Representation from the Royal Society of Chemistry

January 2022

researchers and students in universities, teachers, and regulators.

We welcome the opportunity to respond to this inquiry, considering the following terms of reference:

- The [illegible]
  industry (see section 4);
- The reasons why these groups are underrepresented (see section 5);

backgrounds; disabled people; people from disadvantaged socio-economic backgrounds; and LGBT+ people. This draws on our 2018 report Diversity landscape of the chemical sciences [2], which showed that the chemical sciences are not representative of society as a whole, in particular with regard to disability, ethnicity, sexual orientation, socioeconomic background and gender and subsequent research.

Section 5: Sets out the evidence on the reasons why particular groups are underrepresented, including barriers to retention and progression; reward gaps and job satisfaction considerations; structural barriers in research and funding systems; higher education inequalities; bullying, harassment, and cultures of not belonging; implicit bias and exclusionary environments; and barriers to progression from compulsory education.

Section 6: Sets out evidence on the implications of the underrepresentation of these groups in chemistry and in STEM more broadly, including negative impacts on the quality of science and innovation,

v. Inequalities in education – long-standing barriers to access to high quality science education need to be addressed to ensure that every student, whatever their background, receives an excellent chemistry education.

vi. Shifting the burden – Throughout these recommendations, it must be ensured that those from underrepresented groups are not being burdened with unrecognised work to combat their own underrepresentation.

General comments

Language

i. We use "disabled people" in recognition of a social model approach to disability which notes that people with physical and/or mental impairments or differences are disabled by an inaccessible society; 'disability' is created in the interaction with society, rather than being a characteristic or appendage of an individual as suggested by "people with disabilities".

ii. We use "people from minoritised ethnic backgrounds" or "people of minoritised ethnicities" for a similar reason; to highlight that particular racial or ethnic backgrounds are not inherently, or even numerically, 'minority' but that dependent on geographical/historical/social contexts some people are minoritised on the grounds of their racial or ethnic background.

Scope

i. We note that the terms of reference for this inquiry do not include specific reference to LGBT+ people. As our data and evidence shows, LGBT+ individuals are a group facing significant barriers to representation, progression and retention in STEM.

ii. Our 2019 report [7] gathered data and evidence on the experiences of LGBT+ individuals in the physical sciences (i.e. physicists, astronomers and chemical scientists) and the barriers to their retention and career progression. The report shows that STEM workplace policies and procedures do not adequately support employees who are not heterosexual and cisgender.

iii. 18% of LGBT+ physical scientists have personally experienced harassment or other exclusionary behaviour at work. Trans and non-binary respondents experienced the highest level of exclusionary behaviour.

iv. 28% of LGBT+ respondents stated that they had at some point considered leaving their workplace which are not seen as fitting in with ‘typical’ experiences of exclusion. It is vital that these intersectional experiences are attended to when working to address under-representation, so as not to fall into a ‘one size fits all’ model of inclusion and diversity work which can then itself become exclusionary.

4. The nature or extent to which women, ethnic minorities, people with disabilities and those from disadvantaged socioeconomic backgrounds are underrepresented in STEM in academia and industry

Overview

i. Our 2018 report [2] showed that the chemical sciences are not representative of society as a whole, in particular with regard to disability, ethnicity, sexual orientation, socioeconomic background and gender. We identified themes of mental health and disability, ethnicity, sexual orientation, socioeconomic background and gender where improvements in equality and inclusivity are needed.

Diversity in our membership and the chemical sciences

i. Our [1] presents diversity data from across our membership and organisational activities – including governance bodies, prizes, grants, education, publishing. The chemical sciences community, particularly that in the UK, is reflected in our membership.

ii. The demographics of our largest membership category (MRSC or ‘Member’) are listed below with the UK population benchmark percentage (details on population data are available in our Diversity data report 2020 [1] – page 7, footnotes) indicated in brackets for comparison:

o Gender identity: 25% (50.6%) female, 75% (49.4%) male, <1% self-described;

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- The proportion of women continuing to postgraduate study drops from 44% at undergraduate

revealed that women of all ethnicities tend to leave academic chemistry after PhD level, but this attrition is most marked for Black women.[3]

ii. There are significant differences in gender breakdown at undergraduate and PhD chemistry level according to ethnic background.[4] For White students, there is a male majority at undergraduate (42.4% F / 57.6% M) and PhD* (36.7% F / 63.0% M) levels. For Asian students, the gender distribution is more even at both levels (48.2% F / 51.8% M and 48.6% F / 51.4% M, respectively). For Black students, there is instead a female majority at both levels (60.6% F / 39.4% M and 57.1% F / 42.9% M, respectively).

iii. This picture changes after chemists complete their postgraduate studies, with fewer women progressing to non-professorial staff and further to professors, regardless of race or ethnicity. The progression beyond postgraduate studies to non-professorial staff (White 31.8% F, Asian 28.6% F, Black 16.7% F) and further to professors (White: 13.2% F, Asian: 16.7%, Black: zero female or male professorial staff[5]) shows significant att (a)4 (n)-2nk sian: 1tt (a)4 (n)-2l5 Td( )T8tlenecnnsten-GBr95 (e)y4 (n)-65reg*2.02e(5

4. Funding systems and structural barriers (see also 5.3). This includes a lack of equal access to research experience at earlier stages and, later, unequal access to funding, as well as narrow definitions of success that penalise people who take less traditional paths.

5. Global community. This includes a focus on collaboration with other countries in the Global North, leading to missed(rth)-. l3tHo92t-4 92t-4 92t-4 92t-4-9(rth)-(rth)-50 0/-5fDBT0 g/fb24-3 (d)-4

- Findings also suggest that disabled respondents may be more likely to feel unfulfilled compared to non-disabled respondents. They are less likely to consider their job challenging or stimulating, and less likely to say their current job makes full use of their skills. They are also less likely to have access to learning and development opportunities to help them perform in their current role or progress in their career.
- Disabled respondents also appear to have faced particular difficulties in maintaining and developing their skills as a direct impact of the COVID-19 pandemic. 21% of disabled respondents reported they had been affected by this, compared to 9% of non-disabled respondents. They are also less likely to feel secure in their current job.

iv. Career breaks

- Of those who take career breaks, 13% of respondents feel their prospects are better as a result, 42% feel they are worse, and 45% feel they are unaffected. However, what is concerning is the disparity between how different groups perceive they are affected by career breaks, with women and disabled respondents feeling they are more adversely rsely rsely cabled respooh(- 9)y men

ii. Being the only one with a particular lived experience or identity. Chemists described how the absence of other people “like me” impacted their sense of belonging in the chemical sciences. For example, being the only person from a minoritised race or et

Implicit bias and exclusionary environments

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decision (37%) [15, page 25]. This creates the 'illusion of choice'; although multiple routes exist, not all routes are open to all students which leads to inequitable access.

iii. Inequitable access also arises because students studying triple science are more likely to come from socially advantaged backgrounds. Research by the Sutton Trust found that 20% of higher attaining students eligible for pupil premium attended schools that do not offer triple science compared with only 12% for higher attaining students from more advantaged backgrounds. Perception of qualification 'difficulty' may also limit student confidence and expectation of what can be achieved, and consequently their options for progression [37].

iv. Schools differ in how they deploy their science teachers. Our research [15] found that there is a widespread practice of teachers of the sciences being deployed outside of their 'specialist' discipline. Long-standing relative differences in teacher shortages between the three school science disciplines (the shortage of expert physics teachers is more pronounced than that of chemistry teachers, and schools usually find it quite easy to recruit biologists), inevitably affects deployment decisions. Again, inequalities are evident in the system, schools with higher proportions of students eligible for free school meals and those in the most deprived areas are less likely to have science teachers with a qualification relevant to the main science discipline they teach [40, see also 41]. This is a problem as evidence suggests that the most effective teachers have good subject and pedagogical content knowledge. Moreover, passionate expert teachers of chemistry can influence students' decisions to continue their studies in the subject and pursue a STEM related career.

The implications of these groups being underrepresented in STEM roles in academia and industry

i. There is substantial evidence that diversity in STEM is vital for high quality research and innovation and to enable scientists to address the world's economic and societal challenges. It is a core believe of the RSC that for the chemical sciences to prosper, they must attract, develop and retain a diverse range of talented people.

Impacts on science outcomes and performance

i. Our 2021 report [10] found that, although belonging and not-belonging can impact everyone, chemists from underrepresented groups are less likely to feel they belong, and this has a negative impact on their retention, progression and scientific outputs, as well as on themselves as people. Within the terms of reference of this submission, 'belonging' in the below points should thus be considered to correlate with diverse and inclusive work environments, while 'not belonging' for those from underrepresented groups correlates with the underrepresentation of those groups and its causal factors.

ii. A sense of belonging leads to better science outcomes. Chemists are more innovative and creative when they feel like they belong. They worry less about being judged and feel freer to share their opinions and give things ago. They are more passionate about their work, more collaborative and more focused. Employees who feel a strong sense of belonging have 56% higher performance than employees who do not feel they belong as stated in our report.

iii. Conversely, not belonging negatively impacts science outcomes. Chemists who don't feel they belong are less likely to contribute their ideas, are more hesitant or qualify what they say.

iv. Belonging improves mental health and well-being. When chemists feel they belong at work they feel happier and more confident, energetic, motivated and empowered.

v. Not belonging impacts performance, progression and retention. Feeling of not belonging is associated with a sense of under-performance, of losing motivation, falling 'out of love' with chemistry, and seeing careers stall. Over time, not-belonging leads chemical scientists to ask whether chemistry is the right place for them.

Impacts on economic recovery, strength of the sector, and addressing global challenges

i. In our 2020 workforce report, ____ [3], we provide a five-point action plan aimed at strengthening the chemical sciences workforce to enable

iii. . Following our 2019 report [17] that presented the results of a review of our recognition programme, we committed to evolve scientific recognition. This has included actions in 2021 and 2022 to diversify the type of contributions that we recognise, for example:

- Greater recognition of teaching activities – one of the activities for which a lack of recognition was found to disproportionately affect women in our Breaking the Barriers report.
- Balancing our portfolio across career stages, recognising that there is currently more opportunity to recognise diverse people at earlier career stages.
- Increasing recognition of teams and collaborations, which goes hand-in-hand with recognising different types of people (career stages, employer type and job roles).
- Setting conduct expectations and revoke prizes where those expectations are not met, with

iii. Funding bodies and institutions have a key role to play in fostering this environment of trust and should also consider how they might increase transparency such as through the systematic provision of diversity data in reference to funding awarding. Funding bodies, institutions, organisations and companies should also share evidence of improvements achieved, so that models of best practice can be utilised by the community.

iv. At the level of government, actions to encourage greater collection and transparency of data should include considering requiring ethnicity pay gap reporting, along similar lines to gender pay gap reporting.

v. There is additionally a need for intersectional data, in order to understand the challenges faced by those belonging to multiple underrepresented groups and how these may differ in nature and/or extent (see 3.3, 4.7).

Funding, reward and recognition

Our evidence points to continued inequalities in salary and reward across academia and industry (6.2), and in research and innovation, to the significant impact of funding systems as a structural barrier to equality in chemistry for multiple underrepresented groups (see 5.1.iv, 5.3).

i. Our 2018 report Breaking the Barriers suggested a number of actions funding bodies should take to address the underrepresentation of women in academic chemistry. We further believe that these actions would impact positively on the representation of other groups; our preliminary research indicates that points 3 and 5 are particularly important for disabled people in the chemical sciences.

1. Review career pathways. Explore options for new models / roles (including senior roles with a teaching focus).
2. Provide more longer-term contracts for early career researchers.
3. Make flexible and part-time working possible, at scale.
4. Make funding contingent on progress on diversity.
5. Improve funding for care (including parental) and sickness leave and returners.
6.

constitutive pillar of initiatives such as the proposed Résumé for Research and Innovation current system of disability and welfare benefits in the UK may contribute to the underrepresentation of disabled people, and those from other marginalised groups, in STEM.

- Funding bodies must also consider those with chronic energy-limiting conditions; at present, for example, there is no high-level funding provision for postgraduate study on a part-time basis due to

Organisations should support and promote effective mentoring programmes and build inclusion and diversity considerations into these.

iv.

teachers; addressing teacher recruitment and retention issues; and collecting and recording information about teachers' discipline-specific expertise within the sciences.

Shifting the burden

A necessity underlining the recommendations in this submission is that a disproportionate burden must not fall on those from underrepresented groups to themselves be obligated to undertake the work needed to address their own underrepresentation.

i. A key issue contributing to a lack of retention and progression of women is that women are more heavily involved with non-reseai›nen75BT0 g/ BT0 g/TT1k oe(c)6 (sh)-2 (75BTps)5 (i)-3 BT0 k o oe0 g/I70.025 654

Endnotes

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44. *Study on Research Assessment Practices*, Science Europe, 2020, https://www.scienceeurope.org/our-resources/science

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