

## House of Commons Science and Technology Committee: inquiry into Women in STEM careers

### Response from the Royal Astronomical Society

#### Declaration of interests

This is the official response from the Royal Astronomical Society (RAS) to the Committee inquiry into Women in STEM careers. The RAS is active in work in diversity and equalities, so has an interest in the subject of the inquiry. With the exception of our support for the Daphne Jackson Trust, we have however no direct financial relationship with the bodies referred to in this response.

#### Summary

- Astronomy and geophysics in universities and research establishments are better than physics as a whole at recruiting and retaining women, but nonetheless suffer just as much from the 'leaky pipeline' whereby the proportion of women declines with seniority of position. Universities thus lose a substantial proportion of the pool of talented staff available to them.
- The expectation of high geographical mobility and the prospect of a series of short-term contracts at the time when women are likely to consider starting a family appear to deter them from continuing a career in research beyond postdoctoral level.
- The enhanced parental leave proposals due to come into force in 2015 are welcome, but making a higher level of paternity pay available to men who take up this offer would demonstrate that society recognises the importance of their shared parenting role and likely increase its uptake.
- Although essential for parents to pursue research careers, proposed support for childcare through the taxation system (after the age of 5) and through research grants is limited and restricts professional activity.
- The expectation that academic staff seeking promotion and advancement work very long hours deters parents who wish to maintain a healthy balance between employment and family life.
- Universities should (continue to) work to transform their workplace culture and fully embed the good practice set out in schemes like Project Juno and Athena SWAN.
- If the Government wishes to see faster progress in this area, it should follow the lead of the National Institute for Health Research. BIS should mandate Research Councils UK to stipulate that only those research groups that meet the Juno or Athena SWAN Silver standards are eligible for grant funding.

#### Introduction

1. With more than 3700 members, the RAS is the leading UK body representing astronomy, geophysics and space science. A large fraction of our membership is made up of professionals employed in these areas, so we have a keen interest in the subject of this inquiry.
2. In common with bodies like the Institute of Physics (IOP) and the Science and Technology Facilities Council (STFC), the Society has long acknowledged and worked to redress the low

proportion of women who enter and are retained in employment in the sciences we represent. The Society established a Committee on Women in Astronomy and Geophysics in the 1990s, recently reconstituted as a Committee on Diversity in Astronomy and Geophysics (CDAG) to recognise broader equality and diversity issues. We also now support the Daphne Jackson Fellowships that specifically offer flexible working arrangements for early career researchers<sup>1</sup>.

3. In preparing this response, we consulted our membership as a whole to obtain opinions from active researchers in universities and research establishments, those who have left academia to take up posts in industry and those who have left STEM careers altogether. Around 50 Fellows responded, describing the issues that affect women in particular and offering recommendations for action.
4. The Committee may also wish to look at past RAS-supported projects that explored the under-representation of women in astronomy, including the 'She is an astronomer' initiative that formed part of the International Year of Astronomy in 2009<sup>2</sup> and the Demographic Survey and Research Interests of the UK Astronomy and Geophysics Communities that took place in 2010-11<sup>3</sup>.

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

5. Although far from gender parity, astronomy and geophysics recruit and retain a higher proportion of women than physics as a whole. The Demographic Survey data show that in 2011 26%, 30% and 30% of postdoctoral researchers in astronomy, solar system science and geophysics respectively were women, compared with 17% in physics as a whole. Amongst lecturers, the proportions are 27%, 26% and 32% respectively, whilst 20% of lecturers in physics are women.
6. As the Committee notes in its terms of reference for this inquiry, in common with other STEM disciplines this proportion declines with seniority, with women making up 7% of astronomy professors, 13% of those in Solar system science and 8% of those in solid-Earth geophysics.
7. Women (and men) in astronomy and geophysics cite a number of factors that restrict movement into more senior roles in academia.
8. First of all, a key feature of careers in universities is that it is generally considered an advantage for members of staff to have worked in a number of different locations, ideally overseas, before being considered for permanent roles.
9. Many women working in academic posts in astronomy and geophysics have partners in similar occupations (see e.g. work by Janine Fohlmeister and Christiane Helling on the career

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<sup>1</sup> <http://www.daphnejackson.org/>

<sup>2</sup> <http://www.sheisanastronomer.org/>

<sup>3</sup> <http://tinyurl.com/RAS-demography>

situation of female astronomers<sup>4</sup>). The expectation of high mobility then gives early career researchers in relationships a choice: they can either elect to travel with their partner and likely take on a more junior or no role in research or they can try to manage a long-distance relationship (often referred to as the 'two body' problem). Researchers at this level are also likely to be of child-bearing age and women may choose to start a family rather than attempt to seek permanent posts in the same location as their male partner. Consistent with this, there is a substantial decrease in the representation of women between PhD and postdoc positions<sup>5</sup>, which typically coincides with the time when family life starts to be a strong consideration.

10. The level of statutory pay for paternity leave is also a concern for couples starting a family. Policies vary with employer, but the majority offer only the lowest level of statutory paternity pay (£136.78 per week) for two weeks, whereas rather more offer enhanced maternity pay of up to 100% of earnings for up to six months after the birth of the child.
11. The shared parental leave proposals expected to be in place from 2015 allow more flexibility for parents. Where the father is the higher earner however, the absence of enhanced paternity pay makes it unlikely that couples will elect to lose a greater proportion of their household income by the father taking substantial periods of leave.
12. In common with many occupations, academics with young children also need to cope with limited and expensive childcare. When children begin formal education, this can become even more difficult as 'wrap around' provision before and after school and in school holidays is difficult to find. The demise of the childcare voucher scheme which covered children up to the age of 15 and its replacement by a tax subsidy that initially ends at the age of 5 will make this worse for many parents employed in universities as the cost of this provision will then increase<sup>6</sup>.
13. Some research grants (e.g. from the European Research Council) do not include childcare as a chargeable item for conference attendance or fieldwork travel, although this provision may be essential for researchers to work productively and to develop the international research profile essential for career progression and promotion. Where the cost can be reclaimed, it may then be a taxable benefit rather than an allowable tax-exempt expense. This can be of particular importance for part-time employees, as longer periods away from home need extensions to normal childcare arrangements.
14. Given the financial difficulties alone, it is not surprising that so many women elect to take a career break to bring up a family. After that break, they often then struggle to re-enter employment in university research. Departments do not always look favourably on the

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<sup>4</sup> <http://arxiv.org/abs/1204.5632> and private communication, Christiane Helling

<sup>5</sup> Diversity in University Physics: Statistical Digest 2010  
[http://www.iop.org/publications/iop/2010/page\\_43857.html](http://www.iop.org/publications/iop/2010/page_43857.html)

<sup>6</sup> <https://www.gov.uk/government/policies/helping-people-to-find-and-stay-in-work/supporting-pages/introducing-a-tax-free-childcare-scheme>

inevitable associated gap in activity, even if the guidelines for assessment in the Research Excellence Framework take this into account.

15. Working life for those in permanent academic posts is also often seen as incompatible with family life. Respondents from our membership refer to a poor work-life balance where 'ridiculous amounts of unpaid overtime' are the norm, along with a lack of awareness of colleagues and managers of the need to work sensible hours to manage family responsibilities. Although numbers are small, so the data need to be treated with caution, the RAS Demographic Survey noted that women at professorial level in astronomy and geophysics appear to be twice as likely not to have children as their peers of the same age in wider society.
16. Beyond these structural issues, a number of researchers in UK universities (particularly in geophysics groups) cited examples of direct sexism from colleagues (some of which may even be unlawful) that shape the culture of the departments they are employed in and deter women from remaining in academic research. This behaviour is much less common and much less accepted than it used to be, but subtle and subconscious gender bias still appears to exist in hiring practices among both genders.<sup>7</sup>
17. One RAS Fellow referred to this workplace culture and commented that universities also lack the will to redress these attitudes and the underlying organisational issues. At the very least their policies have not been effective in stemming the loss of women researchers and the large fraction of the potential pool of talent that they represent.
18. Interventions at university level are of vital importance, but the proportion of women entering careers in and moving to senior positions in astronomy, space science and geophysics is unlikely to increase significantly until more girls choose to study physics beyond the age of 16. At GCSE level girls make up almost half of Physics candidates. Despite this potential base and many efforts by the IOP and other organisations, the proportion of A level Physics candidates who are girls has remained at around 20% for more than a decade. This is little better in Scotland, where in 2012 29% of Higher Physics and 21% of Advanced Higher Physics entrants were girls.<sup>8</sup>

**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?**

19. At present we do not have extensive data on the movement of women into careers outside of academia. The proportion of women in astronomy and geophysics in universities and research establishments undoubtedly declines with age and seniority and the increase in women in professorial positions over time is slow (highlighted by 'She is an astronomer' in 2009 as well as the more recent RAS Demographic Survey<sup>9</sup>).

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<sup>7</sup> <http://physicsworld.com/cws/article/news/2012/oct/24/physicists-show-bias-against-female-job-applicants>

<sup>8</sup> [https://www.iop.org/policy/statistics/education/page\\_43188.html](https://www.iop.org/policy/statistics/education/page_43188.html) and private communication, Sean McWhinnie, Oxford Research and Policy

<sup>9</sup> <http://www.sheisanastronomer.org/index.php/press/98-ewass-launch-of-she-is-an-astronomer>

20. Where women do move into careers in industry, these cover a wide variety of occupations from employment in the space sector, finance and computing to teaching in schools. Examples of these are included in two RAS booklets on the wider impact of astronomy (see 'A New View of the Universe'<sup>10</sup> and 'Beyond the Stars'<sup>11</sup>) and show the added value that women and men who trained in astronomy and space science research can bring to the wider economy.
21. These career moves are in many cases positive for the women involved and we would expect many research scientists to do the same either immediately after they complete their PhD training or after one or two postdoctoral posts.
22. Nonetheless this 'leaky pipeline' and the lower number of women moving into senior posts means that universities are losing out on a significant proportion of the pool of talent available and that the training of some potentially world class scientists is not being exploited to the full.

**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?**

23. A clear example of good practice is embodied in the IOP's Project Juno<sup>12</sup> that has been adopted by physics departments across the UK, in the process including the overwhelming majority of astronomy groups. Together with the Athena SWAN standards that cover all STEM areas in universities<sup>13</sup>, this effectively means that almost all astronomy and geophysics research groups have commitments to changing organisational practices, to improve the representation of women. The cultural and practical changes that result from implementation of, rather than just support for, Juno standards benefit women and men alike and the Society wholeheartedly backs this project.
24. Specific (and transferrable) examples of good practice were cited by the University of Glasgow, which has Juno Champion status. These include a system of regular formal appraisal and constructive feedback for all members of staff (including postdocs) that helps identify career development needs; regular monitoring and appraisal of PhD student progress, discussion forums for PhD students and for postdocs, with formal reporting of concerns to departmental management, equality and diversity training for all staff members involved in recruitment and for all PhD students and postdocs involved in teaching/supervision/lab demonstrating.
25. It is also essential that research groups have access to data on the gender balance of staff and students, from undergraduate to professorial level. Acquiring and maintaining these data is normally the responsibility of the university human resources team. The University of

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<sup>10</sup> [http://www.ras.org.uk/images/stories/Publications/Big\\_science\\_for\\_the\\_big\\_society.pdf](http://www.ras.org.uk/images/stories/Publications/Big_science_for_the_big_society.pdf)

<sup>11</sup> <http://www.ras.org.uk/images/stories/Publications/beyondthestars.pdf>

<sup>12</sup> <http://www.iop.org/policy/diversity/initiatives/Juno/>

<sup>13</sup> <http://www.athenaswan.org.uk/>

Bristol, whose physics department has Juno Practitioner status, uses these data to keep track of the turnover, promotions and the implementation of flexible working and shapes its strategy accordingly.

26. To date Juno and Athena SWAN have had much less involvement in research establishments that employ astronomers, space scientists and geophysicists such as the British Geological Survey and the Rutherford Appleton Laboratory. NERC and STFC are responsible for these and a number of other research facilities. The two bodies should move to implement Juno or equivalent projects in these organisations.
27. Early-career scientists juggling work and family life, and women in particular, would benefit from a more stable and flexible working environment in universities, with for example longer contracts for postdoctoral fellowships. Increasing the number of location-independent fellowships from research councils and other bodies would also make it easier for academic couples to work at the same or nearby institutions.
28. Turning to the problems faced by 'dual career' couples, this forms part of the Athena SWAN guidance for universities. Outside of the UK, universities in Switzerland<sup>14</sup> and the United States<sup>15</sup> have considered schemes to assist partners of appointed academics to find employment in the same location. If UK universities wish to recruit and retain women, they could consider a similar approach.
29. As noted earlier, it is considered an advantage if candidates for permanent university posts have spent significant periods of time overseas. This can deter applicants with families. One suggestion to counter this is that higher education institutions also recognise the value of international collaboration and the contact with overseas peers that it brings, even for researchers who remain based in the UK throughout their career.
30. If higher education institutions are serious about improving the retention of women scientists, there needs to be a significant change in workforce culture. The starkest example of the reported presence of overtly sexist attitudes in some research groups is surprising and needs to be rigorously challenged, as does the assumption that women who take time off for maternity and parental leave will damage the assessment of research activity.

### **What role should the Government have in encouraging the retention of women in academic STEM careers?**

31. Every response from research scientists in our community described the difficulty in balancing family life and childcare with a successful career. A key, though probably not sufficient policy change to address this would be to extend the proposed tax-free childcare scheme to cover children aged up to 15, thus allowing parents to arrange care for children who are in school as well as those in early years settings.

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<sup>14</sup> <http://www.crus.ch/information-programme/programme-cus-p-4-equal-opportunity-gender-studies/module-3-dual-career-couples-dcc.html?L=2>

<sup>15</sup> <http://gender.stanford.edu/dual-career-research-report>

32. In wider terms, the Government should be taking a leading role to encourage employers, schools, colleges and universities to bring women into science and to help them understand the excitement and value of STEM careers. In astronomy in particular there are many examples of women scientists who make excellent role models for girls of school age.
33. Although the Department for Business, Innovation and Skills mentions the need to engage new audiences in its Science and Society strategy, there is no reference to the under-representation of women in the physical sciences. Actions to address this shortfall should be embedded in the BIS strategy.
34. If the Government wishes to see faster progress in bringing and retaining women in STEM careers, it could mandate Research Councils UK to stipulate that only university departments that have obtained the status of Athena SWAN Silver or its equivalent will be eligible for research grant funding. This is already the case for NHS National Institute for Health Research and would push universities to embed practices that advance the careers of men and women on an equal basis.<sup>16</sup>

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<sup>16</sup> <http://www.athenaswan.org.uk/content/history-and-principles>