
BREAKING
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We thank our Inclusion and Diversity Committee (IDC), and especially its chair, Polly Arnold OBE, for support and input during the preparation of this report. We are indebted to Lesley Yellowlees, founding chair of the committee, for her part in commissioning the study, and thanks go to Marina Resmini, member of the IDC, for her support in creating our focus groups.

Talented, hard-working people should not be made to feel that they cannot progress in their field.

There is no acceptable reason to stop someone achieving their potential. Yet it is evident from our research in the community that barriers exist when it comes to progression and retention in the chemistry profession. Our recent report, , highlighted that while this is the unfortunate truth for more than one group, it is a particular challenge for women working in academia.

Gender balance is not a target in and of itself but an outcome of an equitable system. As our survey respondents say, the academic system should be focused on retaining the best talent, 'regardless of gender or any other protected characteristic.'

I am encouraged by the strength of feeling in the community on this issue, demonstrated by the level of engagement and number of in-depth answers we received in response to this study. The reports, evidence, ideas and recommendations you shared with us capture di erent perspectives and a wide range of circumstances, but all have the same underlying message.

There is plenty of evidence, and not enough action.

We must acknowledge and applaud the progress made so far. But there is so much more that must be done to break the barriers down for good and to make a genuine di erence, we must all act now.

We are ready to take the lead on driving this change and indeed, we are already putting our plans into action. But we

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In early 2018, our Diversity Landscape of the Chemical Sciences report showed a worrying lack of progress in developing and retaining women in leadership positions in the chemical sciences.

The report provided evidence that just 9% of chemistry professors in the UK are women. This means that between undergraduate study and reaching senior positions in academia, the relative proportion of female chemists drops by 35 percentage points.

Our new study identi es three key barriers to women's progression in the chemical sciences:

current short-term funding and contracting structures, combined with current de nitions of scienti c excellence and success, are creating uncertainty and unnecessary amounts of pressure.

inconsistencies in the quality and accountability of management, poor sponsorship and recognition opportunities for women, lack of transparency in recruitment and promotion processes, unequal allocation of workloads, overloading female chemists with academic citizenship activities, and reported cases of bullying and harassment are driving talented people elsewhere.

practical barriers that have impacts at di erent stages in chemists' careers, a lack of opportunity for part-time and exible working, plus a lack of understanding and respect for caring responsibilities are forcing individuals to choose between a career and other demands on their time.

These challenges are not speci c to one gender. However, it is clear that they disproportionally a ect women.

The vast majority (99%) of our survey respondents acknowledge the seriousness of the issues raised in this report, and their comments give the entire community a mandate for action.

Cultural change is needed, and the time to act is now.

- take the lead
- push for accountability
- develop best practice

1. To launch a bullying and harassment helpline by summer 2019
2. To launch grants for carers in early 2019
3. To launch annual recognition for chemistry departments that demonstrate signi cant progress in inclusion and diversity
4. To facilitate an exchange of best practice between peers
5. To launch a gender equality forum to accelerate culture change

Signi cant change does not happen when one group acts in isolation. It is essential that every part of our community academic funders, academic employers, societies, and you as individuals works together to drive momentum and promote further change.

These are complex issues, and change is going to take time. But change has to start somewhere, and the more we do now, the better.

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It is clear from the evidence that a continued challenge for gender equality exists, particularly in retaining and developing women into positions of leadership within the chemical sciences. Change is happening, but nowhere near fast enough. Continuing at the current rate of change, a simple statistical analysis of the data tells us that we will never reach gender parity.[1]

We designed this study to look into the reasons why the retention and progression of women is low, with three overall objectives:

1. To improve our understanding of the barriers to retention and progression of women in academic roles
2. To identify actionable solutions to enable women to meet their full potential in these roles
3. To begin to investigate issues of retention and progression of women outside academia

The focus on academia came about because of the data gathered as part of our report, , and because:

- the problem is particularly acute in STEM
- our issue of women's retention and progression is particularly pronounced in comparison with other scienti c disciplines, and
- there is clear potential for us to have an impact at scale in this area.

Through a major survey, interviews and focus groups, we gathered data from more than 1,800 people across the community, giving us new insights into the barriers facing women in the chemical sciences.

The research took place at the same time as other relevant reviews and activity in the sector, including:

- The 2018 Athena SWAN Review[2]
- Royal Society of Edinburgh’s 2018 review of 'Tapping all our Talents’[3]
- The UK Research and Innovation (UKRI) 'strategy and action plan’ on diversity, expected in spring 2019[4] and its call for experts on diversity and inclusion to feed into this.

The bene t of addressing retention and progression of women is clear to the community itself. More diverse teams

“I don’t think there are any role models I know who have managed to balance an academic career and a family and a life.”

Female, PhD, UK

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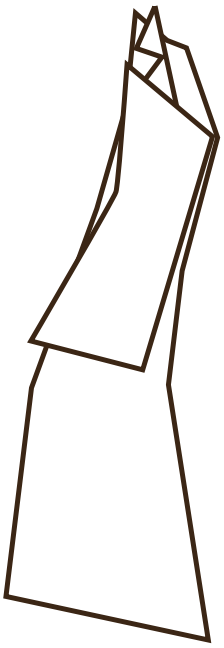
We designed our approach to encourage open and honest conversation. The interviews and survey were open to all respondents. Focus groups comprised female chemists at di□erent stages of their careers.

PhD students
Early career researchers
Senior academics
Academic leavers

Senior academic and industry contacts
Policy & diversity specialists
Representatives from funding bodies

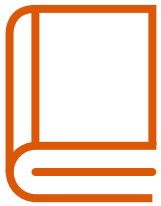
99%



The dominance of short-term contracts creates unnecessary pressure and uncertainty

Funding eligibility criteria can be arbitrary and can limit opportunities instead of creating them

De nitions of success are skewed towards a 'publish or perish' mentality



Decisions about recruitment and promotion lack transparency and fairness

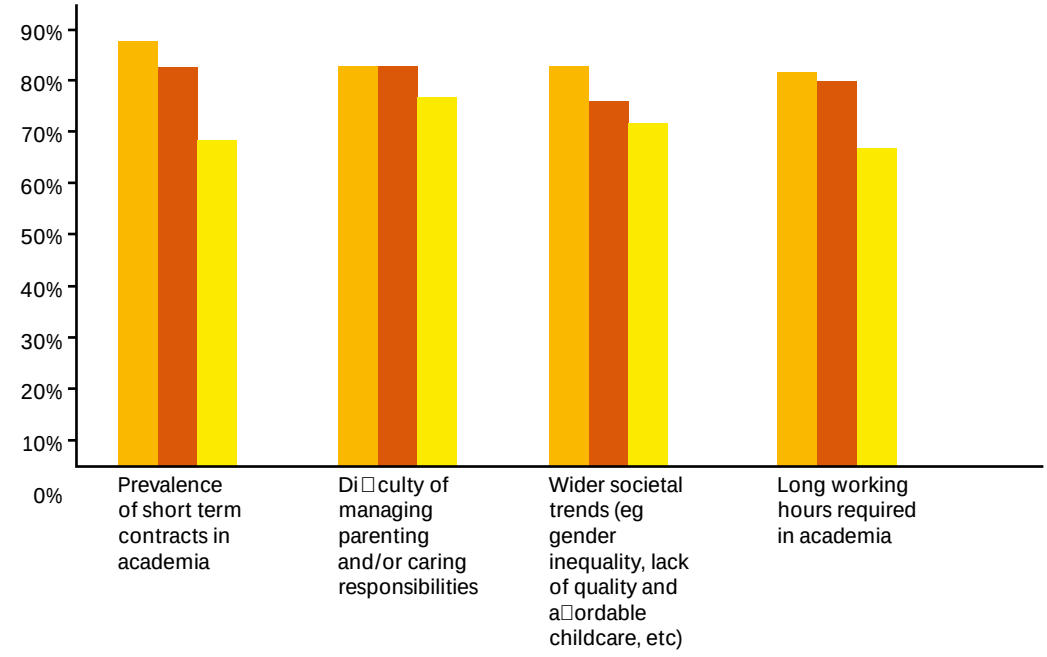
Quality of management and leadership in UK chemistry departments is inconsistent, with few relatable role models

There is a tendency for academic citizenship responsibilities to fall to women

Long working hours are seen as necessary for career progression

Lack of part-time and exible working options makes it harder to manage caring responsibilities

Provision of a ordable, high-quality childcare is frequently inadequate


90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Prevalence of short term contracts in academia
Di□culty of managing parenting and/or caring responsibilities
Wider societal trends (eg gender inequality, lack of quality and a□ordable childcare, etc)
Long working hours required in academia

78%

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78%

Recruitment, promotion and policy-making decisions lack transparency and fairness

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“Thinking about all the collaborations I’ve worked on… they’ve all started in the pub.”

Female, senior chemist, UK

“If a postgrad student becomes pregnant during her studies, she is most likely forced to take a break. My university was one of the first arranging a lab technician to help a pregnant postgrad student when she couldn’t work with solvents of certain chemicals anymore due to health concerns. This model really should be adopted in more universities... With more postdoctoral students the number of women in other senior academic roles would surely rise as well.”

Female, UK

Maintaining a 'double career' relationship or family

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Extended family caring responsibilities

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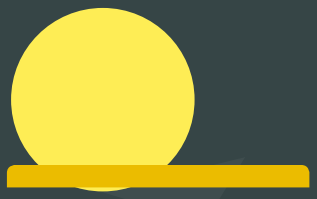
Many of these barriers apply to both men and women, however, they disproportionally a□ect women.

Many of these barriers apply to women in settings outside chemistry departments including other STEM disciplines and in commercial organisations.

Other barriers are present – discrimination, harassment and bullying exist at scale.

The 'lack of relatable role models' describes the absence of 'next-up' or senior chemists (of all genders) to which others can aspire. Participants at all career stages emphasised the importance of seeing senior colleagues lead aspirational lives.



"For me, the greatest lesson to be taken from industry is flexible working for everyone, not just for women. This enables all genders to take on more equal shares for caring responsibilities (whether child or elder care) meaning that one, usually a woman, isn't forced into lower paying part-time work or into leaving the sciences altogether."

Female, industry UK

93%

95%

Several interviewees highlighted the economic impact of the current gender imbalance, and discussed the bene ts that improvements would deliver. These included:

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- Securing the future of UK HEIs and the HE sector, ensuring these retain a competitive edge
- Securing the UK's future talent pipeline in a competitive and global market
- Contributing to future economic development of the wider chemical sciences sector (an important growth sector itself)
- Positive impact on other sectors that have demand for SET (science, engineering and technology) skills
- Encouraging the development of new ideas, entrepreneurial opportunities and diversi cation

A small number referenced the NHS costs arising from the mental health 'burden' of academic sta . They indicated that these costs will decrease if working practices in HEIs are consciously improved.

Others suggested that the sector would bene t from greater analysis of the economic impact of attrition, believing that evidence of nancial costs to the sector will motivate change. Only a small number of interviewees spontaneously mentioned the wider economic impact of the loss of women from academia.

The challenges of assessing the economic contribution of women in science are well documented.[12] The Women's Business Council estimated the economic cost of the loss of women in science to the UK economy to be £2bn annually.[13] However this gure, based on calculating the loss of graduate earnings across STEM, does not explore the economic impact of senior women in particular, or the potential economic impact of reputational decline for institutions and UK HE overall.

Other studies have demonstrated the economic bene ts of more diverse teams. A recent report from McKinsey provided evidence of the economic bene t of diversity in business. It concluded that:

> "Following a meticulous analysis of 300 companies around the world, we found a di erence in return on equity of 47% between the companies with the most women on their executive committees and those with none, and a 55% di erence in operating results."[14]

An accurate assessment of the cost of attrition of female academic sta in chemistry would require faculties to collate and share data on: destination of leavers, salaries, changes in team performance and productivity. The lack of data on these points does not detract from the economic imperative to improve gender imbalance.

This research captured con! icting perspectives on the e, ectiveness and impact of the Athena SWAN programme. Many in the community eagerly await the results of Advance HE's 2018 Athena SWAN review.[15]

A signi cant number of participants in this review acknowledged the success of Athena SWAN in raising the pro le of gender equality agenda across the sector.

The initiative is strongly praised for its principle of holding universities to account on progress. Many described seeing some positive impact of the Charter in their teams, ranging from more open discussion and awareness of the diversity issues, to changes in policy and practice.

A small number of respondents said it has made a positive contribution to the appointment of women to senior roles in their departments.

However, there was substantial criticism from across the community, including some who said it has delivered some bene ts in their teams. Concerns included:

- The fact that the administrative burden falls disproportionately to women chemists, taking time away from their research.
- In too many cases, applying for an Athena SWAN award is seen as a tick-box exercise.
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“It is easy to gloss over the data and present a good picture of your institution. Ask anyone who has participated in Athena SWAN!”

Female, reader/senior lecturer, UK

“Having to have women on every interview panel has been a negative outcome of Athena SWAN”

Female, senior academic, UK

“It would be good to externally influence these departments using external factors. Athena SWAN goes some of the way, but unfortunately in many places it becomes just another "little job for the ladies". Processes that change the mindset of the entire workforce, would be useful.”

Reader/senior lecturer, UK

Making the systemic change we so clearly need in order to make chemistry for everyone is no easy task. The community does not underestimate the complexity of the challenge, but is more than ready to take it on:

“Big change is needed. It cannot and will not come from within the departments who want to keep the sta

“Where the Royal Society of Chemistry can make a di□erence is doing the communications, the case studies, saying this is important... There is a lot of consensus that we (funders, learned societies, academic institutions) need to get our houses in order, but fundamentally it requires a massive shift in academic culture and that is more challenging.”

Male, research funding agency, UK

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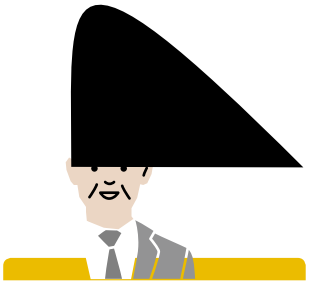
Female, lecturer, Europe (non-UK)



“I went to a [university diversity] committee and I was the only man there, and a senior man. This demonstrated that chemistry [the chemistry department] was making a commitment [to diversity]. Several commented on it when I walked into the room. That was a sea change. It is important not to say ‘women, this is your problem.’”

Male, senior academic, UK

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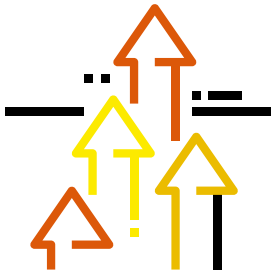

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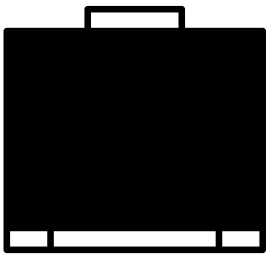

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“The importance of sponsorship, mentoring and role models cannot be overestimated... I decided to go into industry as I could see a clear career path for myself, and already had examples of women I admired who had been successful. I’m still fairly early in my career... but have been supported, challenged, and have progressed well, while staying technical. I doubt I’d have had the same experience had I chosen to complete a PhD and go into postdoc

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We used a mixed-methods approach to allow exploration of prompted and unprompted perspectives, at scale.

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	M	26%	27%
		73%	73%
	O	1%	1%
	C	87%	88%
	P	3%	3%
	B	4%	4%
	O	5%	5%
	A	45%	41%
	I	31%	33%
	E	9%	10%
	C /	4%	5%
	M	1%	1%
	F	1%	1%
	G /	3%	3%
	O NB:	6%	7%
/	R P, D	56%	55%

Percentages may not sum to 100% due to rounding

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1. Communicate: i) the scale of the challenge; ii) that systemic change is required for impact; iii) examples of good practice

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1 , Royal Society of Chemistry, 2018

2 https://www.ecu.ac.uk/wp-content/uploads/2018/07/Athena-SWAN-2018-review-FAQs-v1.pdf

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www.rsc.org

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