

The image features a vibrant yellow background filled with various abstract, geometric shapes in shades of yellow and light green. A prominent, dark blue vertical line runs down the center of the page. In the lower-left quadrant, the words "BREAKING" and "TH" are written in a bold, dark blue, sans-serif font. The text is partially cut off by the vertical line and the edge of the frame.

**BREAKING**  
**TH**



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# Acknowledgements

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.

# Foreword

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, [Chemistry in the Community](#), 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 different 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 difference, 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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# 2 Executive summary

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.

**Talented women interested in an academic career are leaving the sector before reaching their full potential.**

**Excellent female scientists who stay in academia are not progressing to senior grades in the same proportion as their male peers.**

**Continuing at the current rate of change, we will never reach gender parity.<sup>4</sup>**

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

**Academic funding structures:** current short-term funding and contracting structures, combined with current definitions of scientific excellence and success, are creating uncertainty and unnecessary amounts of pressure.

**Academic culture:** 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.

**Balancing responsibilities:** practical barriers that have impacts at different stages in chemists' careers, a lack of opportunity for part-time and flexible 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 specific to one gender. However, it is clear that they disproportionately affect women.

**At a national level, progress in increasing diversity in the chemical sciences remains extremely slow.**

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.

**As the UK's professional body for chemical scientists, we will use our position, influence and connections to:**

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

**We have a five point action plan:**

- 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 significant 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

Significant 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.

# 3 Introduction

**“Excluding or diminishing any section of society weakens science.**

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.<sup>1</sup>

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, [The Chemical Sciences Workforce](#), and because:

- ▶ the problem is particularly acute in STEM
- ▶ our issue of women’s retention and progression is particularly pronounced in comparison with other scientific 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.

## Building a clearer picture

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

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

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

(HEI) KH E T

A KH EI P

C A



"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."

**Focus group**  
Female, PhD, UK



## 4 Methodology

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 different stages of their careers.



### Focus groups

- PhD students
- Early career researchers
- Senior academics
- Academic leavers

### Telephone interviews

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



**99%**

**of female chemists in UK  
academia can evidence  
the lack of retention and  
progression of women**

## Wide-reaching implications



**A constant fight**

**Frustratingly slow**

**Little support**

**Exceptionally poor**

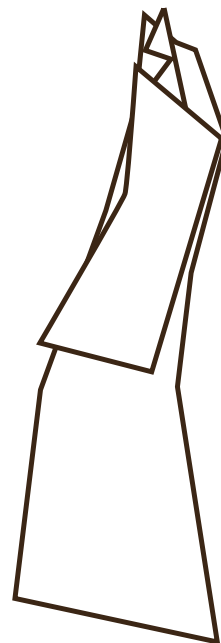
**Unbearable pressure**

**○ ensive**

**Not sustainable**

**Inexcusable**

**Appalling**



# Understanding the barriers to retention and progression

G... ..  
... ..  
... ..  
... ..  
... ..

M... ..  
... ..  
... ..  
... ..  
... ..

## Three key themes



### Academic funding structures

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

Definitions of success are skewed towards a 'publish or perish' mentality

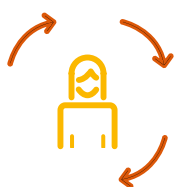


### The academic culture

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



### Balancing work with other responsibilities

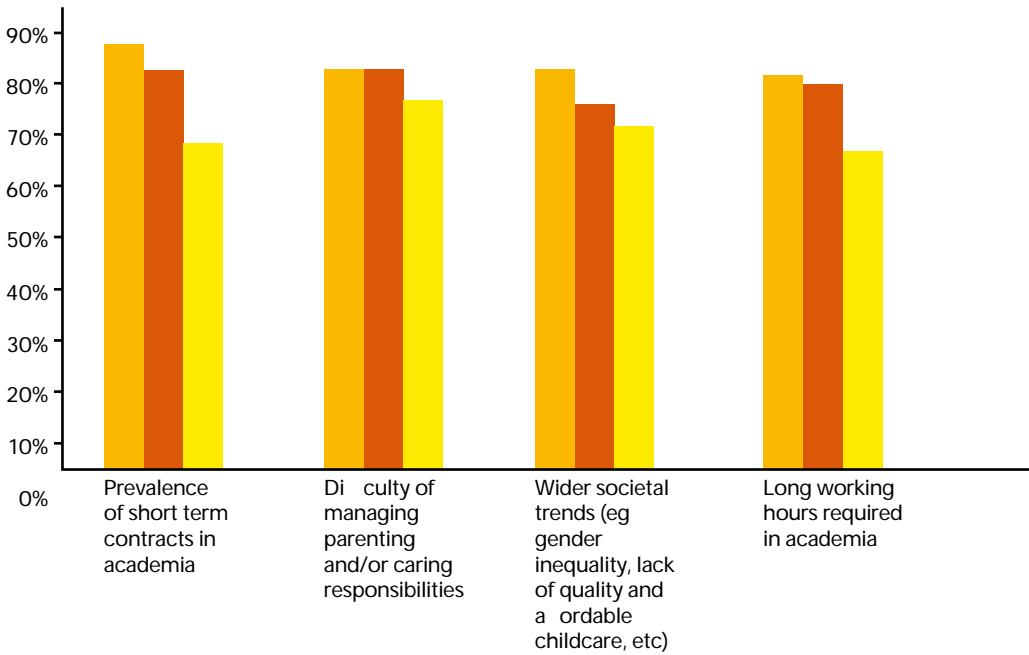
Long working hours are seen as necessary for career progression

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

Provision of affordable, high-quality childcare is frequently inadequate

# Drawing out the detail

Exploring the detail of the challenges faced by academics in the UK



**78%**

**of chemists who currently work in UK academia felt that the prevalence of short-term contracts has an impact on the retention and progression of women**

**78%**

**also said that managing parenting and caring responsibilities has an impact**





## The impact of academic culture

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

- ▶ M
- ▶ P



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

### Focus group

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.”

**Survey respondent**  
Female, UK



## Maintaining a 'double career' relationship or family

- ▶ **R**esearchers often have to choose between their family and their career. This is particularly true for women who are often expected to take on more of the domestic and childcare responsibilities.
- ▶ **M**ore flexible working arrangements, such as part-time work or job sharing, can help to maintain a 'double career' relationship.
- ▶ **R**esearchers should be encouraged to take on more of the domestic and childcare responsibilities.

## Extended family caring responsibilities

- ▶ **T**he presence of extended family members with caring responsibilities can be a significant barrier to career progression.
- ▶ **T**he presence of extended family members with caring responsibilities can be a significant barrier to career progression.

## Further issues raised

**S**ome participants raised the issue of the 'leaky pipeline' where women are lost to the profession at various stages of their career.

**E**ven when women do progress, they may face a 'glass ceiling' where their career progression is limited.

**T**he presence of children and family responsibilities can be a significant barrier to career progression. **B**alancing work and family responsibilities is a challenge for many women.

**A** lack of role models and mentors can be a barrier to career progression. **T**he presence of children and family responsibilities can be a significant barrier to career progression.

Many of these barriers apply to both men and women, however, they disproportionately affect 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.

## Spotlight



"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."

**Survey respondent**  
Female, industry UK





**93%**

**of survey respondents believe that it is up to the chemical science community to tackle the issues of attrition and progression**

**95%**

**of respondents working in**

## Picking out the key themes





**Respondents also highlighted the range of personal, institutional, economic and societal benefits that stem from establishing equality in the chemical sciences:**

## Addressing an ongoing challenge

Q. *[Faint, illegible text]*

S. *[Faint, illegible text]*

*[Faint, illegible text]*



# Economic impact of the loss of women from UK academic teams

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

## 1 Increasing individual and family finances

## 2 Boosting GDP through increasing participation, productivity and earnings

- ▶ Research into the economic impact of the loss of women from academia
- ▶ The economic impact of the loss of women from academia
- ▶ The economic impact of the loss of women from academia
- ▶ The economic impact of the loss of women from academia

## 3 Supporting and securing science's future contribution to the UK economy

- ▶ 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 diversification

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

Others suggested that the sector would benefit from greater analysis of the economic impact of attrition, believing that evidence of financial 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.

**For many, the moral reasons for 'fixing' this loss take precedence. A number of survey respondents urged the community to move on from analysis to action with tangible outcomes.**

The challenges of assessing the economic contribution of women in science are well documented.<sup>12</sup> The Women's Business Council estimated the economic cost of the loss of women in science to the UK economy to be £2bn annually.<sup>13</sup> However this figure, 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 benefits of more diverse teams. A recent report from McKinsey provided evidence of the economic benefit of diversity in business. It concluded that:

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

An accurate assessment of the cost of attrition of female academic staff 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.



# Spotlight

## Perspectives on Athena SWAN

This research captured conflicting perspectives on the effectiveness and impact of the Athena SWAN programme. Many in the community eagerly await the results of Advance HE's 2018 Athena SWAN review.<sup>15</sup>

### Raising awareness

A significant number of participants in this review acknowledged the success of Athena SWAN in raising the profile 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.

### or creating more challenges?

However, there was substantial criticism from across the community, including some who said it has delivered some benefits 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.
- ▶ Inequalities persisting in some departments that have received awards.
- ▶ Institutes not aiming high enough. Receipt of a Bronze award can be perceived as 'job done'.
- ▶ The programme is resulting in only 'pockets' of progress.
- ▶ 'Positive action' can create new challenges for women. A small number say that, as a result of its demonstrable progress in recruiting a more balanced leadership team, they encounter views that women have been appointed on the basis of gender over merit. This deters other women from seeking promotion, under the impression that they need to exceed expectations for new roles and positions in order to counter views they have been appointed 'to tick a box.'

Only a small number of examples show that male staff are leading their departments' Athena SWAN work. One interviewee emphasised that having a senior male Athena SWAN lead for their faculty has helped embed the importance of increasing diversity across their team.



"It is easy to gloss over the data and present a good picture of your institution. Ask anyone who has participated in Athena SWAN!"

**Survey respondent**  
Female, reader/senior lecturer, 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."

**Survey respondent**  
Reader/senior lecturer, UK



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

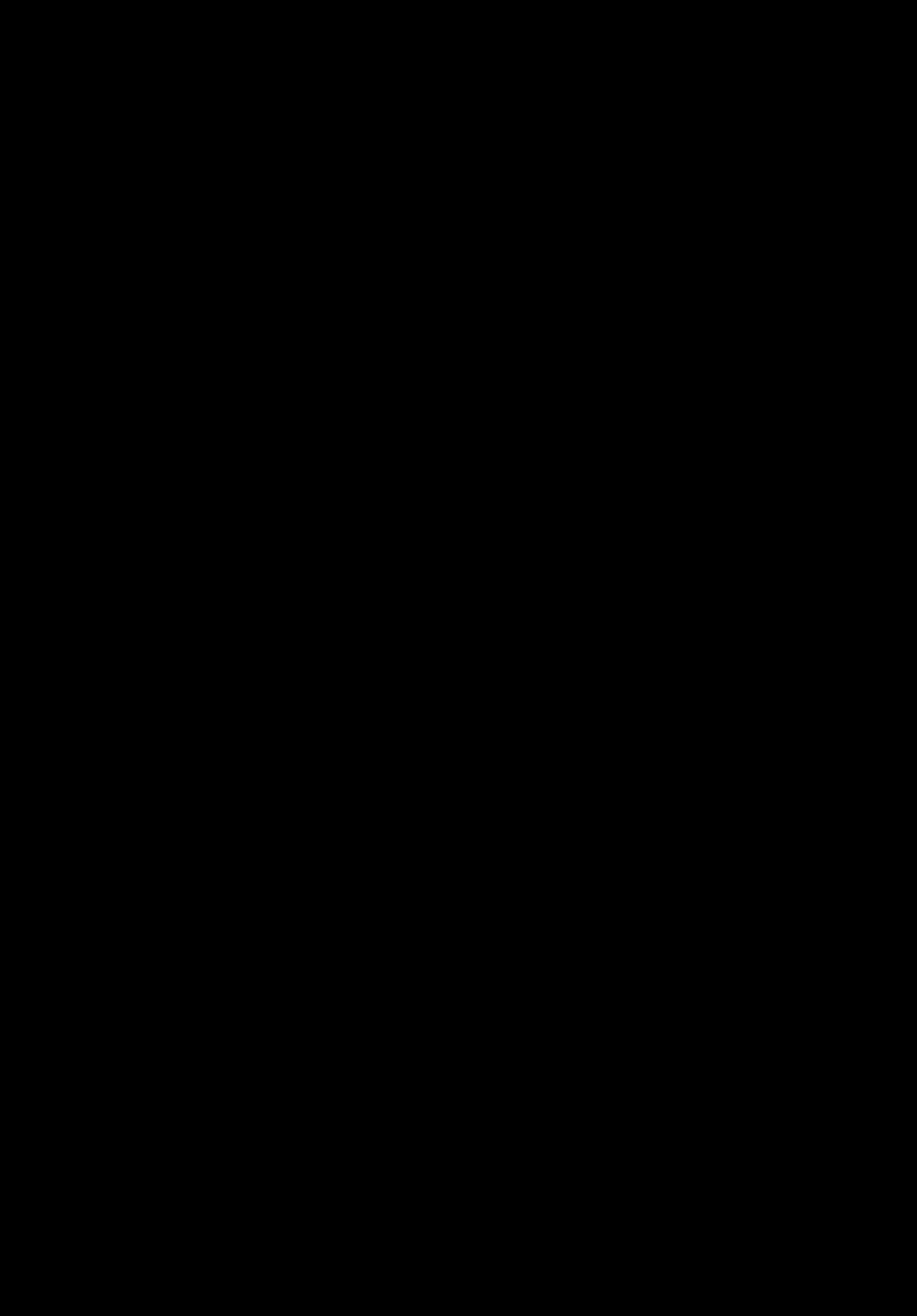
**Focus group**  
Female, senior academic, UK

# 7 The way forward 'chemistry for everyone'

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 difference 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.”

**Stakeholder interviewee**

Male, research funding agency, UK

“The Royal Society of Chemistry can empower everybody not only to change within the community, but to put pressure on Government for policy change and to influence the wider society and promote cultural change.”

**Survey respondent**

Female, lecturer, Europe (non-UK)

# Reacting to our key themes

## Academic funding structures:

B  
R  
A

- ▶ A
- ▶ E
- ▶ I

## The academic culture:

B  
R  
A  
HE

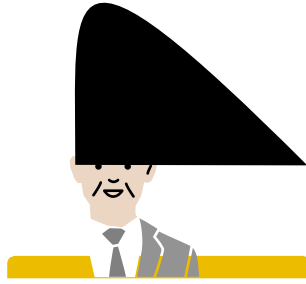
- ▶ I
- ▶ E
- ▶ P
- ▶ R

A  
HR

## Balancing work with other responsibilities:

A  
S  
R





“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.’”

**Stakeholder interviewee**

Male, senior academic, UK

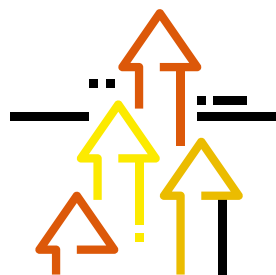
# Supporting an empowered community

Research



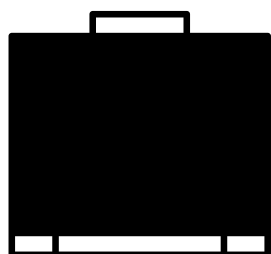
## 1 Communication

- ▶ Support
- ▶ Advocate
- ▶ Support
- ▶ Communicate
- ▶ Engage



## 2 Advocacy and influence

- ▶ Communicate with NGOs
- ▶ Influence HR (STEM)
- ▶ Advocate for AN
- ▶ Lead



## 3 Funding changes

## 4 Culture change





“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





## What we will do

- ...

# Appendices

## Appendix 1: Research methodology

### Overview

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

**Table 1: Women in the chemical sciences research overview**



T. ... F. ... B. S. ...  
 C. ... D. ... D.

**Survey**

1,787 ... 63%

**Table 2: Overview of survey respondents**

		All respondents (overall 1,787)	UK respondents (overall 1,296)
<b>Royal Society of Chemistry membership</b>	M	60%	71%
<b>Gender</b>	M	26%	27%
		73%	73%
	O	1%	1%
<b>Field</b>	C	87%	88%
	P	3%	3%
	B	4%	4%
	O	5%	5%
<b>Employment sector of those currently in employment</b>	A	45%	41%
	I	31%	33%
	E	9%	10%
	C	4%	5%
	M	1%	1%
	F	1%	1%
	G	3%	3%
	O	6%	7%
	NB:		
<b>Current role / stage for current academics</b>	R	56%	55%
	P, D		

Percentages may not sum to 100% due to rounding



## Stakeholder interviews

20 30 60

**Table 4: Details of stakeholder interviews**

Group	Number of interviews

## Appendix 2: Further suggestions

S. ...

T. ... (7).

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

▶ ...

▶ ...

▶ ... N. ...

## Appendix 3: Additional analysis

T  
D

# References

- <sup>1</sup> [https://www.rsc.org/learning/chemistry/chemistry-in-the-21st-century/chemistry-in-the-21st-century-2018-01-01](#), Royal Society of Chemistry, 2018
- <sup>2</sup> <https://www.ecu.ac.uk/wp-content/uploads/2018/07/Athena-SWAN-2018-review-FAQs-v1.pdf>
- <sup>3</sup>



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