggests that women are not put forward or encouraged to put themselves forward [for European Research Council grants] because the criteria stipulate excellence and future leadership, and women are less confident about making those sorts of claims for themselves at an early career stage”.¹³⁴ By applying for smaller grants, women researchers “have less money to engage additional researchers in their projects (e.g. to provide statistical or data analysis support)”.¹³⁵

Publication

26. The Open University (OU) stated that “publication is key to successful career development for women in STEM but evidence shows women are less likely to get published, to be first author [and] to be on editorial boards”.¹³⁶ The Royal Society of Chemistry stated that “generally, women write more comprehensive and concise journal papers than men, resulting in fewer publications but ones that are more widely cited”.¹³⁷ The British Medical Association stated that “there is anecdotal evidence that men are more likely to repeatedly submit their research for publication, despite initial rejection, and women less likely to resubmit their research after rejection”.¹³⁸ Double-blind peer review, where the identities of authors and reviewers of articles are anonymised, is intended to reduce bias.¹³⁹ The Campaign for Science and Engineering (CaSE) stated that “double-blind peer review for publications and grant applications may be necessary to help to minimise discrimination”, although it recognised that “the process of peer review itself makes true “blind” review difficult to attain”.¹⁴⁰ We investigated measures being taken to reduce publication bias as part of our 2011 inquiry on *Peer review in scientific publications*.¹⁴¹

Working patterns

27. Women are “more likely than men to take a career break for parental leave and are more likely to be working on a part-time basis”.¹⁴² Professor Dame Julia Higgins, who gave evidence on behalf of the Royal Society, stated that in her experience working at Imperial College London, “the departments have been quite readily flexible” around working hours.¹⁴³ She added that “the interesting thing has been persuading the women to ask for the flexibility, which, of course, is partly a perception of what the culture will be like”.¹⁴⁴

¹³³ WSC 13 [Portia Ltd] para 4

¹³⁴ WSC 102 [Open University] para 9

¹³⁵ WSC 13 [Portia Ltd] para 5

¹³⁶ WSC 102 [Open University Supplementary] Para 10

¹³⁷ WSC 72 [Royal Society of Chemistry] para 24

¹³⁸ WSC 85 [British Medical Association] para 21

¹³⁹ Science and Technology Committee, Eighth Report of Session 2010-12, *Peer review in scientific publications*, HC 856 paras 15–20

¹⁴⁰ WSC 98 [Campaign for Science and Engineering]

¹⁴¹ Science and Technology Committee, Eighth Report of Session 2010-12, *Peer review in scientific publications*, HC 856

¹⁴² WSC 72 [Royal Society of Chemistry] para 15

¹⁴³ Q 62

¹⁴⁴ Q 62

Sarah Dickinson, Equality Challenge Unit, stated that “quite often the senior management and the head of department know that these policies are in place, that there is flexible working, core hours and things like that, but when they survey the staff there is a large proportion who are not aware of these policies”.¹⁴⁵ She considered that “it is just a case of making sure that everyone knows about them”.¹⁴⁶ Not everyone agreed that it was simply a case of increasing awareness of flexible working options. STEM careers “are often portrayed to be both all-consuming and overwhelmingly competitive” with a “strong preconception that one cannot participate in science on anything other than a completely immersive basis”.¹⁴⁷ The “aggressive” academic environment where there is “a general belief that individuals are working against one another” contributes to “a feeling that part time working and parental leave is frowned upon and will compromise a woman’s career”.¹⁴⁸ The BMA stated that women working part time are “more likely to encounter perceptions that they are less dedicated and less productive than full time colleagues, with the result that they are passed over for promotion”.¹⁴⁹

Improving diversity and equality

Diversity and equality training

28. Evidence submitted to our inquiry suggested that gender biases in STEM are likely to be largely unconscious rather than intentional. Referring to the Yale study (see paragraph 20), the IMarEST stated that “the sexism exhibited was unconscious, as scientists would give other reasoning for their decision” and suggested that “we need more awareness of this, so that a conscious effort can be made to overcome any such bias; obviously there are academics who would want to change this, if only they knew they were doing it”.¹⁵⁰ However, there is some denial of the existence of bias amongst scientists. Professor Jo Handelsman, the lead author of the Yale study, has stated that whenever she gives “a talk that mentions past findings of implicit gender bias in hiring, inevitably a scientist will say that can’t happen in our labs because we are trained to be objective”.¹⁵¹ Dr Valerie Bevan and Professor Mark Learmonth stated that “most scientists have little or no background in feminism or qualitative research; in fact they eschew anything that is not deemed to be objective, rational or evidence based”.¹⁵² Dr Bevan highlighted her personal experience working for a “major employer of healthcare scientists” where “the majority of senior staff did not see equality and diversity issues as part of their core activities” and therefore “all white male appointment panels were common and [...] seen to be fair because the panel was composed of ‘objective scientists’”.¹⁵³ Portia Ltd explained that “scientists may be rigorously trained to be objective, but just like the society at large, hold gender

¹⁴⁵ Q 62

¹⁴⁶ Q 62

¹⁴⁷ WSC 90 [STFC WSTEM NETWORK] para 5.3

¹⁴⁸ WSC 80 [IMarEST] para 3.3

¹⁴⁹ WSC 85 [BMA] para 10

¹⁵⁰ WSC 80 [The Institute of Marine Engineering, Science & Technology (IMarEST)] para 3.7

¹⁵¹ Yale News, *Scientists not immune from gender bias, Yale study shows*, Press Release, 24 September 2012

¹⁵² WSC 18 [Dr Valerie Bevan and Professor Mark Learmonth] para 15

¹⁵³ WSC 18 [Dr Valerie Bevan and Professor Mark Learmonth] para 17

beliefs that tend to valorise men's progress".¹⁵⁴ There was strong support for diversity bias training. The London Mathematical Society highlighted that "there are many practicalities that would make it difficult to ensure that application processes in academia were gender blind" and suggested that "those involved in selection panels and grant review panels could, however, be required to undergo training on unconscious bias".¹⁵⁵ The Society for General Microbiology similarly suggested that "all academic staff should receive unconscious bias training [...] before they can run a research group" because "individual principal investigators responsible for developing their research team members' careers may not be" trained.¹⁵⁶ Many supported the view that "such training can force people to face up to their prejudices and examine the ways that their behaviours, intentional or otherwise, can affect others, especially minorities".¹⁵⁷ Cardiff University stated that "universities need to mainstream and make mandatory equality and diversity training, with particular emphasis on the phenomenon of the potential consequences of unconscious bias in recruitment and promotion".¹⁵⁸ Many universities do offer unconscious bias training.¹⁵⁹ However, the University of Manchester cautioned that while "many institutions are starting to deliver training" there could also be "a lack of take-up of this training by those who need it most".¹⁶⁰

29. Scientists are susceptible to the same unconscious gender biases as the rest of the population and it is unfortunate that some are unwilling to accept this simply because their professional research requires them to be objective. It is important to recognise that biases that harm women are held by both men and women.

30. *We recommend that diversity and equality training, including unconscious bias training, should be provided to all STEM undergraduate and postgraduate students by their Higher Education Institution (HEI). In addition, such training should be mandatory for (i) all members of recruitment and promotion panels for STEM jobs in HEIs; and (ii) all line managers and supervisors of staff.*

31. *All research funders should also ensure that diversity and equality training is provided to all members of grant application review panels. This is particularly important where women are under-represented on those panels and in the STEM discipline being considered.*

32. The University of Manchester also highlighted an additional recruitment stage where bias could occur: search committees,¹⁶¹ which are "often dominated by men who only access their own networks (which usually are made up of other men) so potential female candidates do not get identified or approached early on in the recruitment process".¹⁶² This

¹⁵⁴ WSC13 [Portia Ltd] para 14

¹⁵⁵ WSC 73 [London Mathematical Society] para 5.7

¹⁵⁶ WSC 39 [Society for General Microbiology] para 3

¹⁵⁷ WSC 41 [Dr Katherine Sloyan] para 12

¹⁵⁸ WSC 19 [Cardiff University with contributions from the Cardiff Women in Science Network] para 26

¹⁵⁹ For example, WSC29 [UCL] para 22; WSC 61 [University of Stirling] para 11; WSC44 [Imperial College London] para 17

¹⁶⁰ WSC 14 [The University of Manchester] Para 3.7

¹⁶¹ Panels of high-level academics who search for good candidates for available posts

¹⁶² WSC 14 [The University of Manchester] Para 3.4

could be only partly excused by the under-representation of women in the pool of potential candidates. In many cases, “senior academic roles do not even have search committees”.¹⁶³ Positive action may provide some solutions. The Equality and Human Rights Commission (EHRC) defines positive action as “the steps that you can take as an employer to encourage people from groups with different needs or with a past track record of disadvantage or low participation to apply for jobs”.¹⁶⁴ For example, positive actions included “encouraging applications from under-represented groups, such as through targeted advertising”.¹⁶⁵ Positive action “is not the same as positive discrimination, and does not involve treating particular groups more favourably when recruiting”.¹⁶⁶ ***Universities should ensure that recruiters and search committees identifying potential candidates for senior roles give particular consideration to encouraging suitably qualified female candidates, in line with the principles of positive action.***

Role models and mentoring

33. Girlguiding UK stated that “it’s hard to consider what career you want to pursue or what you want to achieve in life if you don’t have strong role models to inspire you”.¹⁶⁷ It explained that:

many older girls (16 plus) are alert to high-profile figures with interests and ambitions that reflect their own, male and female, but there are few examples from politics or male-dominated fields such as engineering, where girls’ professed lack of interest means that they pay little attention. Those who consider such careers tend to be independent minded and positive about standing out from their peers.¹⁶⁸

The University of Oxford stated that the “lack of women perpetuates the masculine culture of many science departments, in turn deterring female undergraduates and graduates from remaining in academia”.¹⁶⁹ The Russell Group Equality Forum stated that the “distinct lack of successful female role models with families” means that “graduates see academia as somewhere not to have a successful career and a family”.¹⁷⁰ The “low numbers of women in senior positions often leads to a perceived ‘invisibility’ of successful women in academic STEM careers”.¹⁷¹ This is likely to discourage “the anticipation of success among female scientists who wish to progress further” and to perpetuate “current cultural norms”.¹⁷² Role models are essential to “evidence the possibility of success” and to “encourage women to actively advance their own careers”.¹⁷³ Mentors and role models also “have a vital role in

¹⁶³ WSC 14 [The University of Manchester] Para 3.4

¹⁶⁴ Equality and Human Rights Commission, *Positive Action in Recruitment*, <http://www.equalityhumanrights.com>

¹⁶⁵ Equality and Human Rights Commission, *Positive Action in Recruitment*, <http://www.equalityhumanrights.com>

¹⁶⁶ Equality and Human Rights Commission, *Positive Action*, <http://www.equalityhumanrights.com>

¹⁶⁷ WSC 75 [Girlguiding] para 15

¹⁶⁸ WSC 75 [Girlguiding] para 13

¹⁶⁹ WSC 42 [University of Oxford] para 26

¹⁷⁰ WSC 71 [Russell group equality forum] para 3

¹⁷¹ WSC 74 [Society of Biology] para 14

¹⁷² WSC 74 [Society of Biology] para 14

¹⁷³ WSC 74 [Society of Biology] para 14; WSC 80 [IMarEST] para 6.5

setting cultural norms”.¹⁷⁴ Women who have mentors “publish more, carry out more research and have greater career satisfaction than those without”.¹⁷⁵ Queens University, Belfast, highlighted how increasing the transparency of promotion processes and providing mentoring to encourage women to apply for promotion meant that “over time, we have found that women’s chances of being successfully promoted match, and even outweigh, those of men”.¹⁷⁶

34. Role models cannot simply be women in senior positions; the University of Oxford stated that “women consistently report that they have few ‘ordinary’ role models available”, that is, “women who are juggling a career in science with some form of work-life balance and/or having a family”.¹⁷⁷ There is a perception “that to succeed in a STEM career, women have to be ‘super-human’ which deters many from staying”.¹⁷⁸ UCL Engineering considered that “more examples of positive work-personal life balances and plenty of role models need collecting – especially across engineering to showcase the ‘normal’ over the super women”.¹⁷⁹ It also suggested that “diverse stories—including how dual career couples have managed—should be included”.¹⁸⁰ The Open University (OU) suggested that “role models should not only include women but also role models of successful men who work part time and take on caring roles, so that it is not only women who are always seen as being responsible for childcare”.¹⁸¹ The OU explained that “women scientist role models are problematic as they are often intertwined with personal biographies about their partners and children in a way that men’s stories are not, so parity about how role models are portrayed is needed”.¹⁸² The Royal Academy of Engineering stated that “having high profile men who take advantage of flexible work contracts or who have made it to senior positions via non-traditional routes is really important”.¹⁸³

35. Women in senior positions in academia can experience disproportionate pressure to act as a role model or to participate in activities designed to improve the visibility and influence of women. Dr Katherine Sloyan stated that “there is pressure on high-achieving women to act as role models, which, while sometimes flattering, can lead to additional unwanted stress: it is not pleasant feeling like you’re representing all women all of the time”.¹⁸⁴ While greater representation of women in committees provides “more visible role models for junior staff”, it can also “have the unintended consequence of further burdening talented female staff with administrative activities”.¹⁸⁵ This can mean that “male counterparts are free to pursue activities that are perhaps more highly valued by senior

¹⁷⁴ WSC 91 [Wellcome Trust] para 23

¹⁷⁵ WSC 85 [British Medical Association] para 21

¹⁷⁶ WSC 88 [Queens University, Belfast] para 13

¹⁷⁷ WSC 42 [University of Oxford] para 26

¹⁷⁸ WSC 42 [University of Oxford] para 26

¹⁷⁹ WSC 59 [UCL Engineering] para 22

¹⁸⁰ WSC 59 [UCL Engineering] para 22

¹⁸¹ WSC 102 [Open University] para 7

¹⁸² WSC 102 [Open University] para 7

¹⁸³ WSC 95 [Royal Academy of Engineering] para 22

¹⁸⁴ WSC 41 [Dr Katherine Sloyan] para 9

¹⁸⁵ WSC 61 [University of Stirling] para 10

managers”.¹⁸⁶ ScienceGrrl considered that “successful mentors and sponsors can be male or female”.¹⁸⁷ However, Newcastle University stated that while “there is no reason why a female should not have a male mentor”, a senior male academic “is less likely to fully appreciate the impact of work and family responsibilities women frequently have to deal with”.¹⁸⁸ It was also highlighted that there may be “some stigma against senior men associating with junior women (either real or perceived)”.¹⁸⁹

36. The Equality Challenge Unit (ECU) highlighted that “quick wins” for universities wanting to support their staff included “induction, networking and mentoring”.¹⁹⁰ The ECU report, *Mentoring: progressing women’s careers in higher education* makes recommendations on how to implement mentoring in HEIs and highlights the benefits of mentoring schemes.¹⁹¹ Athena SWAN “does not have a check-list of objective essential activities that universities must do to retain women academics”, but it highlights activities such as improving the “visibility of women” and “induction and training, [for example] all staff given a comprehensive induction and may be assigned a mentor”.¹⁹²

37. Role models are important for inspiring males and females to study STEM subjects and pursue STEM careers. The lack of senior or high-profile women scientists reduces the availability of female role models, which particularly affects girls and women.

38. The National Academies, learned societies and HEIs should emphasise both male and female role models who have successfully combined a STEM career with family life. In particular, highlighting male scientists who have combined career with childcare and family responsibilities could help to counter perceptions that these are women’s issues rather than matters that concern all parents.

39. There is strong support for mentoring schemes and evidence that it encourages women to apply for promotions and other opportunities. We recommend that HEIs and other STEM employers should implement mentoring schemes for all staff, with particular attention paid towards mentoring for women and other groups that are under-represented at senior levels.

¹⁸⁶ WSC 61 [University of Stirling] para 10

¹⁸⁷ WSC49 [ScienceGrrl] para 12

¹⁸⁸ WSC 55 [Newcastle University] para 2.4

¹⁸⁹ WSC 80 [IMarEST] para 3.4

¹⁹⁰ WSC 51 [Equality Challenge Unit] para 9

¹⁹¹ Equality Challenge Unit, *Mentoring: progressing women’s careers in higher education*, April 2012, p.21

¹⁹² WSC 51 [Equality Challenge Unit] para 8

4 Practicalities of an academic career

Early career instability

Short term contracts

40. Academic research funding is provided through the dual-support system where the four UK Higher Education Funding Councils provide core funding for infrastructure, including permanent staff costs, and the Research Councils award grants for specific research groups and projects.¹⁹³ Other funding sources for research include charities and the private sector. Following completion of a PhD, Post-Doctoral Researchers (PDRs, also referred to as “post-docs”) are usually employed under a series of short-term contracts of one to five years before gaining a permanent academic contract.¹⁹⁴ A typical research group would be led by a Principal Investigator (PI) and a number of post-docs and PhD students who carry out research under the supervision of the PI. The PI, who is usually a permanent member of staff, applies for funding for specific projects (for example, research grants) and appoints post-docs to work on those projects.¹⁹⁵ Grant funding is usually tied to a particular PI at one institution under whom a post-doc may be employed on a fixed term basis. Alternatively, post-docs may obtain a research fellowship, where funds are awarded directly to an individual to pursue their choice of independent research, typically for up to 5 years.¹⁹⁶ Because fellowship funding is attached to an individual, the researcher (PI or post-doc) has greater choice over where to do their research.

41. The Society of Biology highlighted that short term contracts encouraged mobility between institutions both nationally and internationally to “expand training and skills development”.¹⁹⁷ This was considered to be useful to the scientific community as movement of post-docs fostered collaboration between research groups on an international scale and “institutions recognise that collaborations borne from the movement of scientists invigorate science through discussion and the exchange of ideas”.¹⁹⁸ Professor Uta Frith, Russell Group, explained that “short-term contracts are probably inevitable in a very competitive situation” and that they encouraged innovation.¹⁹⁹ She added that short term contracts were a way of ending research projects that had originally seemed “promising” but were not.²⁰⁰ Short term contracts are beneficial to Higher Education Institutions (HEIs), the employers of post-docs, according to a report by our predecessor committee, which found that:

¹⁹³ The four funding councils are the Higher Education Funding Council for England (HEFCE), the Higher Education Funding Council for Wales (HEFCW), the Scottish Funding Council (SFC) and the Department for Employment and Learning in Northern Ireland.

¹⁹⁴ WSC 44 [Imperial College London] para 7

¹⁹⁵ WSC 90[STFC WSTEM Network] para 11.13

¹⁹⁶ WSC 88 [Queens’ University Belfast] para 20

¹⁹⁷ WSC 74 [Society of Biology] para 8

¹⁹⁸ WSC 21 [Dr Nicola Patron] para 2

¹⁹⁹ Q 100

²⁰⁰ Q 100

The employing university benefits from short-term contracts in that it employs a researcher only for the duration of the external research grant. It need make no predictions about its ability to attract funding for future research for which an individual researcher is qualified. Put simply, the university places all the risk over its future research income onto the researcher.²⁰¹

For a typical post-doc, the period of employment under short term contracts occurs when they are 25-35 years old, meaning early academic careers are “relatively unstable in what is known to be a crucial period [...] for both men and women”.²⁰² This instability can make it difficult to secure a mortgage and “inhibits continuity of employment rights”.²⁰³ The Society of Applied Microbiology considered that “this is discouraging for scientists who also wish to establish a stable home and family”.²⁰⁴ The STFC WiSTEM Network explained that the need to be geographically mobile “particularly during early career, is a major obstacle highlighted by women, especially when contrasted with the financial rewards and stability other careers with such demands can bring in the long term”.²⁰⁵ Bournemouth University highlighted that post-docs with a partner suffer additional difficulties; if the partner has a job outside academia they may not be geographically mobile and the “partner’s non-academic career can often be prioritised, being more likely to provide a permanent rather than fixed term contract and therefore more stability”.²⁰⁶ If both partners are in academia they can suffer from the “two-body” problem where “if one member of an academic couple accepts a job in a distant location, it can be very difficult for the other to follow, without their career being negatively affected”.²⁰⁷ While this can affect both women and men, a 2010 survey showed that “42% of females had partners working in STEMM (compared to 29% of males)” making it a proportionally larger issue for women.²⁰⁸ The Open University stated that in dual academic careers, “women are more likely to follow their male partners than the reverse” if there is a need to relocate.²⁰⁹ Professor Dame Julia Higgins explained that “historically, it has usually been the woman’s career that has given way to the man’s career” and that although “it should not automatically be the woman who gives in [...] it nearly always is”.²¹⁰ The situation is exacerbated by some research fellowships specifying that a post-doc must relocate to a different university or country: these tend to be from charity or industry funders, for example the Marie Curie and Wellcome Trust Fellowships in life sciences and AXA research fellowship.²¹¹ For post-docs

²⁰¹ Science and Technology Committee, Eighth Report of Session 2001–02, *Short-term research contracts in science and engineering*, HC 1046, para 14; for Government response see Science and Technology Committee, Fourth Special Report of Session 2002–03, *Short term research contracts in science and engineering Government response to the committee’s Eighth Report of Session 2001–02*, HC 442

²⁰² WSC 44 [Imperial College London] para 7

²⁰³ WSC 65 [Sean McWhinnie, Oxford Research and Policy, and Jan Peters, Katalytik] para 22; WSC 64 [Medical and Dental Schools Council] para 4.3.3

²⁰⁴ WSC 68 [Society for Applied Microbiology]

²⁰⁵ WSC 90 [STFC WiSTEM Network] para 7.4

²⁰⁶ WSC 96 [Bournemouth University] para 2.6

²⁰⁷ WSC 51 [Equality Challenge Unit] para 3

²⁰⁸ WSC 81 [Institute of Physics] para 18

²⁰⁹ WSC 22 [The Open University] para 15

²¹⁰ Q 70

²¹¹ WSC 21 [Dr Nicola Patron] para 11

considering starting a family, the lack of a permanent position can impact on their entitlement to maternity leave.²¹² Therefore the early stages of academia are where most women are lost in the “leaky pipeline” of science careers.²¹³

42. The ScienceGrrl Campaign explained that many male and female scientists were unhappy with the system. For example, a male post-doc stated that he was “tired of the nomadic lifestyle which had prevented settling down” and added that “it’s also played havoc with long-term financial stability with regards to pensions and house buying”.²¹⁴ A female lecturer considered that had she not gained a permanent post she would have “left academia as I had reached the point where I could no longer deal with the uncertainty and moving around”.²¹⁵ Dr Nicola Patron, a UK academic whose partner lives in Australia, stated that “my current contract is for two years and I expect that at least one more national or international move will be necessary”.²¹⁶ Dr Patron explained that short term contracts were a problem for productivity as a significant proportion of time would be spent on securing the next contract.²¹⁷ In 2011, the Science is Vital Campaign produced the report *Careering Out of Control: A Crisis in the UK Science Profession?* which stated that “the constant cycling of new people through labs on short-term contracts is detrimental to productivity as expertise is lost and has to be constantly refreshed”.²¹⁸ Prospect stated that “there are strong concerns related to funding for research and the short term nature of many contracts in research, even in fields where the research is more valuable when it is long term, such as climate science”.²¹⁹

43. Some research funders are moving towards offering longer term grants and fellowships, for example, Dr Leslie Thompson, Research Councils UK (RCUK), stated that “it has been a policy of [the EPSRC²²⁰] to move from less than 5 per cent of our grants being of three years or longer in duration to a third of the grants being of a longer duration”.²²¹ Dr Thompson also stated that “institutions don’t always use the flexibility they could have for managing their population of short-term researchers as creatively as they might do”.²²² She considered that this was “because the responsibility is, more often than not, put on the shoulders of the individual research lecturer, not on the shoulders of the department or the institution as the employer”.²²³ The Women’s Engineering Society suggested that “a clear career path should be devised for all universities which enables a route up the ladder without having to move from city to city or having to take fixed term contracts”.²²⁴

²¹² WSC 65 [Sean McWhinnie, Oxford Research and Policy, and Jan Peters, Katalytik] para 22

²¹³ WSC 21 [Dr Nicola Patron] para 6

²¹⁴ WSC 49 [ScienceGrrl] para 3

²¹⁵ WSC 49 [ScienceGrrl] para 3

²¹⁶ WSC 21 [Dr Nicola Patron]

²¹⁷ Q6 Dr Patron

²¹⁸ Science is Vital Campaign, *Careering out of control: a crisis in the UK science profession*, October 2011, p.12, <http://scienceisvital.org.uk>

²¹⁹ WSC 7 [Prospect] para 7

²²⁰ Engineering and Physical Sciences Research Council

²²¹ Q157 Dr Thompson

²²² Q157 Dr Thompson

²²³ Q157 Dr Thompson

²²⁴ WSC 38 [Women’s Engineering Society]

Dr Patron suggested that funding agencies should “offer competitive long-term fellowships (2–3 years) that do not require relocation but which do provide funding for short term travel to other labs (1-3 months) so that collaborative networks are still built”.²²⁵ Other suggestions included that research councils could “provide a greater number of long-term fellowships” or “offer new competitive Fellowship schemes specifically aimed at academics who have had to relocate in order to follow a partner”.²²⁶ The University of Oxford suggested that HEIs should provide post-docs “with a month free from lab work to write their next application; or bridging funding of three months [or] a part-time position to sustain their research career between external contracts”.²²⁷ Bridging funding was also recommended by others.²²⁸ The Royal Academy of Engineering considered that as the Government “has a substantial influence over university culture through the funding provision it makes and the level of certainty of future funding levels”, an “increase in the level of future funding certainty would help the HE sector to plan and underwrite more longer term contracts for staff”.²²⁹ The Cambridge Association for Women in Science and Engineering went further and suggested that “legislation could be introduced to limit the use of short term contracts”.²³⁰

44. The Minister considered that “the life of a post-doctoral researcher is pretty tough” and that having “to move around on short-term contracts” might “be off-putting for some women”.²³¹ When asked about short term contracts in research, the Minister explained “we have always got to get a balance between short and long term [contracts], but with things like Royal Society fellowships, which we support financially, there are opportunities to get work done on a much longer time scale”.²³² The Minister stated that “the Vitae career development requirements are very good, in that they say that the PI—the organisation employing you on the contract—has an obligation to think about your long-term interests, advise you on what to do next and help you on that”, which he noted had “been one of the big omissions in the past”.²³³

45. Balancing the benefits of short term contracts with the needs of Post-Doctoral Researchers was examined by our predecessor committee in 2002. We are disappointed at the lack of progress in the last decade. The system of short term employment contracts for post-docs results in job insecurity and discontinuity of employment rights that is difficult for any researcher, but disproportionately deters women from continuing with science careers. It also has implications for workforce productivity.

46. We are pleased that some research funders are recognising the benefits of long term contracts to academic careers and encourage others to follow this example. We

²²⁵ WSC 21 [Dr Nicola Patron] para 18

²²⁶ WSC 41 [Dr Katherine Sloyan] para 11; WSC 73 [London Mathematical Society] para 5.8

²²⁷ WSC 42 [University of Oxford] para 39

²²⁸ For example, WSC 37 [Newcastle University Universities and Colleges Union] para 7, WSC 19 [Cardiff University] para 12

²²⁹ WSC 95 [Royal Academy of Engineering] para 23

²³⁰ WSC 33 [Cambridge Association for Women in Science] para 7a

²³¹ Q170 [Mr Willetts]

²³² Q193 [Mr Willetts]

²³³ Q193 [Mr Willetts]

encourage Higher Education Institutions (HEIs) to provide longer term posts for post-docs, recognising the benefit to scientific progress of continuing expertise.

47. *We recommend that the Government should work with the Higher Education sector to review the academic career structure and increase the number of more stable and permanent post-doc positions.*

48. *International collaboration brings benefits to science but requiring researchers to relocate is not the only way to promote it. We suggest that research funders should remove from fellowship conditions any requirements for researchers to move institute or country and instead provide funding for shorter visits to other institutes for collaboration purposes. We recommend that research funders work with HEIs to create funding for permanent post-doc positions.*

49. *Wherever possible, HEIs should provide three months of bridging funding for post-docs, to allow them time to apply for new contracts.*

Time away from research

50. Throughout their career a researcher's success is measured by their track record, which means securing grant funding for research and publishing their research as papers.²³⁴ Achieving funding and having a good publication record are interlinked: a good publication record usually attracts funding.²³⁵ However, assessing publication records by the number and impact of papers produced “militates against career breaks or reduced working hours”.²³⁶ For example, the h index, a commonly used measure, makes no allowance for time away from research or for part time working.²³⁷ The Royal Academy of Engineering explained that:

This emphasis on individual output over a specific period of time presents a fundamental difficulty for those wishing to take a career break to change employment patterns or working hours whilst maintaining progress to higher grades within the university [...] [It] can affect any staff who need to juggle research demands with childcare or other caring responsibilities, or even those who wished to take a sabbatical to work in industry.²³⁸

Non-research activities

51. Women researchers may be more likely than men to participate in non-research activities such as teaching and outreach. The British Medical Association stated that women “end up carrying out non-research roles [...] more often than men, reducing the time available for their research activities”.²³⁹ The London Mathematical Society explained

²³⁴ WSC 21 [Dr Nicola Patron] para 1

²³⁵ WSC 66 [Physiological Society] para 9

²³⁶ WSC 90 [STFC WISTEM Network] para 5.5

²³⁷ WSC 17 [Plymouth Marine Laboratory] para 6; the h index considers both the number of published papers and the number of citations; for example, a researcher with an h index of 10 has written 10 papers that have received at least 10 citations each

²³⁸ WSC 95 [Royal Academy of Engineering] para 5

²³⁹ WSC 85 [British Medical Association] para 19

that “surveys of women mathematicians show that many women feel that they are often asked to take on teaching and pastoral roles”.²⁴⁰ Promotion in STEM careers “is assessed by criteria such as research income and publication output, metrics that have been recently shown to discriminate against women”.²⁴¹ Promotion criteria also “tend to under-emphasise other activities such as student-oriented roles, including pastoral care and teaching, and community-oriented roles such as departmental administration or outreach work”.²⁴² The STFC WiSTEM Network stated that:

academic scientists spend a considerable proportion of their time communicating (in articles, at conferences and seminars), networking, writing grant proposals, supervising students, managing staff, teaching and—increasingly—performing public outreach activities and working on the commercial exploitation of their findings.²⁴³

However, such activities are not formally recognised or rewarded in a systematic way across the HE sector. The British Medical Association considered that such activities which “impact adversely on research profiles and career progression, should be acknowledged and valued”.²⁴⁴ There was also a view that “the definition of excellence used is often too narrowly focused on specific research-related metrics”.²⁴⁵ The Royal Academy of Engineering recommended that “HEIs’ promotions criteria should be examined to ensure that contributions across management, out-reach, knowledge transfer activity, teaching [and] research are equally and appropriately recognised”.²⁴⁶ The Physiological Society suggested that there should be “greater scrutiny to ensure that truly unbiased measures are used and supported”.²⁴⁷ The STFC WiSTEM Network stated that “quantitative measures of staff and job applicants’ productivity such as number of papers published and h-index should be replaced with a comprehensive evaluation of the person’s contribution to the organisation and the field”.²⁴⁸ For example, there should be “acknowledgement and credit for tasks such as organisation of group seminars, engagement with visiting school-children, mentoring junior colleagues, taking on placement students, acting as counsellors”.²⁴⁹

The Research Excellence Framework (REF)

52. The Research Excellence Framework (REF) is the new system for assessing the quality of research in UK higher education institutions and will be completed in 2014.²⁵⁰ The REF will be used by funding councils to assess HEIs for quality-related funding (block

²⁴⁰ WSC 73 [London Mathematical Society] para 2.7

²⁴¹ WSC 66 [Physiological Society] para 8

²⁴² WSC 74 [Society of Biology] para 10

²⁴³ WSC 90 [STFC WiSTEM Network] para 5.6

²⁴⁴ WSC 85 [British Medical Association]

²⁴⁵ WSC 74 [Society of Biology] para 10

²⁴⁶ WSC 95 [Royal Academy of Engineering] para 15

²⁴⁷ WSC 66 [Physiological Society] para 24

²⁴⁸ WSC 90 [STFC WiSTEM Network] para 11.9

²⁴⁹ WSC 90 [STFC WiSTEM Network] para 11.9

²⁵⁰ Research Excellence Framework, *Research Excellence Framework*, <http://www.ref.ac.uk>; The deadline for REF submissions from HEIs was November 2013

grants).²⁵¹ The REF does not measure non-research activities but is a measure of the quality of research at an institution.²⁵² Individuals are still measured by their publications and citations but the REF compensates for researchers who have taken a career break or are working part time (for example, fewer publications).²⁵³ The Higher Education Funding Council for England (HEFCE) manages the REF exercise on behalf of the four UK Higher Education funding bodies.²⁵⁴ David Sweeney, Chief Executive of HEFCE, stated that the REF now required:

only four outputs per person submitted. If you have career gaps, we allow the number of outputs to decrease. We have provided considerable advice to institutions on when it is appropriate for that to happen. There are some clearly defined circumstances that you can just apply formulaically, and for more complex circumstances, such as caring responsibilities, we have an equalities and diversity advisory panel that considers cases that institutions put. We are absolutely determined that clear gaps, whether it is from gender-related issues or industry engagement, should not hinder those who are really good from demonstrating their excellence.²⁵⁵

53. When asked about the measurement of non-research activities, Mr Sweeney stated that “nationally and internationally, [...] there is no appropriate robust measure of the quality of teaching”.²⁵⁶ In October 2013, the Minister stated that “one of the principal aims of this Government’s higher education reforms has been to place students back at the heart of universities where they belong” which “means strengthening the incentives to focus on teaching”.²⁵⁷ He considered that:

the academic community and governments have created very strong competitive funding for research which drives such excellent performance across a breadth of disciplines. However there was no matching incentive to focus on teaching [...] the pendulum has swung too far away from teaching.²⁵⁸

The Royal Society of Chemistry suggested that “HEFCE reviews the REF process to check for any potential, unintended effects on the gender balance in STEM disciplines” as “procedures that may have unintended consequences are those that do not recognise collaborative ways of working, which women tend to prefer, and procedures that lead to (or reflect) particular individuals having a celebrity-like status within their community – the majority [of] whom are currently men”.²⁵⁹ Mr Sweeney confirmed that HEFCE:

²⁵¹ Research Excellence Framework, *Research Excellence Framework*, <http://www.ref.ac.uk>

²⁵² WSC 72 [Royal Society of Chemistry] para 40; Q143 Mr Sweeney

²⁵³ WSC 87 [HEFCE] para 6

²⁵⁴ WSC 87 [HEFCE] para 7

²⁵⁵ Q146

²⁵⁶ Q144 Mr Sweeney

²⁵⁷ Rt Hon David Willetts MP, Social Market Foundation, *Robbins Revisited: Bigger and Better Higher Education*, October 2013, p.56

²⁵⁸ Rt Hon David Willetts MP, Social Market Foundation, *Robbins Revisited: Bigger and Better Higher Education*, October 2013, p.57, p.62

²⁵⁹ WSC 74 [RSC] para 40

will publish the equality impact assessments that institutions have done and we will do a very detailed analysis ourselves, possibly also with the Equality Challenge Unit, as we did in 2009, looking at the outcome. We will see if we have made progress since 2001, which is when I am aware that we first did such an analysis.²⁶⁰

The Minister hoped “that the impact measure [of the REF] will help ensure that some of the outreach and communication activity is properly valued for the first time” and that “we will put into the next grant letter [to HEFCE] very clear guidance on understanding diversity challenges [...] in its approach to the funding of universities”.²⁶¹ **We appreciate that funding from research councils and the REF must be based on scientific and research excellence and support the continuation of this principle. We are satisfied that HECFE takes seriously the issue of monitoring the gender impact of the REF.**

54. We recommend that HEIs and heads of research groups should ensure that important non-research activities are recognised in performance appraisals and promotion boards.

Maternity

55. Although it varies by STEM discipline, the “average age for appointment to lecturer grade” is around 34 years.²⁶² Dr June McCombie told us that this is “when you are eligible for all of the allowances for maternity leave, for support when you come back”.²⁶³ This means that “women may have to make difficult decisions about when to settle down and start a family” because “having a child before a permanent appointment may mean losing a huge amount of time in the early career stages, but waiting until a permanent appointment may mean progressing to senior levels less quickly”.²⁶⁴ Dr Katherine Sloyan summarised the situation as “an unpleasant choice: risk not having children or risk having to restart my career in my mid-thirties”.²⁶⁵ There is legislation to protect women: the Equality Act 2010 prevents discrimination towards women due to pregnancy or maternity leave.²⁶⁶ However, the Institute of Physics stated that there is “anecdotal evidence from many of our members in academia that maternity leave is often organised ad-hoc, poorly implemented at the departmental level and women are not properly informed of their entitlements”.²⁶⁷ There are some issues “surrounding funding when women leave on maternity and whether research can be paused or covered during their leave”.²⁶⁸ Bournemouth University explained that returning to work following maternity leave can also be “particularly challenging” as women must “catch up on research work after a year’s absence” without “additional administrative support or reduction in teaching workload”.²⁶⁹ Cardiff

²⁶⁰ Q 145

²⁶¹ Q 185 Mr Willetts

²⁶² WSC 81 [Institute of Physics] para 11

²⁶³ Q 70 [Dr June McCombie]

²⁶⁴ WSC 81 [Institute of Physics] para 11

²⁶⁵ WSC 41 [Dr Katherine Sloyan] para 5

²⁶⁶ Equality Act 2010, section 18

²⁶⁷ WSC 81 [Institute of Physics] para 12

²⁶⁸ WSC 29 [University College London] para 7

²⁶⁹ WSC 96 [Bournemouth University] para 2.4

University stated that there was also pressure on women to “come back as early as possible” in order for “individuals to retain the same teaching duties and administrative responsibilities, and also keep up their publication output or ‘research productivity’”.²⁷⁰ For post-docs on short contracts, an additional problem may be “the contract status of women taking maternity leave: depending on the timing of the birth of a child they may be not be eligible for full maternity pay”.²⁷¹ To qualify for Statutory Maternity Pay a woman must be in employment for 26 weeks before the end of the 15th week before the baby is due.²⁷² Katrine Rogers explained that as she was on a short-term contract, she was unable to return to her previous position after maternity leave, and was also “unable to benefit from contractual maternity pay”.²⁷³ The Equality Challenge Unit explained that:

Maternity leave remains the main reason for a career break, and our experience shows that many universities enforce women in dual-career families to take responsibility for childcare by restricting paternity leave [...] This means that the current culture of academic science is disproportionately harmful to women.²⁷⁴

Because the length of time required to achieve a permanent post coincides “with the time at which people are seeking to purchase houses and/or start a family”, many women “leave academia, or never enter it in the first place, in favour of more stable careers”.²⁷⁵ The “lack of successful female role models with families” perpetuates the situation.²⁷⁶ The STFC WiSTEM Network stated that some “women fear that a career in STEM cannot be reconciled with their (future) domestic life” although for some, “an academic STEM job often offers greater flexibility than a teaching job when it comes to raising a family”.²⁷⁷

56. The Russell Group Equality Forum explained that “caring for family members is increasingly becoming an issue for men as well as women” and that “this should be recognised and men should be facilitated to play active roles as carers for both children and elders”.²⁷⁸ This would “serve to balance the responsibilities of caring between genders and a change in attitudes towards these issues, allowing for greater flexibility in careers”.²⁷⁹ Jenny Marsden, Principal Physicist, Hull and East Yorkshire Hospitals NHS Trust, stated that promoting “child caring for both genders more equally, as in Sweden” was “changing the culture, so there is not the unconscious bias in employing women that they might go off and have children”.²⁸⁰ She added that “you employ someone between the ages of 20 and

²⁷⁰ WSC 19 [Cardiff University] para 7

²⁷¹ WSC 42 [University of Oxford] para 13

²⁷² GOV.UK, *Maternity pay and leave: Eligibility*, <https://www.gov.uk/>

²⁷³ WSC 12 [Katrine Rogers] para 3

²⁷⁴ WSC 51 [Equality Challenge Unit] para 4

²⁷⁵ WSC 96 [Bournemouth University] para 2.8

²⁷⁶ WSC 71 [Russell Group Equality Forum] para 3

²⁷⁷ WSC 90 [STFC WiSTEM Network] para 7.3

²⁷⁸ WSC 71 [Russell Group Equality Forum] para 22

²⁷⁹ WSC 71 [Russell Group Equality Forum] para 21

²⁸⁰ Q13

40 and, whether they are male or female, they may have a career break”.²⁸¹ It was suggested that:

- a) Research funders should be “more flexible” and consider extensions of funding and time for maternity leave;²⁸²
- b) Research funders and Principal Investigators “should be open to flexible working options”, including “enable[ing] time and support for women when they need to start planning their next move”;²⁸³
- c) HEIs should “provide additional support to help scientists through the difficulties of running their research group while on maternity or paternity leave” including “providing funding for a post-doc to support the lab in their absence and making effective use of keeping-in-touch (KIT) days”;²⁸⁴
- d) Academics returning from maternity leave could be “offered a 6 month period, in which they are relieved of teaching duties so that they can focus on their research work”;²⁸⁵ and
- e) The “learned or professional societies could consider free/flexible membership for people on parental leave [...] as a means of keeping up to date and in touch with your profession while on leave and potentially reducing the barriers to re-entry following a career break”.²⁸⁶

57. Dr Thompson, RCUK, stated that:

Any research council grant will cover any additional costs of paid maternity leave of researchers employed on the grant and the period of the grant can be extended. Researchers can be employed part time. Any fellowship pays maternity leave, if that is needed, and they can be extended. They can be held part time or they can be changed to part-time working. Studentships allow for six months at full stipend for the six months of unpaid extension. At the end of the day, the universities are the [employers]. We are aware, following discussions with the Russell Group, that not everybody fully understands the flexibility that we provide on research grants. So we have undertaken to produce new guidance that makes sure this is absolutely crystal clear to the community.²⁸⁷

The Children and Families Bill is currently progressing through the House of Lords.²⁸⁸ Under the provisions of that Bill, working mothers and fathers will be able to share parental leave when a baby is born.²⁸⁹

²⁸¹ Q13 Jenny Marsden

²⁸² WSC 55 [Newcastle University] para 4a.2

²⁸³ WSC 55 [Newcastle University] para 4a.2

²⁸⁴ WSC 74 [Society of Biology] para 28

²⁸⁵ WSC 14 [University of Manchester] para 5.9

²⁸⁶ WSC 91 [Wellcome Trust] para 21

²⁸⁷ Q 159

²⁸⁸ Children and Families Bill 2012-13 to 2013-14, *Parliament*, www.parliament.uk

58. **There appears to be a lack of coordination and communication between research funders and HEIs which, exacerbated by the use of short term contracts, results in women falling into cracks in the funding system when maternity support is required. Research funders need to make their maternity provisions clearer to researchers and their employers.**

59. **We have recommended a review of the academic careers system which should examine how to better support women taking maternity leave and help them integrate back into the workplace. A move towards longer-term employment of academic researchers should encourage maternity provisions in line with other employment sectors.**

60. **We support the shared parental leave system being proposed by the Children and Families Bill, as shared parental leave is an important step towards creating equality for everyone in the workplace. However, simply introducing a new system will not in itself change workplace attitudes towards maternity, or the difficulties caused by taking parental leave. Academia will still need to address the real and perceived career damage which can be caused by taking parental leave.**

Balancing career with family

61. Women are more likely than men to work part time.²⁹⁰ The Institute for Physics and Engineering in Medicine stated that the main reason for flexible working is “balancing childcare responsibilities with the demands of a career in science” and considered that “there appears to be a dearth of opportunity for sufficiently flexible working patterns, or real commitment to ‘family-friendly’ policies”.²⁹¹ Where flexibility or part-time working does exist, “there is a perception that career progression is more difficult, as quantity is valued and quality alone is not enough”.²⁹² Under the Working Time Regulations, employers cannot normally expect adults to work in excess of 48 hours per week, averaged over 17 weeks.²⁹³ As highlighted in the previous chapter, there is a perception that it is “impossible to work part-time in science and be successful”.²⁹⁴ There is “a long-hours culture in academia and [...] there may be little point in working part-time in a university, particularly if the reality is that full-time working means regularly working 60 hours per week”.²⁹⁵ The Society for Applied Microbiology explained that “measurement of success is usually by output, and what can be achieved in a normal working week is not seen as competitive for funding or career progression”.²⁹⁶ As a result, “researchers are regularly working six or seven days a week and clocking up hours far in excess of contractual obligations” and “this particularly impacts women early in their research careers when they

²⁸⁹ Department of Business, Innovation and Skills, Press release, *Government outlines how mums and dads can use new shared parental leave system*, 29 Nov 2013

²⁹⁰ WSC 85 [British Medical Association] para 10

²⁹¹ WSC 15 [The Institute of Physics and Engineering in Medicine] para 4

²⁹² WSC 14 [University of Manchester] para 3.1

²⁹³ GOV.UK, *Maximum weekly working hours*, <https://www.gov.uk/maximum-weekly-working-hours>

²⁹⁴ WSC 66 [The Physiological Society] para 15

²⁹⁵ WSC 81 [Institute of Physics] para 17

²⁹⁶ WSC 68 [Society for Applied Microbiology]

may also be taking on additional responsibilities within the family context”.²⁹⁷ The Equality Challenge Unit (ECU) stated that there is a “frequent requirement in STEMM for individuals to be in a specific lab or the field at set times resulting in lack of opportunities for genuine flexible working”.²⁹⁸ The Royal Academy of Engineering explained that “local culture within the HEI management is probably the most significant factor in how flexible or otherwise a HE environment is in practice”.²⁹⁹ The ECU highlighted the importance of defining core working hours and stated that “women are more likely to take advantage of [...] appropriate core hours (e.g. 10:00 – 16:00)”.³⁰⁰ The ECU noted that some universities operate core hours that are “often not fully enforced or [...] flexible” which “means that staff can be excluded from meetings held later in the day, for example if they need to collect children from school”.³⁰¹ An additional difficulty for primary carers is that caring responsibilities may not be compatible with “activities that are often viewed as essential for a successful academic career” such as “international travel for conferences”.³⁰² Childcare is also “extremely expensive”.³⁰³

62. All HEIs should review the working hours of their academic staff and the management of research groups to ensure that practices are in keeping with the needs of those employees with caring responsibilities. Such matters should not be devolved down to research groups. Line managers who pressure staff into working unreasonably long working hours should be held to account by their employer. In addition, every academic researcher should have a named contact within the HEP’s human resources team to whom they can confidentially direct queries.

63. Scientific research cannot always take place within regular working hours. However, we recommend that research departments should determine and operate appropriate core working hours with flexibility outside of those core hours. This would ensure that most staff members are available for key meetings while ensuring that those with caring responsibilities are not disproportionately disadvantaged. Fellowships and academic positions should be advertised with the option of working part time unless there are insurmountable obstacles to such an arrangement.

Career breaks

64. The Daphne Jackson Trust explained that “parental leave (incl. maternity, paternity and adoption leave) is usually relatively short term, well planned and most employers have good regulations in place for managing returns” whereas “a break of more than 24 months (2 years), is often not planned”.³⁰⁴ It explained that:

²⁹⁷ WSC 68 [Society for Applied Microbiology]

²⁹⁸ WSC 51 [Equality Challenge] Unit para 5

²⁹⁹ WSC 95 [The Royal Academy of Engineering] para 6

³⁰⁰ WSC 51 [Equality Challenge Unit] para 5

³⁰¹ WSC 51 [Equality Challenge Unit] para 5

³⁰² WSC 29 [University College London] para 7

³⁰³ WSC 29 [University College London] para 7

³⁰⁴ WSC 100 [The Daphne Jackson Trust] paras 1–2

women may have children and expect to return to work following maternity leave. But many find that having a family is coupled with relocation with a partner. This often means a planned maternity leave extends into a longer career break. In other instances, women may have to deal with unexpected illness, or caring responsibilities for older relatives.³⁰⁵

A survey from the Institute of Physics showed that women were almost three times as likely to have taken a career break in the last five years as men (14.3% compared to 5%).³⁰⁶ A research career break “can have a severe long-term effect [compared to] other professions” because it causes a “hiatus in [...] publication record” and can “negatively affect the annual performance on the grant and the ability to obtain new research grants”.³⁰⁷ Researchers may “lose their up-to-date knowledge of fast-changing research fields” even after only “short periods away from work”.³⁰⁸ Dr Nicola Patron stated that there was a “career scar” that “drags on from that break [...] as grants/fellowships not applied for while on leave translate to more years without funding and publications”.³⁰⁹ She added that she would “never chance taking a career break” as she did not think she would “ever be able to get back”.³¹⁰

65. Career breaks “require appropriate management, to reduce impact on research and avoid the attrition of talented individuals”.³¹¹ The Medical Schools Council and Dental Schools Council explained that this included “sufficient time planning the break”, retaining links with “‘Keep in Touch’ days or email updates” and “funding for staff absence, to avoid overburdening colleagues and to assist the returner”.³¹² The Daphne Jackson Trust supports women and men wishing to return to a research career following a break of two or more years taken for family, caring or health reasons.³¹³ Fellowships are normally two years in length and based at universities and industrial laboratories in the UK where Fellows undertake a challenging research project and a retraining programme.³¹⁴ The Daphne Jackson Trust has “a 96% success rate in returning [its] Fellows to science, engineering or technology careers”.³¹⁵ Over 90% of its Fellows are women returning to research following a career break to bring up children and the Trust has helped more than 220 women make a successful return to a research career since 1992.³¹⁶ Dr Gemma Sweeney, a Daphne Jackson Fellow, stated that “without this opportunity, it would have been highly unlikely I would have returned to a career in science” and added that “after such a long career break I would not be confident of applying for a position for which I am

³⁰⁵ WSC 100 [Daphne Jackson Trust] para 3

³⁰⁶ WSC 81 [Institute of Physics] para 12

³⁰⁷ WSC 64 [Medical and Dental School Council] para 4.4; WSC 17 [Plymouth Marine Laboratory] para 6; WSC 97 [Russell Group of Universities] para 2.7;

³⁰⁸ WSC 54 [Bryn Jones] para 3.3; WSC 74 [Society of Biology] para 12

³⁰⁹ WSC 21 [Dr Nicola Patron] para 16

³¹⁰ Q10 Dr Patron

³¹¹ WSC 64 [Medical Schools Council and Dental Schools Council] para 7.5.1

³¹² WSC 64 [Medical Schools and Dental Schools Council] para 7.5.1

³¹³ The Daphne Jackson Trust, *Home*, <http://www.daphnejackson.org>

³¹⁴ WSC 79 [Government] para 37

³¹⁵ The Daphne Jackson Trust, *Support us*, <http://www.daphnejackson.org>

³¹⁶ WSC 62 [Daphne Jackson Trust]

qualified”.³¹⁷ The Trust explained that “seven out of ten [Daphne Jackson] fellows stay in research for at least 2 years after completing their fellowship”.³¹⁸ It also explained that:

Fellows carry out their research within UK universities and industrial research institutions, The Trust provides the infrastructure and expertise required to recruit, select, and re-train fellows and administer the awards, whilst the host institution covers overheads and consumable costs, and salary support is provided by external sponsors such as the UK research councils, universities, charities, learned societies and industrial partners. Many universities both sponsor and host fellows.³¹⁹

66. The Trust receives 43 per cent of its funding from the Research Councils.³²⁰ In November 2013 the Government announced that it would provide “£40,000 to support the Daphne Jackson Trust to develop a new fellowship to support people returning to professional engineering jobs after a career break”.³²¹ However, the Minister clarified that this funding was “for a study about how much more they can do on the whole question of someone returning to science after taking a career break” and “not specifically for a set number of fellowships”.³²² There was significant support expressed for the work of the Daphne Jackson Trust during our inquiry.³²³ **A key way to increase the participation of women in STEM careers is to enable them to return following career breaks. We are pleased that the Government is providing financial support to the Daphne Jackson Trust so that it can develop a new fellowship in engineering. We encourage more HEIs to sponsor and host Daphne Jackson Fellows.**

Careers advice and support

67. Dr Patron highlighted that “very few group leaders and PhD supervisors encourage [other] careers” and highlighted “a paper in the United States not so long ago which said that, even though only 30% of PhD graduates would have a career in academia, 80% think they are going to have a career in academia; and 95% had only been spoken to about careers in academia, so they are not preparing themselves for other careers”.³²⁴ Dr Jones stated that “employers out there simply do not understand in any detail what high-performing scientists are capable of doing” and suggested that “we need vastly improved careers advice to help those of us who have left the academic system to find new jobs”.³²⁵ Jenny Marsden stated that “the workplace has changed; you can have many careers during your working life, and that ought to be promoted as well. Studying science is one way to access lots of different things you could do, if it is properly sold”.³²⁶ She added that “we

³¹⁷ WSC 63 [Dr Gemma Sweeney] para 3

³¹⁸ WSC 62 [Daphne Jackson Trust] para 10

³¹⁹ WSC 62 [Daphne Jackson Trust] para 4

³²⁰ WSC 62 [Daphne Jackson Trust]

³²¹ Department for Business, Innovation and Skills, Press release, *Employers, educators and engineering professionals called on to encourage more people into engineering careers*, 4 Nov 2013

³²² Q 201

³²³ For example WSC 65 [Sean McWhinnie, Oxford Research and Policy, and Jan Peters, Katalytik] para 37, WSC 39 [Society for General Microbiology]

³²⁴ Q 49

³²⁵ Q 50

³²⁶ Q 50

ought to have better connections with companies and people looking for top-quality science graduates and science PhD students” and indicated that companies could market themselves “by saying they offer good flexible working practice”.³²⁷ ScienceGrrl considered that “it is unrealistic to continue telling PhD students and post-docs that an academic track is the only successful way to use their STEM education and training” and that:

Retaining talent is important, and investing in a new tier of ‘permanent researchers’ is one approach, but there are many successful paths in addition to academia. We believe that it would be useful to reframe the pipeline to include those who move to other primary and secondary STEM careers. With this in mind, our members have told us that they would value better early careers advice regarding awareness of these opportunities, training in how to compete/succeed in other sectors and to find ways to ensure qualifications and experiences accrued to date were more formally recognised and appreciated by other sectors.³²⁸

Dr Jones considered that “established academics tend to under-appreciate the deficiencies in the academic careers system [...] they managed to obtain permanent jobs and therefore assume that the system cannot be too bad”.³²⁹ Others “fail to recognise that support that was given to them that proved critical in them getting permanent positions”.³³⁰ The Institute of Physics explained that from a survey of their members “only 40% of all the PDRs reported that they felt that they were respected and well regarded in their department” and that “factors such as a lack of a comprehensive induction, poor appraisal, lack of mentoring and lack of impartial careers advice all contributed to this”.³³¹ The Society for Applied Microbiology stated that “many senior professionals, including scientists, lack the skills and training to be effective managers of people”, a problem that “should be addressed as a matter of great urgency”.³³² The University of Oxford considered that “within many science disciplines, work is organised into large research groups, which are often described as having a ‘sink or swim’ culture, with few formal reporting or support mechanisms”.³³³ It stated that “the evidence is that the absence of such mechanisms is largely neutral for men, but has a significant negative effect for women, who place a higher value on structured support”.³³⁴

68. Mr Sweeney stated that HEFCE provided “block-grant funding to universities, which is intended to provide a degree of stability for universities” and that HEFCE “expect[ed] universities to use that wisely in supporting their staff”.³³⁵ Mentoring, careers advice, work placements and regular feedback “all help from the earliest stages to develop women’s confidence as a scientist”.³³⁶ The Minister stated that “the Vitae researcher development

³²⁷ Q 50

³²⁸ WSC 49 [ScienceGrrl] para 22

³²⁹ WSC 54 [Dr Bryn Jones] para 2.12

³³⁰ WSC 54 [Dr Bryn Jones] para 2.12

³³¹ WSC 81 [IOP] para 10

³³² WSC 68 [The Society for Applied Microbiology]

³³³ WSC 42 [The University of Oxford] para 23

³³⁴ WSC 42 [The University of Oxford] para 23

³³⁵ Q 156

³³⁶ WSC 42 [The University of Oxford] para 23

framework is supposed to provide a framework for career development, aimed not just at women”.³³⁷ He highlighted the importance of “proper access to career advice and proper guidance [...] not simply a hire-and-fire culture within a university or research institute”.³³⁸

69. Careers advice is also a key element in encouraging children into STEM careers. Pier Logistics and Cardiff University stated that “there is strong evidence demonstrating that the provision of quality advice/guidance enabling students to make the right careers choices in STEM is pivotal”.³³⁹ They added that “the kinds of professional careers advice on offer to many of the UK’s school-children is limited and fragmentary and increasingly exported to an online (more cost-effective) interface”.³⁴⁰ We have recently criticised the Government’s changes to the provision of careers advice to students.³⁴¹ **Careers advice and support for academic STEM researchers is important for both men and women, but a lack of it can affect women disproportionately. HEIs and learned societies should encourage mentoring, support networks and seminars at the research group level and monitor this practice. We note that such activities are encouraged by the Athena SWAN charter.**

70. **Authoritative and impartial careers advice on options outside academia should be available to all undergraduate and postgraduate students, as well as researchers.**

Destinations of leavers

71. The discourse around women leaving STEM careers is often based on an assumption that to leave STEM is undesirable. However, as the Wellcome Trust highlighted, “pejorative descriptions of the exit from academia as a ‘failure’ or ‘loss’ from science are unhelpful” as “most of those who leave academia following completion of a PhD continue to use their scientific training in a way that benefits their career, their new employer and the economy”.³⁴² The Cambridge Association for Women in Science and Engineering (Cambridge AWiSE) stated that:

When women leave STEM positions, they transition into a diversity of other positions. One category is people-oriented positions, including teaching, public engagement, science outreach, administration, helpline management, career advising, child-care or house-wife positions. Another is applied research positions, including industrial research roles, lab management, technician positions, sales and marketing. Others move into careers with more financial security, such as project management, patent law, publishing, politics, accounting, political lobbying and advising as well as scientific or management consulting.³⁴³

³³⁷ Q 185

³³⁸ Q 185

³³⁹ WSC 52 [Pier Logistics and Cardiff University] para 6.3

³⁴⁰ WSC 52 [Pier Logistics and Cardiff University] para 6.3

³⁴¹ Science and Technology Committee, Seventh Report of Session 2012–13, *Educating tomorrow’s engineers: the impact of Government reforms on 14-19 education*, HC 665, paras 77–86

³⁴² WSC 91 [Wellcome Trust] para 15

³⁴³ WSC 33 [Cambridge Association for Women in Science and Engineering] para 5a

UCL stated that “women leaving academia are drawn to various jobs and sectors” and explained that it was “common for women to go to jobs in industry” because they were “often more secure and better paid, especially at junior levels”.³⁴⁴ It added that “women from science also end up in professional support roles” such as “Human Resources, teaching positions in the NHS, administrative roles and research support posts”.³⁴⁵ Cardiff University stated that women moving into “administrative roles within a higher education institution, into science teaching at secondary or further education level or into roles in business and commerce” were “likely to put their scientific training to positive effect”.³⁴⁶ Therefore “scientifically trained women who leave academia are unlikely to be lost to productive employment and indeed are likely to make important contributions to the educational, social, business and economic good of the country”.³⁴⁷ As the Minister put it, “one person’s leakage from STEM may be another person’s irrigation of the wider community”.³⁴⁸ Nevertheless, the under-representation of women in STEM academic careers is “exacerbated by every woman who takes the decision to leave” and “the unique contributions and perspectives these women could bring to academic science are lost”.³⁴⁹ Having fewer women attaining senior positions “perpetuates the lack of role models for younger women studying STEM subjects” and also “results in the culture remaining masculine so that a ‘chilly climate’ for women persists”.³⁵⁰ It also represents “a loss of skills and talent and a waste of national resource in an area which is predicted to underpin economic growth”.³⁵¹

72. Finding comprehensive data on the destinations of women who leave STEM careers was problematic. Data from the Higher Education Statistics Agency (HESA) cannot be used to “analyse the destinations of staff leaving academia by gender”.³⁵² Vitae’s 2011 *What Do Researchers Do?* publication showed that:

of the 2004–05 cohort [of PhD graduates], 19% were working in HE research roles three and half years after graduation and 22% were employed in HE teaching and lecturing roles. The other 50% were employed outside HE in other research positions, doctoral occupations and other roles.³⁵³

Professor Dame Julia Higgins, Chair of the Royal Society’s Diversity Programme, stated that the Royal Society was “trying to collect data on where people have gone to” because:

while we talk about the leaky pipeline, the only line that we can realistically look at is the academic one. You can see how many undergraduates, doctorates, staff and professors you have. You can see the loss of people. What you don’t know, and one

³⁴⁴ WSC 29 [UCL] para 8

³⁴⁵ WSC 29 [UCL] para 8

³⁴⁶ WSC 19 [Cardiff University] para 8

³⁴⁷ WSC 19 [Cardiff University] para 9

³⁴⁸ Q 177

³⁴⁹ WSC 19 [Cardiff University] para 9

³⁵⁰ WSC 22 [Open University] para 20

³⁵¹ WSC 22 [Open University] para 22

³⁵² WSC 23 [RCUK] para 18

³⁵³ WSC 23 [RCUK] para 19; Vitae, *What do researchers do: Career Paths 2011*, <http://www.vitae.ac.uk>

of the things we are attempting to track, is where they have gone to. [...] We have the HESA data, and we are tracking [...] where people are going to in an attempt to find out how much of it is a genuine loss and how much of it is a change of career.³⁵⁴

73. Exit interviews and/or questionnaires can be used by employers to determine the reasons why staff leave or where they intend to go. When we asked Professor Uta Frith, Russell Group, whether and how exit questionnaires were used by HEIs, she responded that she “[did] not know of any such efforts or attempts to do that”.³⁵⁵ Professor Jane Powell, 1994 Group, explained that “there are questionnaires that will be developed to some extent locally as part of an exit interview procedure, which is done more or less erratically; it is sometimes difficult to get people to sit down for such an interview”.³⁵⁶ She also outlined the difficulties of accurately determining the reasons why staff “moved on” as it could be a combination of reasons rather than just one.³⁵⁷ Professor Powell highlighted that “there have been new fields added to the HESA staff record [...] which will provide more information on reasons for leaving and destinations”.³⁵⁸ This data will be available from March 2014.³⁵⁹ Mr Sweeney stated that HEFCE does not “mandate behaviour in universities at that level, but that is the sort of good practice that we would encourage and support”.³⁶⁰ He added that “the responsible people are the employers, the universities [and HEFCE’s] core task is to get them to take their responsibility seriously and to discharge it”.³⁶¹ The Government clarified that “there is no single body tasked with pulling together all data on gender diversity in STEM”.³⁶² However it highlighted that “the Royal Society is carrying out a study of the diversity of the STEM workforce” and “will outline a new categorisation of the STEM workforce”.³⁶³ The Royal Society’s report “will be published early in 2014 and will help us to understand further where women, and other under-represented groups, go when they leave STEM education or careers”.³⁶⁴

74. Identifying the reasons why staff choose to end their employment in an organisation is crucial to identifying and challenging where poor behaviours and practices may exist. We are disappointed that information on the reasons why women leave academic STEM careers is patchy and largely anecdotal.

75. Higher Education Institutions (HEIs) should routinely conduct exit interviews and/or questionnaires with all researchers leaving their employment. Each HEI should publish this data in a suitably anonymised form so that organisations working to improve diversity in STEM can make use of it. Organisations such as the WISE Campaign,

³⁵⁴ Q 55

³⁵⁵ Q 124

³⁵⁶ Q 125

³⁵⁷ Q 125

³⁵⁸ Q 125

³⁵⁹ Q 125

³⁶⁰ Q 133

³⁶¹ Q 135

³⁶² WSC 105 [Government supplementary]

³⁶³ WSC 105 [Government supplementary]

³⁶⁴ WSC 105 [Government supplementary]

Equality Challenge Unit and national academies should advise HEIs on the best way to gather and publish this data in a consistent manner.

5 Conclusions

76. Dr Nicola Patron, Sainsbury Laboratory, stated that “the academic career system was developed when most faculty members were men (with stay-at-home wives) who could relocate to available research posts as they became available”.³⁶⁵ She added “in an era of dual-career families, science is a difficult choice for everyone”.³⁶⁶ The Women’s Engineering Society (WES) stated that “the issue of women engineers and scientists goes back to WW1” and that “there have been almost annual enquiries into aspects of this issue for many years and ‘wake-up calls’ followed by short term projects every decade since the 1970s and even before”.³⁶⁷ The WES added that “progress has been modest, at best, and short term at worst” with “too much fragmentation of effort and re-invention of wheels”.³⁶⁸ It called for “action rather than examining, over and over again, why the situation exists”.³⁶⁹ The Campaign for Science and Engineering similarly highlighted that “what is needed is not more recommendations, but more action”.³⁷⁰ **Our inquiry has not uncovered any new issues on the topic of gender diversity in STEM subjects. This indicates that the problems and solutions have long been identified, yet not enough is being done to actively improve the situation. While competitiveness for jobs is beneficial for science, careers should not be constructed in such a way that talented women are deterred from remaining and progressing in STEM. It is astonishing that despite clear imperatives and multiple initiatives to improve diversity in STEM, women still remain under-represented at senior levels across every discipline.**

77. **The under-representation of women in STEM is caused by a wide range of factors. Emphasis is often placed on inspiring young girls to choose science, which is commendable, but such efforts are wasted if women are then disproportionately disadvantaged in scientific careers compared to men. It is disappointing that biases and working practices result in systematic and cumulative discrimination against women throughout STEM study and academic careers.**

78. **Universities and other HEIs are the employers of academic STEM researchers so they have ultimate responsibility for employment conditions and the greatest obligation to improve STEM careers for all researchers. While there are many examples of good practice in diversity management, some HEIs appear to be too content to devolve responsibility for working hours, careers support and promotion down to research groups. More standardisation is required across the higher education (HE) sector. We encourage all HEIs conducting STEM research to apply for Athena SWAN awards, or similar recognised schemes.**

³⁶⁵ WSC 21 [Dr Nicola Patron] para 7

³⁶⁶ WSC 21 [Dr Nicola Patron] para 7

³⁶⁷ WSC 38 [Women’s Engineering Society]

³⁶⁸ WSC 38 [Women’s Engineering Society]

³⁶⁹ WSC 38 [Women’s Engineering Society]

³⁷⁰ WSC 98 [Campaign for Science and Engineering]

Conclusions and recommendations

Business case for retention of women in science

1. The UK economy needs more skilled scientists and engineers and this need will not be met unless greater efforts are made to recruit and retain women in STEM careers. (Paragraph 5)
2. Gender diversity in STEM can bring business benefits if well managed. The business case for diversity in science is being reviewed by the Royal Society and we expect that its findings will highlight how STEM organisations can maximise the business benefits of diversity in the workforce. (Paragraph 7)
3. We suggest that the national academies, learned societies and research funders review how gender analysis can improve research findings within different STEM disciplines and formulate guidance on the matter. Research funders should encourage the consideration of gender dimensions of research from funding applicants. (Paragraph 9)

The role of Government

4. Although we accept that difficult financial decisions had to be made by the Government in the 2010 Spending review, it is disappointing that spending dedicated to improving diversity in science was so significantly reduced. While we have no concerns about the quality of the diversity programmes of the National Academies, we have not been assured that they could have the same reach and impact as the UKRC had. (Paragraph 13)
5. The Government should monitor the effects of its policies on mainstreaming diversity funding. If it transpires that cutting UKRC funding and mainstreaming has had a detrimental effect on the retention of women in STEM careers, the Government should increase diversity funding. (Paragraph 14)
6. It would not be practical to mandate that applicants for research funding must hold Athena SWAN awards, although we commend the Chief Medical Officer for taking this step with some NIHR funding streams. We recommend that all public research funders should require applicants and recipients to demonstrate that they are taking steps to improve equality and diversity. Each research funder should publish and disseminate this expectation and what actions will be considered sufficient to meet this criterion. (Paragraph 15)
7. The Athena SWAN Charter is a comprehensive scheme that is widely supported across academia. With increasing demand, the Equality Challenge Unit may require additional resources and the Government should respond positively to any such request. (Paragraph 17)
8. We encourage the Government to work with the STEM community and schools to tackle gender stereotypes in education, particularly at primary level. In addition, we

re-iterate the importance of engagement with STEM industry being part of teachers' CPD. (Paragraph 18)

Women in academia

9. Scientists are susceptible to the same unconscious gender biases as the rest of the population and it is unfortunate that some are unwilling to accept this simply because their professional research requires them to be objective. It is important to recognise that biases that harm women are held by both men and women. (Paragraph 29)
10. We recommend that diversity and equality training, including unconscious bias training, should be provided to all STEM undergraduate and postgraduate students by their Higher Education Institution (HEI). In addition, such training should be mandatory for (i) all members of recruitment and promotion panels for STEM jobs in HEIs; and (ii) all line managers and supervisors of staff. (Paragraph 30)
11. All research funders should also ensure that diversity and equality training is provided to all members of grant application review panels. This is particularly important where women are under-represented on those panels and in the STEM discipline being considered. (Paragraph 31)
12. Universities should ensure that recruiters and search committees identifying potential candidates for senior roles give particular consideration to encouraging suitably qualified female candidates, in line with the principles of positive action. (Paragraph 32)
13. Role models are important for inspiring males and females to study STEM subjects and pursue STEM careers. The lack of senior or high-profile women scientists reduces the availability of female role models, which particularly affects girls and women. (Paragraph 37)
14. The National Academies, learned societies and HEIs should emphasise both male and female role models who have successfully combined a STEM career with family life. In particular, highlighting male scientists who have combined career with childcare and family responsibilities could help to counter perceptions that these are women's issues rather than matters that concern all parents. (Paragraph 38)
15. There is strong support for mentoring schemes and evidence that it encourages women to apply for promotions and other opportunities. We recommend that HEIs and other STEM employers should implement mentoring schemes for all staff, with particular attention paid towards mentoring for women and other groups that are under-represented at senior levels. (Paragraph 39)

The nature and funding of research careers

16. Balancing the benefits of short term contracts with the needs of Post-Doctoral Researchers was examined by our predecessor committee in 2002. We are disappointed at the lack of progress in the last decade. The system of short term employment contracts for post-docs results in job insecurity and discontinuity of

employment rights that is difficult for any researcher, but disproportionately deters women from continuing with science careers. It also has implications for workforce productivity. (Paragraph 45)

17. We are pleased that some research funders are recognising the benefits of long term contracts to academic careers and encourage others to follow this example. We encourage Higher Education Institutions (HEIs) to provide longer term posts for post-docs, recognising the benefit to scientific progress of continuing expertise. (Paragraph 46)
18. We recommend that the Government should work with the Higher Education sector to review the academic career structure and increase the number of more stable and permanent post-doc positions. (Paragraph 47)
19. International collaboration brings benefits to science but requiring researchers to relocate is not the only way to promote it. We suggest that research funders should remove from fellowship conditions any requirements for researchers to move institute or country and instead provide funding for shorter visits to other institutes for collaboration purposes. We recommend that research funders work with HEIs to create funding for permanent post-doc positions. (Paragraph 48)
20. Wherever possible, HEIs should provide three months of bridging funding for post-docs, to allow them time to apply for new contracts. (Paragraph 49)
21. We appreciate that funding from research councils and the REF must be based on scientific and research excellence and support the continuation of this principle. We are satisfied that HECFE takes seriously the issue of monitoring the gender impact of the REF. (Paragraph 53)
22. We recommend that HEIs and heads of research groups should ensure that important non-research activities are recognised in performance appraisals and promotion boards. (Paragraph 54)
23. There appears to be a lack of coordination and communication between research funders and HEIs which, exacerbated by the use of short term contracts, results in women falling into cracks in the funding system when maternity support is required. Research funders need to make their maternity provisions clearer to researchers and their employers. (Paragraph 58)
24. We have recommended a review of the academic careers system which should examine how to better support women taking maternity leave and help them integrate back into the workplace. A move towards longer-term employment of academic researchers should encourage maternity provisions in line with other employment sectors. (Paragraph 59)

Management of research careers by higher education institutions

25. We support the shared parental leave system being proposed by the Children and Families Bill, as shared parental leave is an important step towards creating equality for everyone in the workplace. However, simply introducing a new system will not in

itself change workplace attitudes towards maternity, or the difficulties caused by taking parental leave. Academia will still need to address the real and perceived career damage which can be caused by taking parental leave. (Paragraph 60)

26. All HEIs should review the working hours of their academic staff and the management of research groups to ensure that practices are in keeping with the needs of those employees with caring responsibilities. Such matters should not be devolved down to research groups. Line managers who pressure staff into working unreasonably long working hours should be held to account by their employer. In addition, every academic researcher should have a named contact within the HEI's human resources team to whom they can confidentially direct queries. (Paragraph 62)
27. Scientific research cannot always take place within regular working hours. However, we recommend that research departments should determine and operate appropriate core working hours with flexibility outside of those core hours. This would ensure that most staff members are available for key meetings while ensuring that those with caring responsibilities are not disproportionately disadvantaged. Fellowships and academic positions should be advertised with the option of working part time unless there are insurmountable obstacles to such an arrangement. (Paragraph 63)
28. A key way to increase the participation of women in STEM careers is to enable them to return following career breaks. We are pleased that the Government is providing financial support to the Daphne Jackson Trust so that it can develop a new fellowship in engineering. We encourage more HEIs to sponsor and host Daphne Jackson Fellows. (Paragraph 66)
29. Careers advice and support for academic STEM researchers is important for both men and women, but a lack of it can affect women disproportionately. HEIs and learned societies should encourage mentoring, support networks and seminars at the research group level and monitor this practice. We note that such activities are encouraged by the Athena SWAN charter. (Paragraph 69)
30. Authoritative and impartial careers advice on options outside academia should be available to all undergraduate and postgraduate students, as well as researchers. (Paragraph 70)
31. Identifying the reasons why staff choose to end their employment in an organisation is crucial to identifying and challenging where poor behaviours and practices may exist. We are disappointed that information on the reasons why women leave academic STEM careers is patchy and largely anecdotal. (Paragraph 74)
32. Higher Education Institutions (HEIs) should routinely conduct exit interviews and/or questionnaires with all researchers leaving their employment. Each HEI should publish this data in a suitably anonymised form so that organisations working to improve diversity in STEM can make use of it. Organisations such as the WISE Campaign, Equality Challenge Unit and national academies should advise HEIs on the best way to gather and publish this data in a consistent manner. (Paragraph 75)

Conclusions

33. Our inquiry has not uncovered any new issues on the topic of gender diversity in STEM subjects. This indicates that the problems and solutions have long been identified, yet not enough is being done to actively improve the situation. While competitiveness for jobs is beneficial for science, careers should not be constructed in such a way that talented women are deterred from remaining and progressing in STEM. It is astonishing that despite clear imperatives and multiple initiatives to improve diversity in STEM, women still remain under-represented at senior levels across every discipline. (Paragraph 76)
34. The under-representation of women in STEM is caused by a wide range of factors. Emphasis is often placed on inspiring young girls to choose science, which is commendable, but such efforts are wasted if women are then disproportionately disadvantaged in scientific careers compared to men. It is disappointing that biases and working practices result in systematic and cumulative discrimination against women throughout STEM study and academic careers. (Paragraph 77)
35. Universities and other HEIs are the employers of academic STEM researchers so they have ultimate responsibility for employment conditions and the greatest obligation to improve STEM careers for all researchers. While there are many examples of good practice in diversity management, some HEIs appear to be too content to devolve responsibility for working hours, careers support and promotion down to research groups. More standardisation is required across the higher education (HE) sector. We encourage all HEIs conducting STEM research to apply for Athena SWAN awards, or similar recognised schemes. (Paragraph 78)

Formal Minutes

Wednesday 15 January 2014

Members present:

Andrew Miller, in the Chair

Jim Dowd
Stephen Metcalfe
Stephen Mosley
Sarah Newton

Pamela Nash
Graham Stringer
David Tredinnick

Draft Report (*Women in scientific careers*), proposed by the Chair, brought up and read.

Ordered, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 78 read and agreed to.

Summary agreed to.

Resolved, That the Report be the Sixth Report of the Committee to the House.

Ordered, That the Chair make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

Written evidence was ordered to be reported to the House for printing with the Report.

[Adjourned till Wednesday 22 January at 9.00 am

Witnesses

The following witnesses gave evidence. Transcripts can be viewed on the Committee's web page at www.parliament.uk/science

Wednesday 16 October 2013

Question number

Dr Bryn Jones, Visiting Fellow at the School of Physics, University of Bristol, **Jenny Marsden**, Principal Physicist (Clinical Scientist), Hull and East Yorkshire NHS Trust, and **Dr Nicola Patron**, Head of Synthetic Biology, The Sainsbury Laboratory

[Q1-52](#)

Wednesday 30 October 2013

Dr June McCombie, former Chair of IOP Project Juno Panel, Institute of Physics, **Sarah Dickinson**, Manager, Athena SWAN Charter, Equality Challenge Unit, **Professor Dame Julia Higgins**, Chair of Diversity Programme, The Royal Society, and **Dr Pia Ostergaard**, Senior Fellowship Advisor, Daphne Jackson Trust

[Q53-87](#)

Professor Uta Frith, Emeritus Professor of Cognitive Development at University College London, representing Russell Group, **Professor Jane Powell**, Deputy Warden, Goldsmiths, University of London, representing 1994 group, and **Clem Herman**, Senior Lecturer in Computing and Communications, The Open University

[Q88-126](#)

Monday 4 November 2013

Dr Lesley Thompson, Director, Sciences and Engineering, Engineering and Physical Sciences Research Council, representing the Research Councils UK, and **David Sweeney**, Director, Research, Innovation and Skills, Higher Education Funding Council for England

[Q127-169](#)

Monday 18 November 2013

Rt Hon David Willetts MP, Minister of State for Universities and Science, Department for Business, Innovation and Skills

[Q170-202](#)

Published written evidence

The following written evidence was received and can be viewed on the Committee's inquiry web page at www.parliament.uk/science

1	Emma Thomson	WSC0002
2	Professor Sue Black, Dr Jonathan Mendel, and Dr Hauke Riesch	WSC0003
3	Siraj Ahmed Shaikh	WSC0005
4	Targeted Initiative on Science and Mathematics Education (TISME)	WSC0006
5	Prospect	WSC0007
6	Sarah Goddard	WSC0008
7	Institute of Materials, Minerals and Mining	WSC0010
8	Public Health England	WSC0011
9	Katrine Rogers	WSC0012
10	Portia Ltd	WSC0013
11	University of Manchester	WSC0014
12	Institute of Physics and Engineering in Medicine	WSC0015
13	Kimberly Gilmpour	WSC0016
14	Plymouth Marine Laboratory	WSC0017
15	Dr Valerie Bevan and Professor Mark Learmonth	WSC0018
16	Cardiff University	WSC0019
17	Dr Elaheh Ghassemieh	WSC0020
18	Dr Nicola Patron	WSC0021
19	The Open University	WSC0022
20	Research Councils UK	WSC0023
21	University of Cambridge School of Clinical Medicine's Athena Swan Governance Group	WSC0024
22	Jenny Marsden	WSC0025
23	Fiona McNeill	WSC0026
24	Athena Swan Action Group St George's University of London	WSC0027
25	Academy of Medical Sciences	WSC0028
26	University College London	WSC0029
27	WOMENSTEC	WSC0031
28	Institute of Health & Society, Newcastle University	WSC0032
29	Cambridge Association for Women in Science and Engineering (Cambridge AWiSE)	WSC0033
30	University of Cambridge	WSC0034
31	College of Life Sciences, University of Dundee	WSC0036
32	University and Colleges Union – Newcastle University Branch	WSC0037
33	Women's Engineering Society	WSC0038
34	Society for General Microbiology	WSC0039
35	WinSET Committee, University of Nottingham	WSC0040
36	Dr Katherine Sloyan	WSC0041
37	University of Oxford	WSC0042
38	National Physical Laboratory	WSC0043

39	Imperial College London	WSC0044
40	The Royal Society	WSC0045
41	The University of Edinburgh	WSC0046
42	Royal Astronomical Society	WSC0048
43	Sciencegrll	WSC0049
44	British Pharmacological Society	WSC0050
45	Equality Challenge Unit	WSC0051
46	Pier Logistics and Cardiff University	WSC0052
47	Higher Education Academy	WSC0053
48	Bryn Jones	WSC0054
49	Newcastle University	WSC0055
50	EDF Energy	WSC0056
51	Royal College of Surgeons	WSC0057
52	Dr Susan Alison Murray	WSC0058
53	UCL Engineering	WSC0059
54	WiSET within Centre for Science Education	WSC0060
55	University of Stirling	WSC0061
56	The Daphne Jackson Trust	WSC0062
57	Dr Gemma Sweeney	WSC0063
58	Medical Schools Council and the Dental Schools Council	WSC0064
59	Sean McWhinnie, Oxford Research and Policy and Jan Peters, Katalytik	WSC0065
60	The Physiological Society	WSC0066
61	The British Psychological Society	WSC0067
62	Society for Applied Microbiology	WSC0068
63	Russell Group Equality Forum	WSC0071
64	Royal Society of Chemistry	WSC0072
65	The Council for the Mathematical Sciences (CMS)	WSC0073
66	Society of Biology	WSC0074
67	Girlguiding	WSC0075
68	John Barry	WSC0076
69	Professor Emma Smith	WSC0077
70	St George's, University of London	WSC0078
71	Department for Business, Innovation & Skills (BIS) and the Northern Ireland Assembly	WSC0079
72	Institute of Marine Engineering, Science and Technology	WSC0080
73	Institute of Physics	WSC0081
74	Amy Boyd	WSC0083
75	BCS, The Chartered Institute for IT	WSC0084
76	British Medical Association	WSC0085
77	Science Council	WSC0086
78	Higher Education Funding Council for England	WSC0087
79	Queen's University Belfast	WSC0089
80	STFC WiSTEM Network	WSC0090
81	Wellcome Trust	WSC0091
82	Aerospace Aviation & Defence Knowledge Transfer Network (AAD KTN)	WSC0092

83	The Royal Society of Edinburgh	WSC0094
84	The Royal Academy of Engineering	WSC0095
85	Bournemouth University	WSC0096
86	Russell Group of Universities	WSC0097
87	Campaign for Science and Engineering	WSC0098
88	Egon Zehnder	WSC0099
89	The Daphne Jackson Trust (supplementary to WSC0062)	WSC0100
90	The Russell Group (supplementary to WSC0097)	WSC0101
91	The Open University (supplementary to WSC0022)	WSC0102
92	Research Councils UK (supplementary to WSC0023)	WSC0103
93	Scienceogram UK	WSC0104
94	Department for Business, Innovation & Skills (BIS) (supplementary to WSC0079)	WSC0105