Women in STEM Careers

House of Commons Science and Technology Select Committee
Science Council Submission

1. The Science Council

1.1. The Science Council was established in 2004. It is an umbrella organisation of learned societies and professional bodies and currently has over 40 member organisations drawn from across science and its applications: a list of member bodies is attached in Appendix 1. In addition to providing a mechanism for the sector to work collectively, the Science Council develops and leads collaborative projects working with member bodies and the wider scientific community: examples include the Future Morph website[1] designed to provide young people with information about careers opportunities, and LMI analysis of the UK Science Workforce,[2] and studies undertaken by special interest groups such as health.

1.2. The Science Council is the leading UK organisation working to advance the professional practice of science. Since 2004 it has awarded the professional qualification of Chartered Scientist (CSci) with 15,000 individuals registered. With the aim of raising the profile, aspirations and retention of scientists at graduate and non-graduate levels, professional registration was extended in 2012 to include Registered Scientist and Registered Science Technician.

1.3. Collectively the Science Council member bodies represent nearly 500,000 individual members, including scientists, teachers, senior executives and other individuals at all levels in industry, academia and the public sector.

1.4. The Science Council has a number of activities that focus on the UK science workforce. Key issues under consideration include mapping the current number of scientists in the economy and understanding of employment trends; identifying the education and skills needs of current and future scientists, both working directly in science occupations and in wider roles; and understanding where growth and change in the economy are likely to occur. A primary underlying objective is to work towards a UK science workforce that reflects society's diversity, looking beyond gender to ethnicity, geographical distribution, age and skills levels and ensuring equality of opportunity. It is therefore central to our work that we understand and address the issues affecting the recruitment, retention and training of scientists at all levels throughout the UK economy.

1.5. We welcome the opportunity to contribute to the committee's current enquiry which has a focus on gender. Higher education (HE) is the key pipeline for the education and training of scientists and it is therefore particularly important that it is a sector that is welcoming to all those with the talent and commitment to pursue a career in science. Gender is important but there are also other diversity characteristics on which the HE and research sectors are failing to deliver: most notably STEM academia and research environments must also increase opportunity for those from lower socio-economic backgrounds and UK born minority ethnic groups.

2. Why do numbers of women in STEM academic careers decline further up the career ladder?

2.1. There has been growth in the HE sector over the last 10 years, creating an opportunity for change. However, data from the Higher Education Statistics Agency (HESA) shows that within academia, between 2003/04 and 2011/12 the number of academic and research staff in STEM HEI cost centres (including medicine) increased by 20%, with the number of females increasing by 26% (29,755 to 40,200). The same increase is not seen in seniority and STEM academics at the highest level (professor) remain predominantly male. In 2011/12 for example female STEM

[1] http://www.futuremorph.org/
[2] *The current and future UK science workforce* TBR, Sept. 2011 http://www.sciencecouncil.org/content/science-workforce

professors made up only 17.1% of the STEM professorial cohort. There remain wide variations across institutions, subjects and departments.

2.2. The lack of female STEM academics at the highest level is compounded by the challenge that a first independent fellowship or permanent position will often be taken at around the age that a woman may start a family.[3] The Research Excellence Framework (REF) for example risked penalising women taking maternity leave. The Science Council welcomes the changes to the panel criteria adopted by all four UK funding bodies which will allow one less output per submission for each period of leave,[4] but academia will need to do very much more to create the flexible environment that will enable women to maintain and advance their careers alongside their family responsibilities.

2.3. There is some anecdotal evidence that women are attracted to working in areas of science with a multidisciplinary approach and where the application of the science is clear or where there are well established practices for supporting flexible working without affecting advancement and promotion. It would be useful to investigate this further and if research supports the proposition, to consider the implications for university departments

2.4. Beyond academia there has been positive progress towards achieving improved gender balance in the science workforce in recent years. For example, the Science Council's Register of Chartered Scientists is now 29% female with over 50% of Chartered Scientists under the age of 35 being women; this trend is continuing and is reflected in new registrations and in our new registers where 42% of Registered Scientists and 66% of Registered Science Technicians are female. Following a pilot benchmarking exercise in 2011, the Science Council now collects annual data from member bodies on the gender split in their own membership: in 2013 just over 35% of the total membership was female. While there are wide variations across the sector, the Science Council considers it essential to have this basic data in order to measure progress towards diversity and to assess the impact of ongoing diversity schemes and projects. The visibility of female case studies and role models has also increased substantially with a number of different programmes targeting this area of activity.[5] Learned societies and professional bodies play a key role particularly in highlighting leading female scientists in academia and beyond. For example 24 member bodies of the Science Council have had at least one female President at some time,[6] and 28% of those serving on the governance committees of our member bodies are female. There has also been an increase in the number of female chief executives from 2 (7%) in 2005 to 15 (37%) in 2013.

3. 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?

Women in the wider STEM workforce

3.1. A key concern for the Science Council has been to understand at what point and why those with science skills and education leave science jobs, as well as why many highly qualified women appear to remain in academic and research posts for many years without achieving progression, even though there is strong demand for their skills in other sectors of the science economy where gender issues are increasingly being addressed and overcome.

3.2. Data suggests that 51% of STEM graduates do not enter scientific occupations. Research published by the UK Department for Business, Innovation and Skills (BIS) in March 2011, STEM Graduates in Non-STEM jobs,[7] found that there were a variety of reasons for this, but one of the key issues was the difficulty in defining STEM employment in the absence of a generally

[3] Prof Athene Donald, Unlocking potential – The Smith Institute June 2011
[4] http://www.ref.ac.uk/media/ref/content/pub/panelcriteriaandworkingmethods/01_12.pdf
[5] http://www.sciencecouncil.org/content/role-models-and-case-studies-report
[6] http://www.sciencecouncil.org/content/celebrating-international-womens-day-2013
[7] http://www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-771-stem-graduates-in-non-stem-jobs.pdf

accepted definition of either a STEM job or STEM skills: neither Standard Occupational Classification (SOC) system codes nor Standard Industrial Classification (SIC) codes are particularly helpful. It is worth noting that this research, which focused on recent graduates and postgraduates, did not identify any strong gender differences. The research found that individuals were, in many cases consciously choosing to study undergraduate degrees in STEM subjects as a means of accessing careers unrelated or only loosely related to STEM as they had identified the premium that employers place on graduates with STEM degrees.

3.3. Following a review of the types of roles undertaken by Chartered Scientists the Science Council has produced summary profiles of 10 different types of scientist careers,[8] which serves to illustrate the different ways in which STEM qualifications and skills are used in the economy. It is significant that for most people the term 'scientist' is narrowly associated with careers in academic or research environments but demand for individuals with deep science skills is very strong in other sectors, including regulation and monitoring, high tech innovation and entrepreneurial businesses, communication and policy. Academia and research scientists are a relatively small proportion of the overall STEM workforce (a total of approximately 200,000) and the matrix of 10 types of scientist has assisted in understanding demand for scientists elsewhere in the economy and help to shape careers messages and information, as well as workforce research

The UK STEM workforce

3.4. In 2010 the Science Council commissioned its first research into the UK science workforce aiming to identify the numbers working in science at all levels. The research provided comprehensive data on the current UK science workforce[9], profiling employment across skills levels, and providing a view on the future workforce and where demand is likely to be highest. Unlike previous methodologies that focused on a relatively narrow band of science or engineering employment sectors, this research uses a new analysis that enables the identification of the science workforce across the entire economy regardless of the employment sector. New definitions were established for primary science workers, secondary science workers and non-science workers and the sectors were classified as core science, related science and non-science, and the gender balance in different employment sectors (see Appendix 2). Key findings with regard to gender were:

- There are 5.8m people employed in the science workforce in the UK with 37.4% of those located in the South East, East and London.
- Health and education sectors employ 60% of the science workforce
- Overall the primary science workforce has a gender balance of 60/40 male/female (close to the UK working population of 54/46 male/female). Within the primary science workforce a number of subsectors have significantly higher proportions of male employees, including ICT where 91% are male
- In the secondary science workforce the gender balance is 44% male to 56% female. In sectors such as textiles, health, pharmaceuticals and education a far higher proportion of women work in secondary science roles than in primary science roles.
- The gender balance for primary science workers in non-science sectors is strikingly different with 73% male to 27% female.
- The average hourly wage for women is higher in secondary science occupations than in primary science occupations

3.5. This research presents a different picture of the employment of women in the workforce to that

[8] http://www.sciencecouncil.org/content/10-types-scientist-%E2%80%93-science-jobs-are-not-all-same
[9] The current and future UK science workforce, TBR report prepared for the Science Council, 2011

shown in the UKRC data of 2010[10] which identified that only 5.3% (674,000) of working women are employed in any SET occupation, compared to 31.3% for all working men in a total of 5.5 million women and men in SET occupations.

3.6. Looking forward, it would be helpful to understand how well STEM sectors are performing relative to each other and to the wider economy.

4. 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?

4.1. The factors affecting the participation of women are varied, complex and often interconnected. In addition, the different disciplines and employment sectors are at varying levels of development and face different issues such as a shortage of women graduates: it is therefore likely that a range of measures and resources are needed to effect lasting change, including in particular some that target behaviours, attitudes and transparency. While this inquiry is focused on academia, it is important to note that there are lower proportions of women in senior science and technical posts beyond academia (and in particular within Government) and many of the barriers remain the same. However, it is also notable that in the NHS, there has been significant change in the numbers of women being appointed to senior science based positions and for many senior women scientists the NHS is perceived as a welcoming and flexible employer.

4.2. In consultations within the Science Council community key issues of poor promotion practices, poor recruitment practices and lack of work-life balance in academia are consistently raised as major concerns with regard to gender issues in academia. While the majority of programmes have focused on the HE sectors (most notably the Athena Project and Athena Swan Awards) perhaps because of its cohesion and easy identification, as well as its importance in terms of pipeline of women in the wider science workforce, there has been less work undertaken to encourage HE to learn from and introduce successful diversity programmes that have transformed many UK and international science based industries. These sectors have tended to develop and embed diversity policies that include gender, but work across all diversity characteristics: they have well established monitoring and reporting processes and often champions at Board level.

The work of Science Council members

4.3. Through collaboration and shared learning several professional bodies have developed their own initiatives to encourage and support good practice in their disciplines. For example, the Institute of Physics established the Juno initiative[11] following a review of best practice in physics departments. The Juno project differs from the Athena Swan awards in that it enables departments to proceed without the involvement of the Vice Chancellor and includes three levels of awards for departments: Supporter, Practitioner and Champion. The number of departments recognised with the Juno awards so far are 21, 11 and 7 respectively.

4.4. The Institute of Physics and Royal Society of Chemistry collaborated with the Athena Project and have continued to build on this work, acknowledging that:

> *"Good practice benefits all, staff and students, men and women. However, bad practice adversely affects women's careers more than men's."*[12]

4.5. Within Science Council member bodies there is increasing awareness that diversity activities must now move beyond gender and enhance wider diversity in the workforce. The Royal Society of Chemistry's report also highlights a key driver for change:

> *"The age profile of the department, and the diversity of its staff, makes a difference. Young men and women with families have different expectations and needs from their older*

[10] http://www.theukrc.org/files/useruploads/files/final_sept_15th_15.42_ukrc_statistics_guide_2010.pdf
[11] http://www.iop.org/policy/diversity/initiatives/juno/
[12] Planning for Success: Good Practice in University Science Departments, Royal Society of Chemistry, 2008

colleagues. Those younger staff members' careers (and their science) cannot thrive unless the working culture of the department reflects the reality of dual career partnerships."

4.6. Other useful work includes the London Mathematical Society's recent publication[13] which refines the Royal Society of Chemistry's 2008 findings and sets out Five Principles of Good Practice that are readily transferrable to other university departments and other employment sectors. The principles are:

Principle 1:	A robust organisational framework to deliver equality of opportunity and reward.
Principle 2:	Appointment, promotion and selection processes and procedures that encourage men and women to apply for academic posts at all levels.
Principle 3:	Departmental structures and systems that enable men and women to progress and continue in their careers.
Principle 4:	Departmental organisation, structure, management arrangements and culture that are open, inclusive and transparent and encourage the participation of all staff.
Principle 5:	Flexible approaches and provisions that encompass the working day, the working year and a working life and enable individuals, at all career and life stages, to maximise their contribution to mathematics, their department and institution.

4.7. Another well respected initiative is the Daphne Jackson Trust[14] which awards Fellowships to enable scientists, engineers and technologists to return to work following a career break. Many Science Council members support the Trust which has an excellent record of success and would benefit from greater financial support.

4.8. The Science Council is supporting the professional bodies' contribution to increasing diversity across all areas, facilitating collaboration and the sharing of learning as well as developing good practice, targets and leadership with the aim creating opportunities for collaboration particularly where individual action would be uneconomical. Additionally through this project we will also be working with our member bodies to establish methodologies for benchmarking and tracking progress, including data collection. Potential areas for collaboration and sharing practice include:

- formal and informal mentoring schemes using networks of members
- targeted career development programmes
- schemes to raise the profile of women within the organisations
- sharing of good practice in promoting women to senior appointments within voluntary organisations
- benchmarking individual organisation's performance within the sector

4.9. There has been progress in other employment sectors but the Science Council considers that more needs to be done to translate this learning and experience into HE and STEM sectors more generally. For example, Lord Davis's report for BIS, *Women on Boards* [15] identified a number of factors preventing women from reaching senior positions on corporate boards including: a lack of flexible working, difficulty in reaching an acceptable work-life balance within a long-hours culture and disillusionment at their lack of career progression. Many of these factors will also be present in the STEM workforce. For example, a lack of part-time roles available at more senior levels in STEM and the perceived effect of part-time working on progression may well perpetuate the issues. There remains much yet to be done to ensure that employers in the STEM sectors facilitate career breaks for women, support returners and increase the ability of both men and women in the STEM workforce to progress their careers alongside family

[13] Good Practice Scheme, Women in Mathematics, London Mathematical Society, 2013
[14] http://www.daphnejackson.org/
[15] http://www.bis.gov.uk/assets/biscore/business-law/docs/w/11-745-women-on-boards.pdf

responsibilities.

4.10. We know for example, that in the UK, part-time work is often 16-18 hours per week and is more common in low paid and low skilled jobs and that part-time work is typically less available in higher grade occupations. However, in Scandinavia, part-time work can commonly mean up to 30 hours and is more frequently available for employees working in managerial, professional and technical roles. It is believed that this accounts for some of the lower gender pay gap in Scandinavian countries when compared with the UK, which suggests that more flexible working practices could be integral to reducing gender inequalities.[16]

5. What role should the Government have in encouraging the retention of women in academic STEM careers?

5.1. Leadership will be necessary from within STEM if good practice is to be embedded across the employment sectors and Government has a potential role to play in fostering leadership and championing change and success. This may be not necessarily mean focusing only on gender and indeed, there is potentially much to gain from embedding ambitions regarding women's participation in STEM within the wider diversity programmes. However, the Science Council considers it will remain important for pan-STEM and UK-wide approaches to be developed on these issues, especially with regard to collection of data and monitoring progress. With the demise of the UKRC we understand from BIS that the intention is that the Royal Academy of Engineering will provide leadership and development for engineering and technology and the Royal Society will do the same for science. However, that leadership must acknowledge and engage with the very large numbers of other organisations working to increase the numbers of women in the STEM workforce.

5.2. The vast majority of these organisations receive no financial assistance or other support from government and depend on voluntary effort and sources of funding. Nevertheless they can be very effective and innovative, and like many of the Science Council bodies, provide leadership and a voice in their specialist fields. Many focus on a single aspect of diversity such as gender, an employment sector, geographical area or age group. There are also specialist organisations working with returners in academia, others work only in ICT, for BME women, or in biosciences, public sector or a specific geographical location; some focus on supporting young aspirant women scientists and engineers and others produce specialist careers information and web support for those still in secondary education. The range is certainly diverse, but overall these smaller organisations provide a huge resource in a complex field where no single solution is likely to provide a fix. They are able to respond to the needs of individual women and support, mentor and champion the role of women in science. Their specialist knowledge and links enable them to respond to the specific circumstances in their sub-sector in a way that a universal pan-STEM, UK-wide organisation cannot.

5.3. The Science Council would not be in favour of introducing quotas for HE but would encourage Government to consider specific initiatives towards improving transparency with organisations being expected to report on the numbers of women present at senior levels and on their recruitment and retention practices. This is an approach that would be easy to adopt across university departments and could help to focus attention and effort on where least progress is being made.

[16] http://www.equalityhumanrights.com/uploaded_files/research/16_flexibleworking.pdf

Appendix 1

Member Bodies of the Science Council - August 2013

Association for Clinical Biochemistry and Laboratory Medicine
Association of Neurophysiological Scientists
Association for Science Education
British Academy of Audiology
British Association of Sport and Exercise Science
British Computer Society
British Psychological Society
British Society of Soil Scientists
Chartered Institution of Water and Environmental Management
College of Podiatry
Energy Institute
Geological Society of London
Institute of Biomedical Science
Institute of Brewing and Distilling
Institute of Corrosion
Institute of Food Science and Technology
Institute of Marine Engineering, Science and Technology
Institute of Materials, Minerals and Mining
Institute of Mathematics and its Applications
Institute of Measurement and Control
Institute of Physics and Engineering in Medicine
Institute of Physics
Institute of Science and Technology
Institute of Water
Institution of Chemical Engineers
Institution of Environmental Sciences
London Mathematical Society
Mineralogical Society
Nuclear Institute
Oil and Colour Chemists' Association
Operational Research Society
Physiological Society
Royal Astronomical Society
Royal Meteorological Society
Royal Society of Chemistry
Royal Statistical Society
Society for Cardiological Science and Technology
Society for General Microbiology
Society of Biology
Society of Dyers & Colourists
The Organisation for Professionals in Regulatory Affairs

Appendix 2

Extracts from The current and future UK science workforce
Report prepared for the Science Council by TBR, 2011

This research uses a new analysis considering the science workforce across the entire economy, rather than looking at total employees within science based industries. This innovative approach enables an understanding of the true size and scope of the science workforce across the economy, rather than limiting the research to considering scientists working in a narrow band of science sectors.

The definitions of the science workforce used for this report are:

- Primary science workers: workers in occupations that are purely science based and require the consistent application of scientific knowledge and skills in order to execute the role effectively.
- Secondary science workers: workers in occupations that are science related and require a mixed application of scientific knowledge and skills alongside other skill sets, which are often of greater importance to executing the role effectively.
- Non-science workers: workers in occupations that are not science based and have no requirement for science based knowledge or skills.

Sectors are also classified as:

- Core science sectors: sectors that are primarily science based in their core activity.
- Related science sectors: sectors in which the primary activity is not necessarily science based but have a strong relationship to science.
- Non-science sectors: sectors which have no science based or related activity.

Chart 1 Employment split by Sub-Sector, Region and Gender – Primary Workers

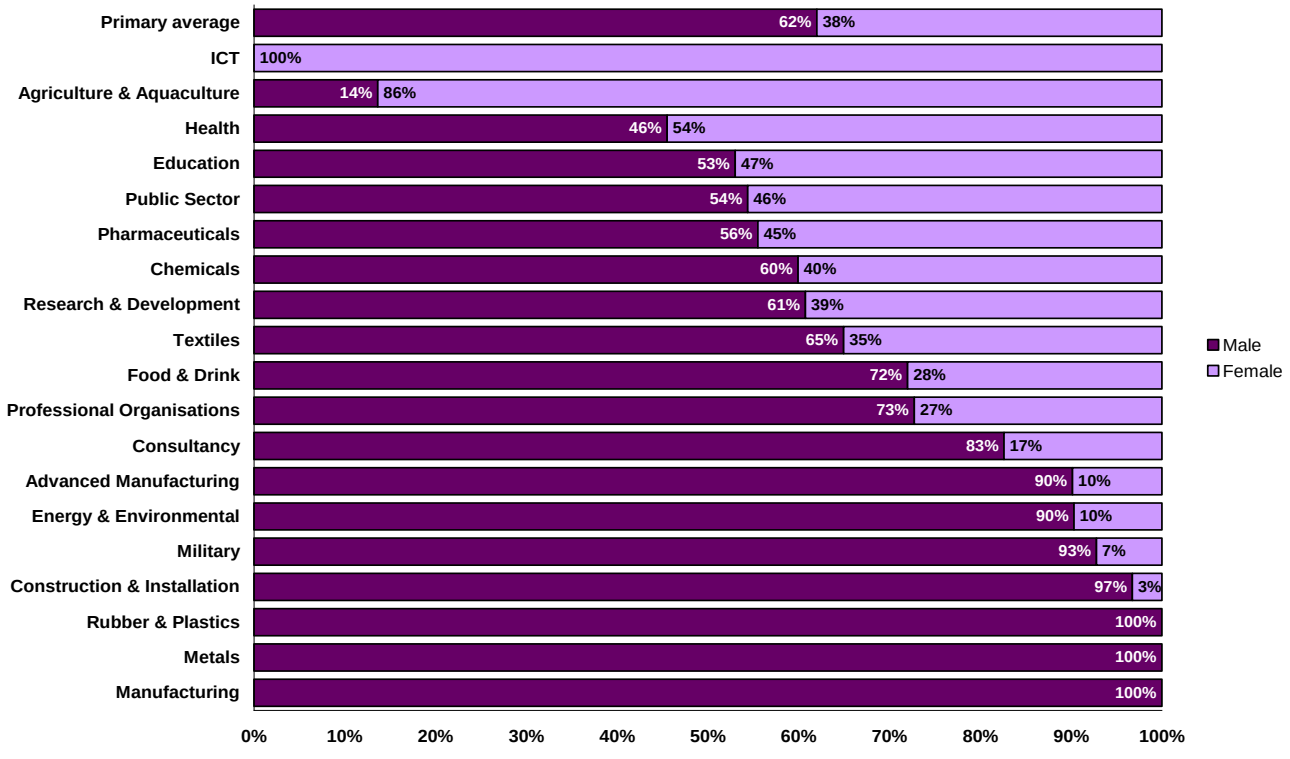

Chart 2 Employment split by Sub-Sector, Region and Gender – Secondary Workers