



TALENT

Re-thinking recognition: Science prizes for the modern world

Introducing our new perspectives series

In a world where global challenges and advances in technology bring both uncertainty and new possibilities, the chemical sciences have a critical role to play. But what will that role be? How can we maximise the impact we make across academia, industry, government and education? And what actions should we take to create a stronger, more vibrant culture for research that helps enable new discoveries?

Our perspectives series addresses these questions through four lenses: talent, discovery, sustainability and knowledge. Drawing together insights and sharp opinion, our goal is to increase understanding and inform debate – putting the chemical sciences at the heart of the big issues the world is facing.

Talent

Talent is the lifeblood of the chemical sciences. But how do we inspire, nurture, promote and protect it? Where will we find the chemical scientists of the future? And what action is required to ensure we give everyone the greatest opportunity to make a positive difference?



Discovery

Chemistry is core to advances across every facet of human life. But where do the greatest opportunities lie? How will technology shape the science we create? And what steps should we take to ensure that curiosity-driven research continues to unlock new opportunities in unexpected ways?



Sustainability

Our planet faces critical challenges – from plastics polluting the oceans, to the urgent need to find more sustainable resources. But where will new solutions come from? How can we achieve global collaboration to address the big issues? And where can the chemical sciences deliver the biggest impacts?



Knowledge

Around the world research fuels scientific progress but the way we are sharing new knowledge is changing. What are the big challenges of the digital era? How can open access become a global endeavour? And what do chemical science researchers really think about the constantly evolving landscape?



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Foreword from Independent Review Group Chair

The Royal Society of Chemistry (RSC) has a proud heritage of recognising excellence in chemistry, extending back to its first Faraday Medal in 1869. However, science and society are continually evolving, and the RSC understands that its recognition portfolio needs to be responsive to the changing landscape. Over the decades there have been many additions — most recently, for example, the Inclusion and Diversity Prize first awarded in 2017 — but these have not been underpinned by a clear set of principles or priorities, so in 2018 I was asked to chair a review of recognition that might articulate a systematic strategic approach.

I was delighted that we were able to assemble an outstanding Review Group with expertise in academic and industrial chemistry, research and teaching, biotechnology, biology and psychology, so that we could examine basic principles and cover the entire range of interests of the Royal Society of Chemistry and its members. We have consulted widely, asked fundamental and difficult questions about the purposes of recognition, and have made some recommendations that may prove controversial.

We have concluded that it will be important for the RSC to decide on the primary aim of a particular prize; for example, it could be to boost the career of an individual, to recognise a team, to raise the profile of chemistry in society, or to support the activities of the organisation. We are clear that although the RSC should continue to recognise the research excellence of individuals, it should also do much more to recognise outstanding teams, teaching, innovation and leadership. It follows from this variety that the nature of the prizes and recognition mechanisms should also be diverse: one size does not fit all, and some recognition will necessarily have a higher public profile than others. Everyone wants to be recognised in some way but it is not possible to give everyone a prize, so it is important that the portfolio is designed to ensure that overall the benefits of prizes extend beyond the small number of winners.

This review sets out a strategic framework of recommendations. A substantial amount of work and discussion will be needed over time to convert the principles into a modernised portfolio of Royal Society of Chemistry prizes that can evolve into the future. We also hope this report might inform similar thinking in other scientific organisations.

Thank you to the Independent Review Group and the Royal Society of Chemistry team for their valuable contributions throughout the review.



Professor Jeremy Sanders CBE FRS FRSC

Independent Review Group

The review was overseen by an independent Review Group, which brought together individuals from within and outside chemistry with a range of experience and expertise. The group considered the literature, information about the current RSC prize and award portfolio and views articulated in a broad consultation process described in more detail in the Methodology section. Informed by this range of evidence and perspectives, the Review Group discussed the overall framework of principles, recommendations and options in a set of two full meetings as well as through phone conversations and email input.

The membership of the Review Group was:

- **Prof Jeremy Sanders CBE FRS** (Department of Chemistry, University of Cambridge) - Chair
- **Dr Angelo Amorelli** (Group Research, BP)
- **Prof Tom Brown** (Department of Chemistry, University of Oxford)
- **Prof Richard Catlow FRS** (Department of Chemistry, University College London)
- **Dr Roger Highfield** (Science Museum Group)
- **Prof Nazira Karodia** (Faculty of Science and Engineering, University of Wolverhampton)
- **Prof Anne Ridley FRS FMedSci** (School of Cellular and Molecular Medicine, University of Bristol)
- **Dr Kristy Turner** (School of Chemistry, University of Manchester / Bolton School)
- **Prof Essi Viding** (Clinical, Educational, and Health Psychology Research Department, University College London)
- **Prof Dr Helma Wennemers** (Department of Chemistry and Applied Biosciences, ETH Zurich).

Foreword from Royal Society of Chemistry

One of the Royal Society of Chemistry's roles for the chemistry community is to reward and recognise excellence. As we have improved our understanding of excellence over time, we must now take action to improve how we reward and recognise modern scientific excellence. With this review, and our action plan based on its findings, we are taking a decisive step forward in recognition in science.

Recognition in science has its roots in the 19th century, but today we understand that great science depends on so much more than individual endeavour and is about more than research. Teamwork, leadership, professionalism and diversity are fundamental elements of excellence in 21st century science, yet the majority of scientific awards overlook or underplay these vital qualities, often focusing on research, with limited opportunities to recognise other important scientific activities like teaching, innovation and communication.

In this context of a rapidly changing scientific environment, we commissioned an independent group to carry out a review of our recognition programmes, with a significant but not singular focus on our prizes and awards. Our aim in commissioning this review was to ensure that our recognition portfolio continues to deliver the maximum impact for chemical scientists, chemistry and society.

This report contains the key findings of the review group as reported to our Board of Trustees. These findings are supported by evidence from consultation (interviews, workshops and a survey of over 2,000 people), literature on recognition, and data and perspectives captured from winners, judges, members, RSC staff, and the wider community since the last review of our prizes and awards in 2008.

We have proudly recognised excellence for more than 150 years – and this review demonstrates that our awards and prizes remain highly sought after and deeply valued by both recipients and the scientific community as a whole. But the traditions that began in 1869 must also be married with contemporary context, making evolution essential to meet the changing needs of the scientific community.

We will recognise excellence where it has been previously under-appreciated: teams and collaborations who achieve amazing things through diversity of ideas, skills and knowledge; teachers who work incredibly hard to inspire the next generation of chemical scientists; and technicians and early- to mid-career scientists, whose vital roles in scientific achievement should be highlighted and celebrated.

We will also expect the very highest standards of those we recognise. They are not only exponents of great science; they are ambassadors for chemistry, and inspirations as an example for others to follow. Producing excellent science will not be enough; recognition will only go to those who conduct themselves as leading members of our community should.

Our five point action plan sets out the Royal Society of Chemistry's contribution to evolving scientific recognition. These are significant steps and we hope to see others take similar action.

We can be proud of the heritage and prestige of our awards programmes of the last couple of centuries, and continue to celebrate those people and achievements we have recognised. It's now our responsibility to adapt so that future generations of scientists can be rewarded and recognised for a new, more inclusive definition of excellence.

We commit to:

- 1 Place more emphasis on great science, not just top professors; this includes teams, technicians and multidisciplinary collaborations**
- 2 Give greater recognition to the people who teach chemistry and inspire the amazing scientists of the future**
- 3 Showcase leaders who go beyond their day job to break down barriers and open up new and extraordinary opportunities in science**
- 4 Celebrate the scientific breakthroughs that transform our understanding of the world and solve major issues like climate change**
- 5 Set conduct expectations and revoke prizes when those expectations are not met**



Dr Helen Pain CSci CChem FRSC
Deputy Chief Executive, Royal Society of Chemistry

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Executive summary

Our Review of Recognition sets out a vision for recognition in 21st century science and in the coming years we will evolve our recognition portfolio to achieve this vision. The review found many aspects of our existing prizes and awards that are valuable and valued, making clear that we have a strong foundation from which to build. There are also clear imperatives and opportunities for us to change.

Prizes can have different purposes, beneficiaries and audiences

Prizes are powerful tools that can validate the achievements of individuals and teams and support career progression. They also have the potential to inspire and support the wider scientific community, acting as a positive incentive. Recognition can be used to reach audiences beyond an immediate scientific community, and to celebrate the value of science to broader society.

Another purpose of recognition is to advance the mission of the awarding body itself. In that case, those being recognised may be expected to contribute in some way to the activities of the organisation, creating a two-way relationship between the awarder and awardee and a responsibility to give back to the community in an appropriate way. More broadly, the awarder may set expectations of winners in terms of their conduct and their service.

Given this range of purposes, there is clearly no ‘one size fits all’ mechanism for recognition. It is important to achieve clarity on the primary purpose, intended beneficiaries and audience for any prize, to ensure that the recognition mechanism is successful in achieving its defined purpose, and that any celebration is most meaningful to those being recognised.

Recognition should reflect the many types of excellence that are crucial for modern science

There are four areas where we should expand opportunities for recognition, to better reflect what we believe to be important in science today:

i. Teams and collaborations

The traditional focus for recognition and prizes in science has been on individuals. While recognising the individual has important purposes, collaboration and teams are integral to most areas of scientific activity across education, engagement, innovation and research. This should be reflected as a core component of our recognition portfolio.

ii. Leadership

Here, we can use recognition as a positive incentive, articulating what we believe good leadership in science looks like and why it is important. Leadership can take different forms, and any recognition mechanism should aim to highlight a range of role models.

iii. Education, engagement and innovation

These spheres are currently underrepresented in our recognition offering. Increasing recognition in these areas would reflect their importance in the modern world. Prizes could be used here to develop case studies, or share and highlight good practice. We should be creative and make sure that the ‘prize’ is relevant and meaningful for winners.

iv. Breakthroughs and emerging areas

Respondents to our survey named *significant breakthroughs* as the number one outcome meritorious of recognition by the RSC. It is also important to recognise contemporary and emerging science, including in areas that lie at or across interfaces between disciplines and sectors.

Recognition should demonstrate the many ways in which chemistry contributes to humanity

We have an opportunity to use recognition to increase the visibility of the chemical sciences beyond the scientific community. Prizes can be a mechanism to share exciting new advances with a range of different audiences, and to showcase the impact of research, innovation, engagement and teaching. Publicity and celebration activities should deliberately set out to engage the public, inspire the next generation, change perceptions, and enthuse us all about the value of chemistry in enriching our world.

Recognition should reflect the many facets of diversity

Diversity has a broad definition and encompasses factors such as socioeconomic background, place of employment, job role and career stage, in addition to protected characteristics such as gender, ethnicity and sexual orientation. Recognition should reflect not only this diversity of individuals and teams contributing to science, but also the diversity of ways in which people contribute to science and society.

Real change will require a holistic, sustained approach at multiple levels, and will take time to achieve. Increasing the diversity of nominations is a necessary condition for increasing the diversity of those who are recognised, and so it is important that nominee pools reflect the diversity of the community. We should continue to optimise our processes at all stages from promotion and nomination through to judging.

At a deeper level, by naming what we recognise and incentivise through our recognition programmes – as well as what we expect from those who are recognised – the Royal Society of Chemistry can be clear and confident about what we believe to be important, using recognition to reflect the chemical sciences at their very best.

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Strategic vision for science prizes

Why do we give prizes?

The review found that, while it is not possible to recognise everyone who deserves it, there are many benefits of recognition. These include creating a feeling in individuals and teams of being valued through recognition by peers, supporting individuals in their careers and raising the profile of work deserving greater prominence. The Review heard that the positive feeling associated with recognition can spread beyond winners and be a morale-booster within winners' groups or places of employment. The benefits can also spread to society more broadly and include the potential to mobilise public advocacy, support policymaking, innovation and profession retention. Winning a prize can create a beneficial relationship between the awarder and awardees, rather than simply being a transaction.

There are pitfalls associated with recognition. Recognition can reinforce the status quo if particular groups are continually recognised. It can stifle creativity and originality.

There can be real or perceived unfair advantage through connections and also the problem of winner cohorts that do not reflect the many types of diversity in science.

The focus of prizes is often individuals and, in combination with other aspects of the academic recognition and reward system in particular, this can lead to perverse incentives and negative impacts on academic research culture.

The review considered the literature on prizes and recognition generally, and on science prizes specifically. Informed also by workshops, roundtable discussions and interviews, the Review Group identified four important *Purposes of Recognition* as a focus for the RSC in investing in recognition in science. These are discussed at greater length in Section 4.

Table 1: Purposes of Recognition

Purpose	Intended primary beneficiary
1. Career progression, encouragement validation and reputation for individuals and teams	The awardee or awardees
2. Advance or provide incentives in an area, inspire and support others	Scientific community and science
3. Communicate, highlight and celebrate science	Society and science
4. Raise the visibility of or serve an organisation and its mission	The awarder and the groups it represents

Principles of Recognition for the RSC

Building on the *Purposes of Recognition* the Review Group articulated eleven overarching and inter-related *Principles of Recognition for the RSC*.

P1. Recognition should be of excellence

Defining excellence is difficult even though each of us, intuitively and subjectively, can often quite easily recognise it. There is excellence in different domains, achievements, roles and contributions. Excellence cannot be judged based on metrics or quantitative data alone. It should be judged against written criteria that are flexible enough to allow for expert review and judgement and are relevant to whatever is being judged.

P2. Recognition should reflect the diversity of individuals and teams contributing to science

Diversity should be front and centre in the thinking about every aspect of recognition programmes, from articulating the fundamental purpose of a prize to nomination and selection processes. The connections between recognition and diversity play out at every level from the individual to the systemic. It is vital to consider protected characteristics like disability, ethnicity, gender, religion and sexual orientation as well as dimensions such as culture, personality, places of employment, socioeconomic background and values.

P3. Recognition should reflect the diversity of ways in which people contribute to science and society

This includes diversity of roles and jobs, for example as communicators, school teachers, technicians and scientists working in companies and academic institutions. It also includes different activities such as outreach, leadership, mentoring, research and development, teaching and volunteering.

P4. Recognition should support scientists at all career stages and in different types of careers, with recognition tailored to different career stages

There are many career paths, with increasing variety as people change sectors and roles, take career breaks and work in one or more part-time roles during the course of their careers. Career stages or steps vary for different domains.

P5. Recognition should be used to celebrate the value of science to society

Publicity and celebration events can deliberately aim to engage a range of audiences, with an ambition to inspire or change perceptions. Winners are role models, ambassadors and advocates within and beyond science. Projects and achievements are case studies showing the value of science education, innovation and research for society.

P6. Recognition by the RSC should reflect the different sectors in its community

The RSC community is broad and includes people working in universities, schools and colleges, industry, government and media. It has a strong UK base but is also international. It includes people who are members of the RSC and people who are not.

P7. Recognition should act as a positive incentive

Recognition has the potential to incentivise many different achievements, contributions and behaviours that are important for science.

P8. Future recognition by the RSC should respect the history of RSC Prizes & Awards but the structure of the portfolio should be rationalised and clearly articulated

P9. Recognition is associated with certain duties or expectations for recipients

This includes formal duties such as giving lectures, mentoring and advising the RSC and informal expectations like being role models, inspirations or advocates. These expectations should be fair and appropriate to career stage.

P10. It is critical to recognise contemporary and emerging science in addition to past achievements

This encompasses emerging areas within an established subfield and in interdisciplinary or multidisciplinary areas. It covers the spectrum from fundamental curiosity-driven research to applied research and translation.

P11. Recognition should reflect the collaborative nature of science today

This includes recognising teams of different sizes, as well as different roles and contributions within a team. More broadly, collaboration is integral to science and takes many forms from an informal long-term collaboration between two individuals to formal and large scale collaborations involving multiple partners and sectors.

What should we prize?

The review heard many views about *what* the RSC should recognise, summarised in Section 4. It is clear that recognition by the RSC should be broader than at present, where about 70% of its prize and award portfolio consists of retrospective prizes for individuals for academic research, often in specific research sub-fields.

One approach to broadening recognition is to keep the existing prize portfolio but to broaden the criteria for the existing prizes and awards. The Review heard suggestions that, for example, activities or attributes such as outreach, teaching, translation, citizenship and mentorship should be added as additional criteria to the current RSC prizes. There are however concerns that this approach is neither pragmatic nor inclusive. Some people are excellent in one domain and others in several domains. Some people are excellent in a “technical” domain sense, others at contributing to teams, others at leading teams and others again in all of these areas. If a person or team is excellent in just one domain or set of competencies that are important for science then there should be room to recognise that excellence.

The review recommends therefore that the RSC should name and recognise the diverse domains, and the different types of excellence within and across them, that the RSC believes are important.

Related to this discussion, and linked also to concerns about research culture in academia, is perceptions from consultation and in the literature that the prestige of prizes for academic research is higher than that for prizes for other areas. There is a self-reinforcing loop whereby activities that are visibly prized are considered to have higher status and activities that are perceived to have higher status are visibly prized.

In evolving its recognition portfolio the RSC can show leadership in reshaping unhelpful perceptions about status and prestige by asserting its values and its understanding of the achievements and contributions that matter for science. An important point is to think beyond a “one size fits all” approach. There is an opportunity to design a diverse portfolio of recognition mechanisms and celebratory activities that achieves a range of purposes and is meaningful for the individuals and communities being recognised.

The review offers the RSC the framework in Figure 1 as a tool to tease out domains and dimensions of excellence to consider in evolving its recognition portfolio. This is intended to be a flexible framework to support consideration of overlapping and inter-connected elements.



Figure 1: Dimensions of excellence



PRINCIPLES

WHY?

- What is the purpose (or purposes) of our recognition portfolio?
- What audiences do we want to reach and why?

WHAT AND WHO?

- What domains do we want to recognise?
- What types of excellence do we want to recognise?
- Are we recognizing a person/team, an outcome or both?

HOW?

- How can we most effectively recognise each of the different domains and types of excellence in order to achieve our purpose(s)?
- How will we most effectively celebrate and publicise the different achievements and contributions we recognise?
- How will we organise ourselves so that the recognition portfolio we have designed achieves its purposes?

▶ Figure 2: Strategic design of a recognition portfolio. Principles of recognition are embedded at each stage of the process

3

Perspectives on prizes: literature review

The review considered perspectives from a variety of literature sources including publications in peer-reviewed journals, reports and news items. Many of the publications focus on recognition in science specifically but the Review Group also considered wider perspectives on the psychology of the giving and receiving of prizes.

Recognition should be of excellence (Principle 1)

In 2014 the Nuffield Council on Bioethics reported on *The Culture of Scientific Research in the UK*.¹ The report made a number of observations and suggestions for key areas including competition, funding, assessment, governance and integrity aimed at key groups including learned societies and professional bodies.

The report concludes that competition for funds and positions leads to less collaboration and more “headline chasing”. In addition, short-termism by funders leads to funding of safe projects in established centres. The report observed an over-reliance on impact factors, resulting in important research not being published, disincentives for multidisciplinary research, and a lack of recognition for non-article research outputs. The report suggests that societal and/or economic impacts of research were welcome by some but that these could lead to an exaggeration of possible applications of research claimed in funding proposals. The report suggested that research organisations should recognise the wider activities of researchers including mentoring, teaching, public engagement and peer review.

An article from The Royal Society ‘*Jisc Futures: What will research look like in 2035?*’, takes a futuristic approach to thinking how the research community should prepare for the future way in which research will be conducted. The article suggests that reward and recognition has not caught up with the breadth of demands of researchers. Suggestions included considering impact in reward and recognition, along with activities such as public engagement, outreach, policy advice and translation.²

Recognition should reflect the diversity of individuals and teams contributing to science (Principle 2)

Evidence suggests that the scientific endeavour and achievements of women do not receive the same recognition through prizes as those of men, a phenomenon that the authors of a 2012 analysis of awards and prizes in the US call the ‘Matilda Effect’.³ There is similar evidence of differences in citation patterns for work published by women compared with that where the lead author is a man.⁴ The 2012 article reports that the number of women winning prizes and awards had increased in the previous two decades but that the number of men winning is higher than expected based on their representation in the nominee pool. The report looks into the influences of implicit bias and committee chairs leading to these outcomes. Solutions offered to the disparity of representation include the inclusion of women on judging panels, especially in the role of Chair.

This report also discusses “The ghettoization of women’s accomplishments into a category of ‘women-only’...” arguing that these awards do not address the issues of underrepresentation, simply camouflage them.

Recent work presents quantitative analyses of prize winning in science, particularly on the nuances of finance and prestige.⁵ Reporting in *Nature* in 2019 and considering data from US Biomedical Societies, Uzzi *et al.* showed that despite gains in the past 50 years, women were still winning fewer prizes and that those prizes tended to be of lower prestige with lower prize monies, described as the ‘Awards Gap’.⁶ The analysis shows women to be winning more awards for non-research activity, including advocacy, mentoring, support, teaching and public service.

The Royal Society of Chemistry is already an active participant within a number of complementary initiatives to support Diversity and Inclusion, including the UK Royal Academy of Engineering and Science Council’s *Diversity and Inclusion Progression Framework* that sets out four levels (Initiating, Developing, Engaging and Evolving) of good practice in eight areas, including for prizes, awards and grants.⁷

Recognition by the RSC should reflect the different sectors in its community (Principle 6)

The 2014 Nuffield Council on Bioethics report cited above provides suggestions and observations for different groups including learned societies and professional bodies. This report suggested that research organisations “should better recognise the wider activities of researchers such as mentoring, teaching, peer review and public engagement”.

Recognition should act as a positive incentive (Principle 7)

The Nuffield Bioethics report provides suggestions and observations to promote widely the importance of ensuring that the culture of research supports good research practice and the production of high quality science. The report also suggests that learned societies and professional bodies take into account the findings of the report in the formulation of guidelines for members on ethical conduct and professionalism.

1 The Culture of Scientific Research in the UK, Nuffield Council on Bioethics, 2014

2 Jisc Futures Article by J. Dally and F. Downey: What will research look like in 2035? The Royal Society, Commissioned by Times Higher Education, Aug 7, 2017

3 A.E. Lincoln, S. Pincus, J. Bandows Koster and S. Leboy, The Matilda Effect in science: Awards and prizes in the US, 1990s and 2000s, Volume: 42 issue: 2, page(s): 307-320 Article first published online: February 20, 2012; Issue published: April 1, 2012

4 Is publishing in the chemical sciences gender biased?, Royal Society of Chemistry, November 2019. www.rsc.org/globalassets/04-campaigning-outreach/campaigning/gender-bias/gender-bias-report-final.pdf

5 Y. Ma and B. Uzzi, Scientific prize network decides who pushes the boundaries of science, *PNAS* December 11, 2018, 115(50), 12608-12615

6 Women who win prizes get less money and prestige, Brian Uzzi, *Nature Comment*, 17 January 2019, Vol 565, 287-288

7 Royal Academy of Engineering and Science Council, *Diversity and Inclusion Progression Framework for Professional Bodies*, 2017.

Incentive prizes

There has been a growing trend to encourage innovation through the offer of large cash prizes.⁸ Examples of this include prizes offered by the charitable X Prize Foundation and the Gates Foundation. In 2007, McKinsey reported that there were over 200 prizes worth over \$100,000.

Incentive prizes are not new, an early example being the *Longitude Prize* established in 1714. Both governments and companies are now following this model with the intention of spurring innovation. In 2009, McKinsey and Company reported that since 1991 a change had occurred with prizes announced shifting from rewarding excellence to those providing incentive for specific innovations.⁹ The work by McKinsey indicated the use of philanthropic prizes were more effective than other instruments in situations where three conditions were met: (1) a clear objective; (2) a large population of potential problem solvers and (3) a willingness of participants to share the costs. In the case where these conditions are not being met, McKinsey suggested that alternative mechanisms such as grants and other prize mechanisms should be considered.

Recognition is associated with certain duties or expectations for recipients (Principle 9)

Frey has published¹⁰ on the idea of giving (supply) and receiving (demand) for awards, setting out how *“The demand for awards relies on an individual’s desire for distinction, and the supply of awards is governed by the desire to motivate.”* He posits that *“Awards can be seen as a device that, like monetary income and intrinsic motivation, motivates individuals to exert effort (Tait & Walker, 2000). The institution bestowing an award wants to induce the recipient to act in its interests. The relationship established has the character of a psychological contract involving a tacit and incomplete agreement. The terms of this award contract are not specified precisely, and are often deliberately left vague. A person accepting an award enters a special relationship with the bestowing institution, owing it some measure of loyalty. The other members of the society clearly recognize this psychological bond.”*

Recognition of scientific research should reflect the collaborative nature of science today (Principle 11)

A review by the UK Academy of Medical Sciences considered how to improve recognition of team science contributions in biomedical research careers.¹¹ This work recognised that it was increasingly common for output-focussed research to include two or more teams or research groups. This includes both large teams and smaller teams working together to provide expertise in complementary areas.

The increase in scientific outputs produced by large teams has been studied by Evans et al who compared the nature of the outputs from large teams with those from small teams.¹² Through an analysis of 65 million papers, patents and software products from 1954 – 2014 they found that *“across*

this period smaller teams have tended to disrupt science and technology with new ideas and opportunities, whereas larger teams have tended to develop existing ones. Work from larger teams builds on more-recent and popular developments, and attention to their work comes immediately. By contrast, contributions by smaller teams search more deeply into the past, are viewed as disruptive to science and technology and succeed further into the future – if at all.” They conclude that their results *“demonstrate that both small and large teams are essential to a flourishing ecology of science and technology, and suggest that, to achieve this, science policies should aim to support a diversity of team sizes”.*

Measures of esteem

The primary purpose of measures of esteem is to increase the profile of scientists and their work, leading to career progression opportunities.¹³ The term “measures of esteem” is used particularly in academia. The UK Medical Research Council (MRC) uses prizes, awards and other measures of esteem to understand how researchers in receipt of MRC grants are recognised for their contributions to academia and the wider society. They have recorded a large number of prizes and awards made to either principal investigators or members of MRC-funded teams. The MRC reports that some funders use measures of esteem alongside citation analysis, peer review and research income as indicators of research quality.¹⁴ Rost and Frey¹⁵ consider membership of the academic editorial board of a professional journal to be an indicator of the esteem in which a scholar is held, although this must be tempered by an awareness that there is now a wide variation in the standing of journals themselves.

8 And the winner is..., The Economist, August 5 2010. (www.economist.com/science-and-technology/2010/08/05/and-the-winner-is)

9 McKinsey and Company, Using Prizes to Spur Innovation, McKinsey.com July 2009. (vdocuments.site/using-prizes-to-spur-innovation.html)

10 Frey, B.S. (2006), Perspectives on Psychological Science, Volume 1- Number 4, 337-388

11 The Academy of Medical Sciences, Improving recognition of team science contributions in biomedical research careers, March 2016. (acmedsci.ac.uk/file-download/6924621)

12 Large teams develop and small teams disrupt science and technology, Wu, Wang and Evans, Nature 566, p378 (February 2019). doi.org/10.1038/s41586-019-0941-9

13 Outputs, outcomes and impact of MRC research: 2013/14 report, Medical Research Council

14 Excellence in Research for Australia, Australian Research Council: www.arc.gov.au/excellence-research-australia

15 Quantitative and Qualitative Rankings of Scholars, K. Rost and B. S. Frey, Schmalenbachs Business School, 2011, 63, 63-91.

4

Perspectives on prizes: consultation

Extensive consultation with members of the RSC community formed a major strand of input to the review. Views were obtained through a combination of interviews, workshops, round-table discussions and an online survey.

Full details of the consultation methodology and participant demographics are given in Section 6.

Why might the RSC give prizes?

The survey provided important insights into what members of the RSC community consider to be purposes and drawbacks of recognition.

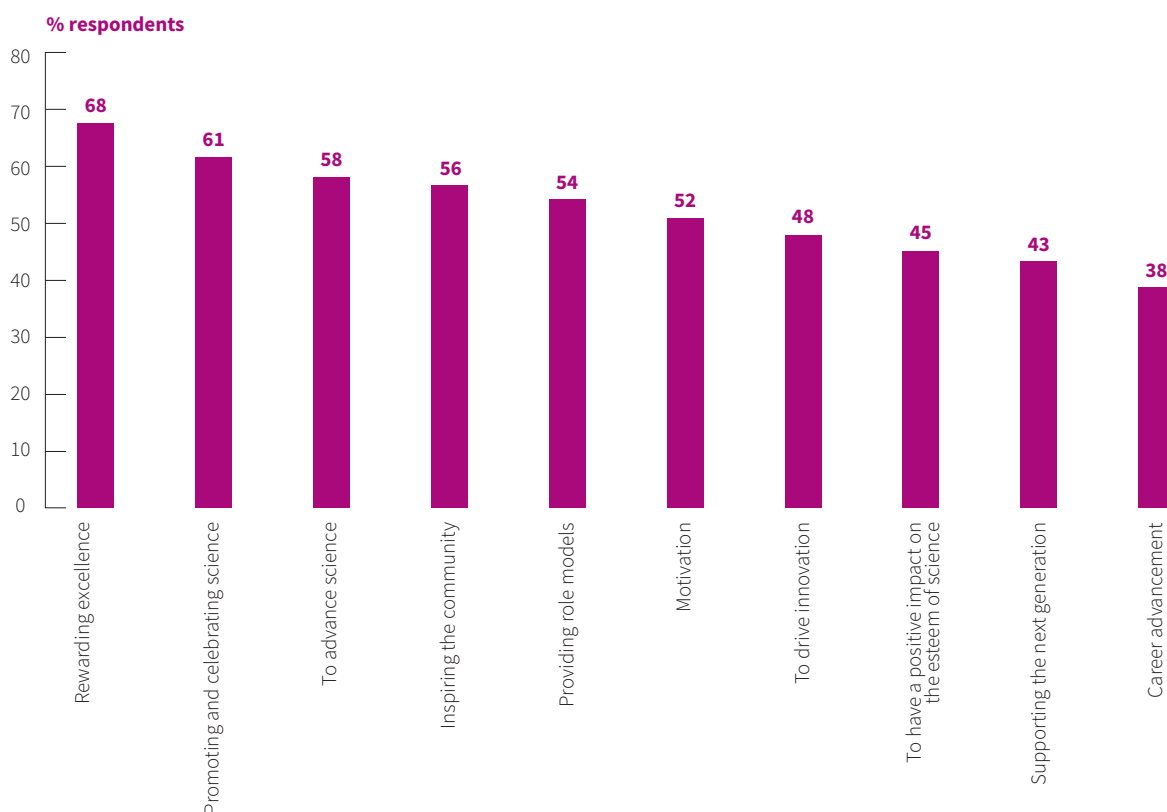


Figure 3: Source: RSC Review of Recognition Programmes Survey, 2018. Survey question: What do you think should be the intended purpose of recognition? Data shown from all who responded to the question (N = 1963). Survey respondents were asked to select all that apply. Top 10 responses shown.

The top ten intended purposes of recognition identified in the survey (Figure 3) are listed in Table 2 below, along with suggested links to the proposed primary beneficiaries of recognition.

Table 2: Intended purposes of recognition and associated beneficiaries

Intended purpose of recognition	Beneficiaries associated with purpose
Rewarding excellence	Awardee(s) Scientific community and science Society and science
Promoting and celebrating science	Society and science
To advance science	Scientific community and science Society and science
Inspiring the community	Scientific community and science
Providing role models	Scientific community and science
Motivation	Scientific community and science
To drive innovation	Scientific community and science
To have a positive impact on the esteem of science	Society and science
Supporting the next generation	Scientific community and science
Career advancement	Awardee(s)

The survey also provided valuable insights into perceived barriers to recognition, many of which the Review aimed to address through its recommendations.

What are the main drawbacks of recognition?	Percentage of respondents
Contributions by high profile scientists are most visible and are most likely to be rewarded	50%
Nepotism	41%
Researchers may pursue prizes over advancing science	34%
Time consuming or complex application/nomination process	33%
Incentives can drive unethical behaviours & activities	31%
Reluctance to nominate	29%
Populism	27%
Recognising individuals reinforces the idea that lone geniuses come up with ideas on their own	27%
Competitiveness has negative impact on networking & collaboration	27%
Disincentive/motivational implications for unsuccessful nominees	22%
Exclusivity	21%
Prizes promote individuals/teams etc. rather than science	20%
Too much kudos given to winners - unfair advantage in career advancement	17%
Some individuals don't want or need external validation	16%
Too few prizes	12%
Don't support the next generation	10%
Accessibility	9%
Geographic reach	9%
Relevance	8%
Too many prizes	7%
Diversity	6%
Other (please specify)	5%
Don't know	4%
None	4%
Too little kudos given to winners	3%
Inclusivity	3%

Table 3: Source: RSC Review of Recognition Programmes Survey, 2018. Survey question: What are the main drawbacks of recognition? Data shown from all who responded to the question (N = 1821). Survey respondents were asked to select all that apply.

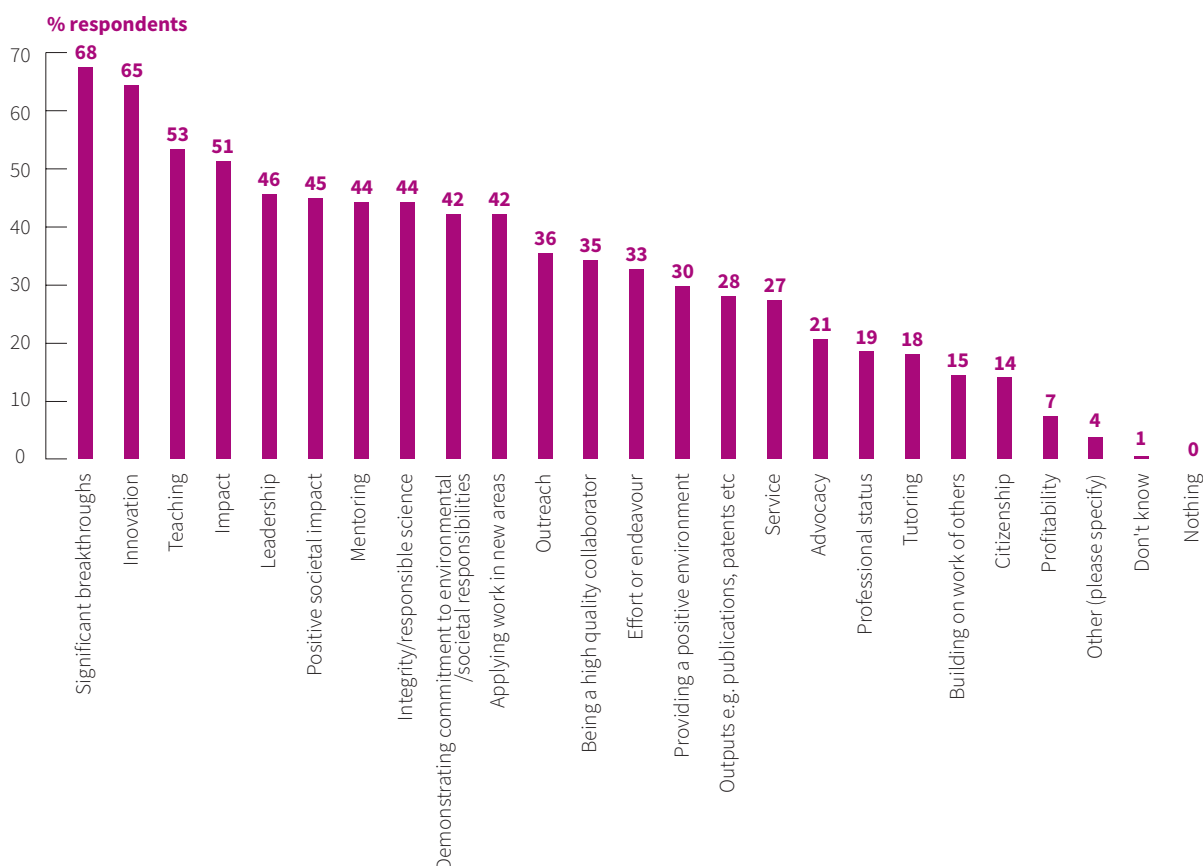
Taking the survey data, literature review, workshop and interview perspectives together, the review proposed four important *Purposes of Recognition* by the RSC. For each purpose there is an intended primary beneficiary.

The purpose and objectives of recognition by the RSC			
Why have recognition?			
<p>Progression, validation, encouragement and reputation for individuals and teams</p> <p>(Awardee benefits)</p> <p><i>Recognising excellent chemical scientists across the spectrum, including e.g. education, industry, outreach, policy, research.</i></p>	<p>Advance, incentivise, inspire and support</p> <p>(Wider benefits)</p> <p><i>Creating role models, incentivising behaviours and activities and supporting the next generation.</i></p>	<p>Communicate, highlight and celebrate</p> <p>(Wider benefits)</p> <p><i>Celebrating winners and the chemical sciences.</i></p>	<p>Raise visibility or serve the RSC and its mission</p> <p>(Awardee benefits)</p> <p><i>Promoting the chemical sciences and the RSC.</i></p>
<ul style="list-style-type: none"> • Aiding career progression at all stages. • To recognise teams. • Provides credibility within and outside the chemistry community. • Provides an external validation of achievements. 	<ul style="list-style-type: none"> • For the advancement of a discipline or sub-field. • Building a community of advocates. • To inspire, be inclusive and promote the chemical sciences. • To encourage and nurture early- and mid-career chemists. • To encourage teachers in all settings. 	<ul style="list-style-type: none"> • Recognising excellence. • Recognise new and emerging areas. • Recognising the contributions of the wider community. • It is about the subject, advances in chemical sciences. • To highlight value of chemistry to diverse audiences (public, government and funders). 	<ul style="list-style-type: none"> • Raises the visibility of the RSC. • Facilitates the voice of the RSC. • Winners may contribute to the RSC and/or the community.

What and who should the RSC recognise?

The review also heard a rich and wide-ranging set of views and suggestions about what should be recognised. These spanned perspectives on the scientific domains that should be recognised, the kinds of achievement or contribution within those domains that should be recognised, and the kinds of behaviours or attributes across domains that should and should not be recognised.

Figure 4: Source: RSC Review of Recognition Programmes Survey, 2018. Survey question: What merits recognition? Data shown from all who responded to the question (N = 1963). Survey respondents were asked to select all that apply.



Diversity

Diversity in a very broad sense was a crosscutting theme throughout consultation. It included consideration of gender, ethnicity and socioeconomic background. It also included diversity of institutions or employers and diversity of career stages, roles and domains being recognised.

To achieve recognition reflecting diversity, the prevailing sense was that the RSC needs a holistic approach. The RSC is on a trajectory and change will take time, with not one but multiple approaches working together, from broadening the range of domains and types of excellence recognised, to increasing the number of nominations of people from under-represented groups. There were many specific views on encouraging and reflecting diversity through processes such as nominations and conventions such as the naming of awards.

The consultation found that there was limited appetite for the RSC to create prizes targeted at individuals with specific protected characteristics but rather that diversity should be reflected within the whole portfolio. In addition, there should be mechanisms to recognise those working towards improving diversity in science.

An important theme was broadening the pool of individuals making nominations and continuing to highlight to the community that the RSC does not share the identity of nominators with judging panels. Perceptions around nepotism or a sense that prize nominators and winners are a “club” act as a barrier to new nominators.

The RSC should provide clear guidance for nominators. Depending on their level of experience and skills development in preparing documents such as nominations, grant applications or reference letters, individuals and groups may also benefit from support or mentoring in preparing a nomination. Issues and opportunities related

to nominations are discussed further in the section on nominations below.

There was a view that some university chemistry departments could be more proactive in contributing to diversity; for example, in annually reviewing all possible nominees or all CVs in the department rather than those of individuals who proactively seek nomination.

In addition to dedicated mechanisms to award those working towards diversity, suggested approaches aimed at increasing the diversity of people recognised included the creation of a junior judging board incorporating a variety of race, gender, age, sexual orientation, *etc.*, an approach used by the Women’s Engineering Society (WES)¹⁶. Other approaches include ensuring that judging panels are themselves as diverse as possible while being aware of the pressures that this can place on a limited pool of individuals, having a more diverse celebration event, and highlighting the diversity of award winners.

Not all respondents saw an issue around inclusion and diversity.

The overall view from survey respondents was that recognition by the RSC was very or fairly diverse and inclusive. Some areas which were mentioned as lacking in diversity or as being uninclusive were socioeconomic background and status (14%), nationality (12%), age (12%), gender (12%), race/ethnicity (12%). Although these were not the majority views, they indicate some areas where the RSC should focus its thinking and effort on inclusion and diversity in the context of prizes and awards.

16 The Women’s Engineering Society (WES) Junior Board
www.youtube.com/watch?v=rPhcHOTIDnQ

“Chemistry departments should have a committee to look at all possible nominees, rather than just pick from those with their hands up!”

Review of RSC Recognition Programmes interview

“Increase diversity and inclusion through the creation and support of role models and champions demonstrating inclusion and diversity. Ensure assessment panels reflect the range of the community.”

Review of RSC Recognition Programmes survey response

“As a community, we need to make sure the list is diverse. I nominated, thinking about diversity – the RSC needs a stronger message.”

Review of RSC Recognition Programmes interview

“My gut feel is there is no issue around inclusion and diversity, if there is an issue I am not aware of it. I always saw the RSC as an institution that champions science and chemistry without favour for any group.”

Review of RSC Recognition Programmes survey response

“Stop being politically correct trying to be all-inclusive and concentrate on the subject matter, not the type of individual or team who are candidates.”

Review of RSC Recognition Programmes survey response

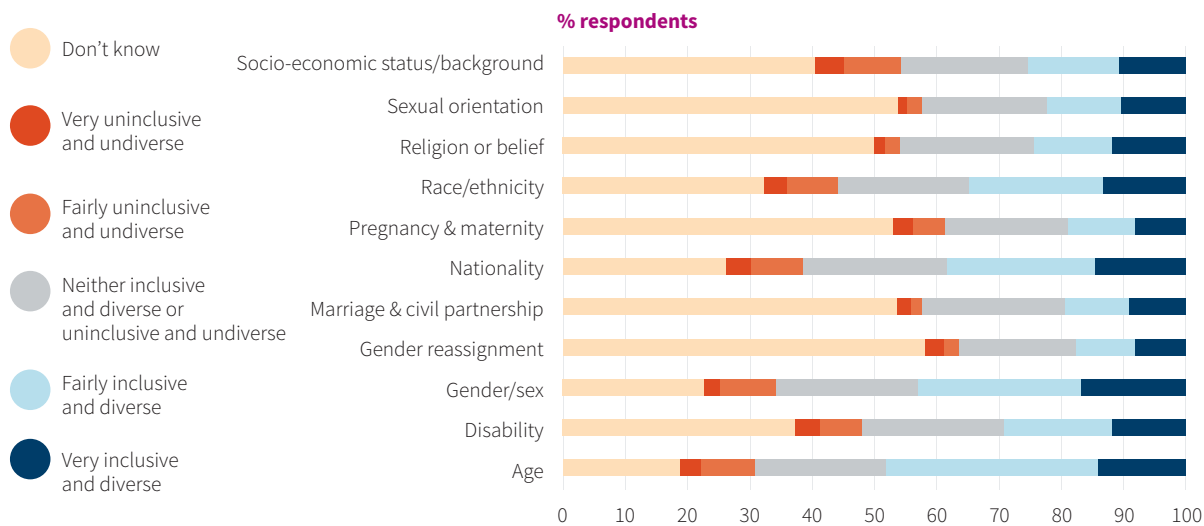


Figure 5: Source: RSC Review of Recognition Programmes Survey, 2018. Survey question: How inclusive and diverse, or not, do you think recognition by the Royal Society of Chemistry is in terms of the following characteristics, including those from the Equality Act 2010? Survey question was asked of those who indicated familiarity with the RSC's Prizes and Awards (N = 1163).

A general observation from the survey is that respondents who were familiar with the RSC's prizes and awards felt that recognition by the RSC is more inclusive than those who were asked about the inclusivity and diversity of recognition more generally.

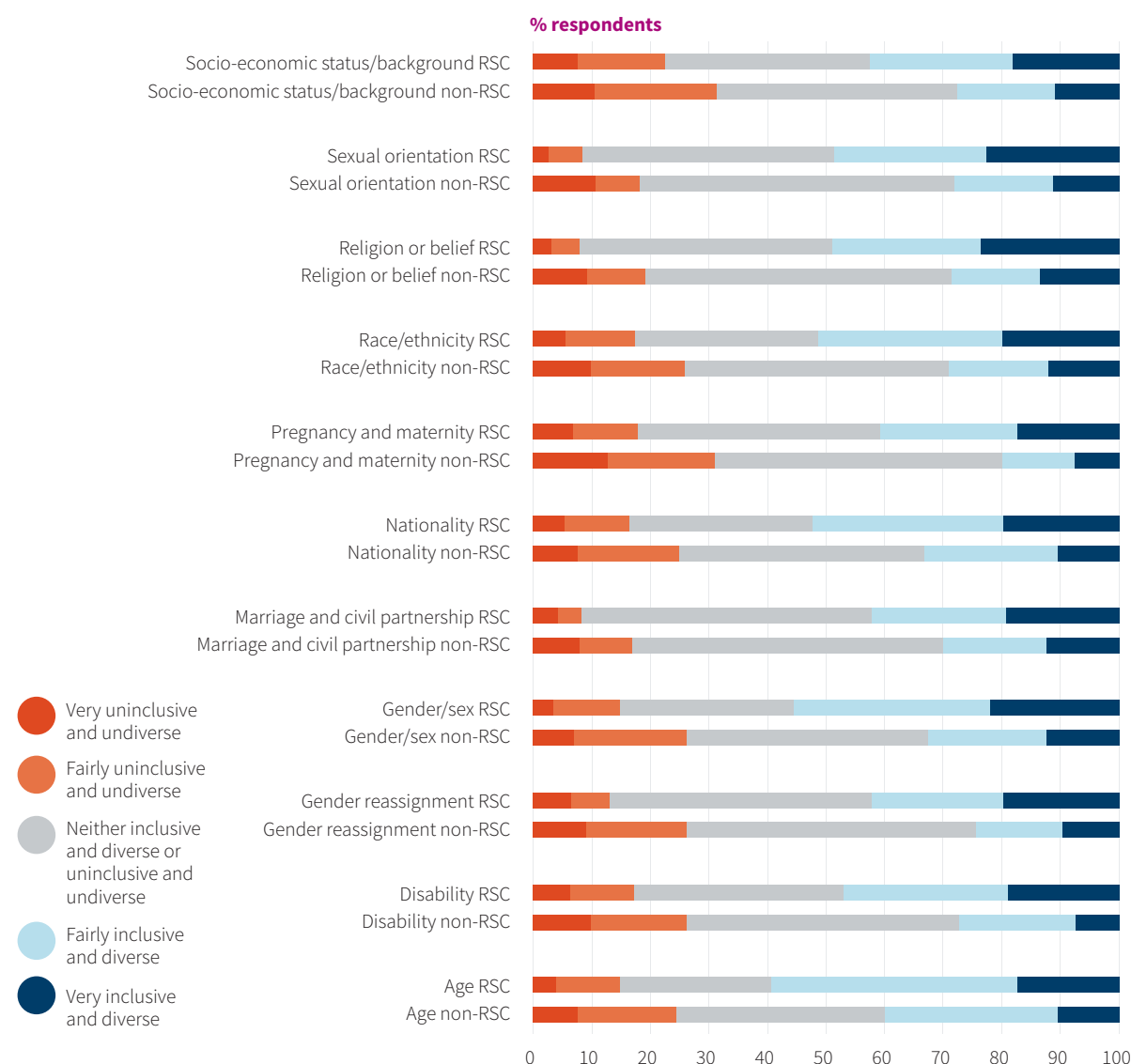


Figure 6: Source: RSC Review of Recognition Programmes Survey, 2018. Survey question: How inclusive and diverse, or not, do you think recognition by the Royal Society of Chemistry (RSC) or in general (non-RSC) is in terms of the following characteristics, including those from the Equality Act 2010? Separate questions were asked of those who indicated familiarity with the RSC's prizes and awards (RSC, N = 1163) and those who indicated they were not familiar with the RSC's prizes and awards (non-RSC, N = 666). 'Don't know' responses have been excluded.

Gender

Whilst there has been a consistent but gradual improvement over the past 5 years¹⁷, likely related to RSC interventions, there was a view that the low percentage of female nominees in some areas has been a key factor in limiting the percentage of female winners, particularly for later career awards. There was also a sense that this must be understood in light of gender demographics, which are not available for all sectors or all countries.

Consultees raised a concern that the headline figures on gender for RSC prize and award winners mask an 'Awards Gap', similar to that discussed by Uzzi *et al.*, where women win disproportionately lower and higher percentages of awards for research and non-research activity respectively, with the latter being perceived by some to have lower status or prestige.

Approaches to increasing the number of female winners suggested through consultation range from encouragement and enablement through to mandated interventions.

The review heard that the RSC should play an active role in encouragement and enablement at the nomination stage; for example, continuing to proactively seek input from RSC divisions and heads of university chemistry departments to boost female nominations, and reminding nominees to consider gender balance when making nominations.

There was some support for actively canvassing nominations, moderated by concerns that this needs to be

separate from the judging process and done in a way that is sensitive to the expectations of a person approached in order to avoid disappointment, tokenism or offence.

There was a steer that the RSC should continue to proactively monitor the gender balance of nominations and winners by field, sub-field and career stage to identify any trends or areas disproportionately affected as a focus for action. Where there is a concern in the portfolio that the proportion of male winners is consistently unrepresentative, the RSC should intervene to understand why this is the case and to redress the situation, bearing in mind that the reason may vary from one prize to another.

Some consider that the pace of change on gender balance is too slow and suggest mandated interventions such as only allowing awards to run if the RSC obtains sufficiently gender-balanced nomination shortlists.

Consultation indicated that while there was some support for the RSC to ring-fence awards for women only, this was not the majority view. There are other such recognition routes internationally for women, such as the *IUPAC Distinguished Women in Chemistry or Chemical Engineering*, where RSC members are highly successful and which the RSC should support. There was more support for the idea that, as with other dimensions of diversity, the RSC should recognise employers or projects that have contributed to achieving greater diversity.

Not all respondents supported further direct intervention by RSC on the matter of gender diversity.

17 <https://www.rsc.org/globalassets/07-news-events/rsc-news/news-articles/2019/04-april/prizes-and-awards-2019/inclusion-and-diversity-data-prizes-and-awards-2019.pdf>

“A suggestion is to call on all university departments to nominate at least one person – this could be a way to increase diversity.”

Review of RSC Recognition Programmes interview

“One option, we know about the spread and the drop off in female participation, so we are not going to award the prize unless at least 30% of nominations are for females.”

Review of RSC Recognition Programmes interview

“RSC could perhaps do more to recognise an institution or company that has a programme to retrain and bring women back.”

Review of RSC Recognition Programmes interview

“Actually I think the Royal Society of Chemistry is over obsessed with women’s rights, inclusion and diversity to the point it may be alienating men in particular and being counterproductive. I am in favour of these things and spent my working life promoting them... gently leading by example may be a better approach.”

Review of RSC Recognition Programmes survey response

Ethnicity

Consultation indicated scope for the RSC to increase the diversity of nominations by and for individuals from diverse ethnic backgrounds. The RSC could encourage scientists from minority groups to proactively seek nomination, for example indirectly by making sure to highlight previous award winners as role models. The RSC should monitor nominations to identify trends and issues associated with ethnicity.

The review heard that the RSC should play an active role in encouragement and enablement at the nomination stage, starting to proactively seek input from divisions and heads of university chemistry departments to boost nominations and reminding nominees to consider ethnicity when making nominations. There was also some support for actively canvassing nominations, moderated again by concerns that this needs to be separate from the judging process and done in a way that is sensitive to the expectations of a person approached in order to avoid disappointment, tokenism or offence.

Institutional balance

The vast majority of RSC prizes and awards for academic research in the UK go to individuals based at Russell Group institutions. The consultation heard a variety of views on how to broaden the range of institutions recognised, beginning with a greater understanding and appreciation of the type of work done in a wider range of institutions. This could include developing recognition of more applied research, of local collaborations with industry (including SMEs) and of research projects involving undergraduates.

The recommendations to recognise teams and projects, as well as individuals and bodies of work, should also improve institutional diversity because individuals may be part of multi-institution projects involving institutions or individuals with a range of resources on different financial and time scales. Similarly, the recommendations to broaden the range of important domains recognised by the RSC should work in favour of improving institutional diversity.

“[The process and the outcomes] are currently very white and dominated by Russell Group and Ivy League – do [the process and outcomes] just reflect the composition of those participating institutions?”

Review of RSC Recognition Programmes interview

“Diversify by gaining nominations from a wider range of institutions – HCUK [Heads of Chemistry UK] is a good place to start.”

Review of RSC Recognition Programmes interview

“Giving a chance to new people... not only from big, well-established groups... but also other people who work hard in less recognised institutions.”

Review of RSC Recognition Programmes survey response

Teams, collaborations and other groupings

Teams and collaborations

Consultation feedback reinforced the view from the literature that, while it is important to recognise individuals, recognising teams is crucial because teams play a central role in many scientific domains today. Team structures are one important way in which collective effort in science is organised.

“Individuals” was the level of recognition selected by the most survey respondents, both overall and by sector, with the exception of respondents who classified themselves in the “Studying” sector and for whom “Teams” was the most selected level. “Teams” was selected second most overall.

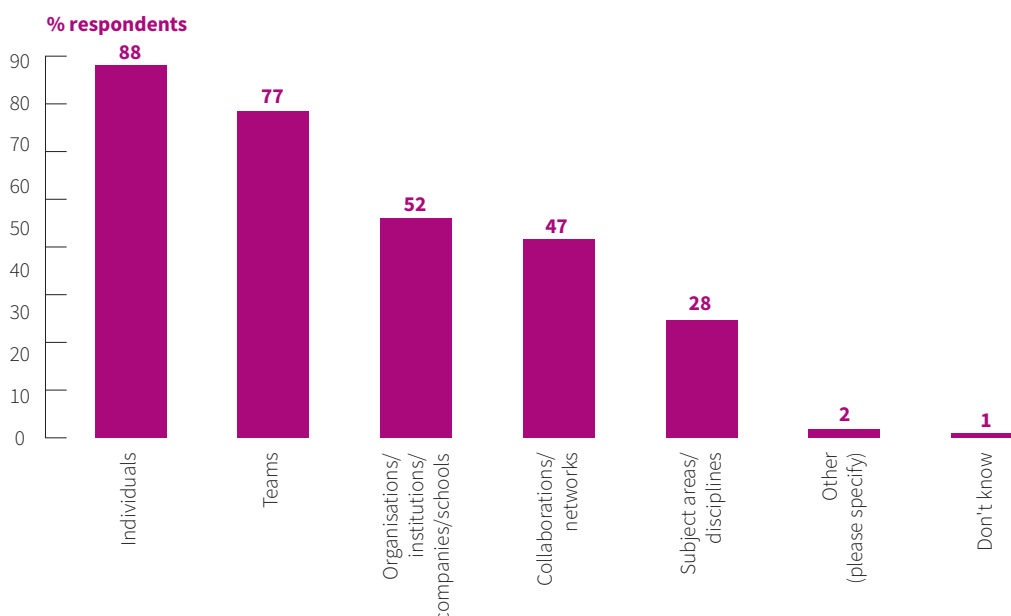


Figure 7: Source: RSC Review of Recognition Programmes Survey, 2018. Survey question: Who or what level should be recognised? Data shown from all who responded to the question (N = 1965). Survey respondents were asked to select all that apply.

There was also a strong view through the workshops, roundtable discussions and interviews that the RSC should offer team awards as a core component of its awards programme.

In creating team awards, as for any award, the RSC should first decide what it wants to recognise and why, to ensure that for each objective team awards are compatible with the desired outcomes. This will include considering what might define a team, and an awareness that that not all members of a team may be or should be chemists or members of the RSC.

The RSC will also need to decide the basis for team awards. Whereas individual awards are often based on “a body of work”, often over a period of years, it would be more sensible for team awards to be based on a discrete piece of work, output or project. This would enable clear identification of who should be included in the recognition, enabling recognition of those involved at all levels and in all roles.

Recognising teams should also work in favour of diversity as it will naturally provide opportunities for a wider range of people at different career stages, in different roles and based at a variety of institutions or companies.

Individuals

Recognition of the individual is important, especially where the purpose of recognition is to benefit the awardee. This is important especially for early career chemists as they establish themselves. There was a sense that, in line with Principle 9 (that recognition is associated with certain duties or expectations of recipients) and noting that at later stages the career benefits are less significant, the expectations on prize and award winners should increase for later career stages. These could be associated with an expectation that the individual acts as a role model and supporter for earlier career chemists, acts as an advisor to the RSC in their area of expertise and/or as an ambassador for science beyond the individual’s specific area of work.

The prevailing view from the consultation was that the RSC should continue to recognise individuals through its prizes and awards, keeping the valued elements of its current portfolio, and being mindful of both the benefits and drawbacks of recognising individuals.

Individual and team excellence are related because effective teams bring together, depend on and amplify individual

excellence. Therefore, there should be space in the prize and award portfolio to recognise both and in some cases, for example when a prize recognises a breakthrough, to recognise either an individual or a team.

Collaboration and collaborations

Teams and collaborations are related but not necessarily the same – not all collaborations are teams and not all teams are collaborative.

Collaboration is integral to science and happens in many different ways, from collaboration between two individuals to collaborations between several large teams or groups. Collaboration can be within one domain or sub-domain, or straddle multiple domains. Some collaborations last for short periods and others span decades. Collaborations happen both within institutions and companies, and between different institutions and/or companies.

Sometimes individuals who collaborate are located in the same place and some collaborations are widely distributed geographically. Some collaborations are informal and fluid, based on an understanding that is often tacit between collaborators about when and how collaboration will accelerate or enable progress. Some collaborations are formal partnerships involving sharing and allocation of resources – sometimes following competition for those resources, for example, through joint grant applications – and pre-defined division of tangible and intangible rewards.

The review heard that finding ways of recognising individuals whose scientific contributions are through collaboration is particularly important for multidisciplinary and cross-sector activities, which by their nature are collaborative. At a minimum, it is essential to ensure that there is no penalty for individuals in multidisciplinary areas, especially in academia where an individual identity and track record in research is key to career progression. Ideally recognition should act as a positive incentive as part of the wider academic reward and recognition system in creating flourishing multidisciplinary research and impact.

The fact that collaboration is so varied and multi-faceted means that rather than trying to define or codify it precisely, there is an opportunity to be creative and flexible in recognition. One specific suggestion from consultation was that the current RSC *Interdisciplinary Prizes* for individuals could very well be for individuals, teams or collaborations.

“Recognise that we do not need to be individual stars – consider teams and teamwork in supporting scientific discovery.”

Review of RSC Recognition Programmes interview

“Just recognising the individual can have (a) negative impact on people who were involved but did not get recognised.”

Review of RSC Recognition Programmes interview

Departments and Employers

Among respondents based in industry and education, there was some variation in the level of recognition selected relative to the overall findings.

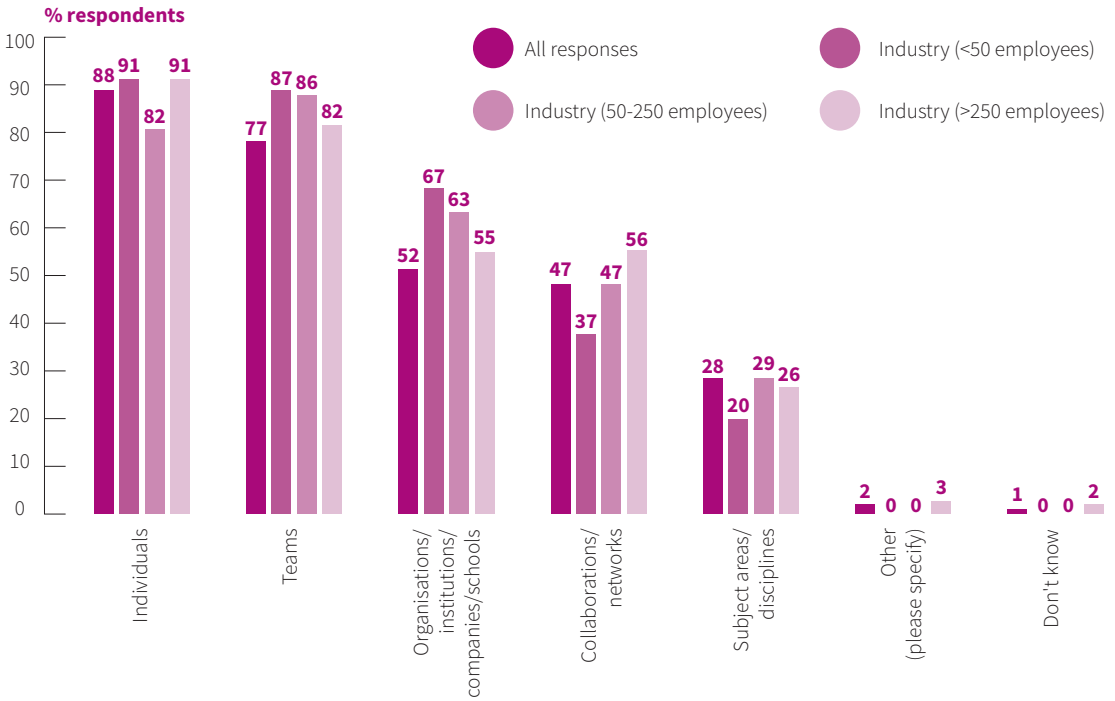


Figure 8: Source: RSC Review of Recognition Programmes Survey, 2018. Survey question: Who or what level should be recognised? Responses from individuals working in industry, segmented by company size, are shown alongside those averaged across all survey respondents. (All responses, N = 1965; Industry (<50 employees), N = 76; Industry (50-250 employees), N = 49; Industry (>250 employees), N = 304). Survey respondents were asked to select all that apply.

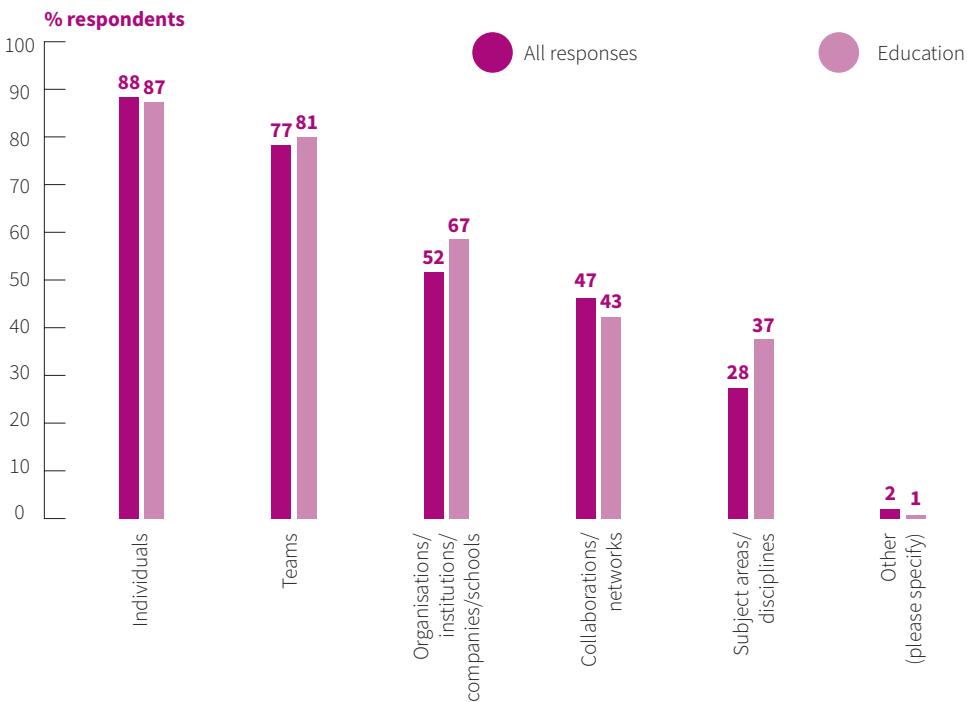


Figure 9: Source: RSC Review of Recognition Programmes Survey, 2018. Survey question: Who or what level should be recognised? Responses from individuals working in education are shown alongside those averaged across all survey respondents. (All responses, N = 1965; Education, N = 194). Survey respondents were asked to select all that apply.

67% of the survey respondents working in education (194 respondents) selected 'Organisations/institutions/companies/schools' as a level that should be recognised, compared with 52% of all survey respondents. There was also relatively higher support for recognition at company level from people working in smaller (<50 employees)

compared with larger (>250 employees) companies and the overall total.

Departments were not widely mentioned as an important unit for recognition in interviews and workshops, with the exception of supportive departments in schools.

“Supportive departments and schools should be/could be badged and recognised. Achieving this should not be a burden for the school – [it should be] part of doing what they already do.”

RSC Review of Recognition Programmes workshop: Education Division Council

Leadership

Leadership was selected by 46% of survey respondents as meriting recognition, rising to 67% among the respondents who identified themselves as senior managers (see Figure 10). The question of leadership arose in different ways through interviews, roundtable discussions and workshops. There is an opportunity for the RSC to articulate its own view on what effective leadership in science looks like, why it is important and to recognise a diversity of leaders and achievements.

There was a sense through consultation that leadership is important because leading teams and collaborations and/or being an effective force for change and growth are so crucial for science itself. At the same time, leadership by scientists that extends beyond the immediate scientific sphere is crucial in the political domain and in ensuring that science delivers maximum impact for society.

In the context of academia specifically, there were views that there is an opportunity for the RSC to use recognition as a positive incentive to highlight leadership and share examples of leadership attributes and skills that are often not part of traditional academic career development.

The recognition and celebration mechanisms for leadership will likely differ from traditional prizes, and should aim to showcase different types of leadership, demonstrated at different career stages and in different domains. For example: initiating and sustaining transformation with, for and through others; building enduring interdisciplinary, cross-sector or international partnerships and structures; successfully championing emerging areas of importance; achieving change on the ground or beyond a person's direct area of responsibility or benefit.

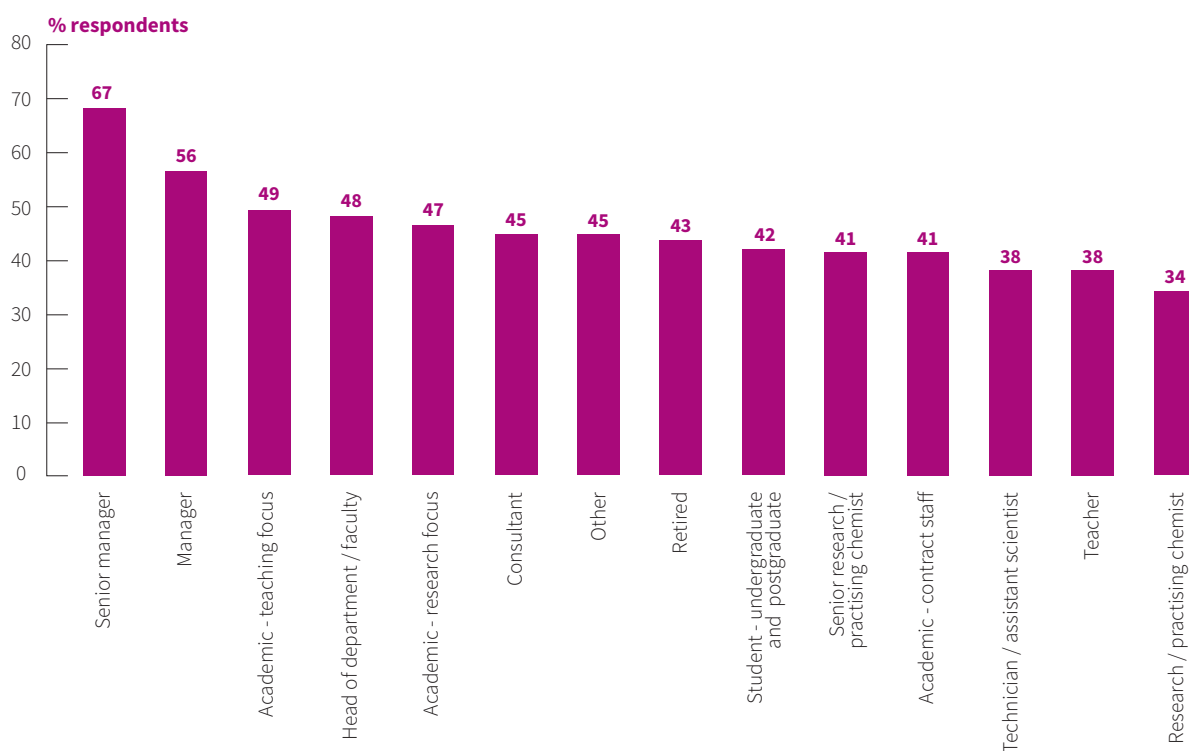


Figure 10: Source: RSC Review of Recognition Programmes Survey, 2018. Survey results showing the percentage of respondents who selected "leadership" as meriting recognition, segmented by job role.

“Advocating/rewarding people who challenge the limits and make real societal changes, not just the science itself.”

Review of RSC Recognition Programmes survey response

“They should be recognising more broadly, for example, leadership, mentoring and innovation.”

Review of RSC Recognition Programmes interview

“The RSC does not currently have a mechanism for recognising an individual's standing within the community, and that recognising attributes such as mentoring and ‘academic citizenship’ more generally may help to drive wider cultural change.”

Review of RSC Recognition Programmes interview

Citizenship & service

In interviews and workshops people raised the idea of “citizenship” in different ways. One emphasis was on behaviours like treating other people respectfully or well, supporting others and supporting the chemical sciences. Another strand was on contribution, for example to places of employment and as members of the wider scientific community in activities like serving on committees and panels, advising and mentoring or supporting early career staff.

The focus on citizenship did not come through as strongly in the survey.

There was a strong feeling that the RSC should seek to find a way to ensure that prize winners are role models in terms of behaviour. In interviews and workshops some people suggested that the RSC identifies an approach for recognising “good citizenship”, in the sense of behaviour and contribution, in its own right. Some held the view that

“good citizenship” should be a criterion for all prizes. Others felt that this would not be implementable as all nominees, if asked, would be able to provide evidence of contribution and positive impact for others, making it impossible to use good citizenship as either a baseline or differentiating criterion between nominees.

28% of survey respondents selected service as a category that should be recognised. The Review Group noted that the RSC is considering service as part of its Volunteer Review and so did not pursue developing recommendations regarding service.

This was a complex area for the Review Group to consider. The recommendations regarding leadership and conduct relate to varying degrees to behaviours. They are specific ways in which recognition can be designed to incentivise and to discourage positive and negative behaviour respectively.

Education: schools and colleges

The view from consultation was that the limited recognition of teaching in schools and colleges in the current RSC prize and award portfolio does not reflect the importance of teaching as part of science.

There was a sense that recognition of teaching should begin with primary education and that, in devising any new recognition mechanisms, there is an opportunity to link with other RSC initiatives related to primary science teaching and learning.

When designing and promoting recognition schemes it is important to be aware that individuals may see themselves as teachers first and chemists or scientists second. It is important to appreciate that within schools many teachers are non-specialists, which means that there should not be an expectation that winners are members of the RSC.

There is also scope to recognise and support a wider range of activities undertaken by teachers, including innovation in teaching methods, involvement in research, outreach,

building teaching collaborations and mentoring. Related to this was a view that teachers will particularly value awards that enable them to have more time for specific projects and professional development.

There is a place for recognising individual teachers. Such recognition may be particularly meaningful if the nominations are made by students, for example for an “Inspirational Chemistry Teacher of the Year” award. There may also be scope for developing other recognition mechanisms such as professional qualifications for teachers of chemistry, analogous to the chartered chemist route.

In addition to recognising individuals, there was a view that teachers would often welcome recognition of their department or school. This could be done in many different ways; for example, by badging supportive departments and schools with outstanding chemistry teaching, or through financial prizes for the science department in a school.

“[Recognise] the unsung heroes/teachers and education: the RSC has a role to promote the chemical sciences in education.”

Review of RSC Recognition Programmes interview

“Consider all contributions to chemical education e.g. primary teachers.”

Review of RSC Recognition Programmes survey response

“Go beyond universities and industry; don’t ignore the role school teachers have.”

Review of RSC Recognition Programmes survey response

Education: higher education providers

Feedback through consultation indicated that the current RSC recognition portfolio does not sufficiently reflect the range and importance of teaching and educational research in higher education. There was a strong sense that this is linked to the wider issue of differences in the status of teaching relative to research in higher education.

Survey respondents working in education perceived RSC prizes & awards to be less accessible than those working in academia or industry. A breakdown of survey responses regarding the accessibility of the RSC's prizes and awards, based on sectors selected by respondents, is shown in Table 4.

Response	Academia	Education	Industry
Don't know	5%	7%	8%
Very inaccessible	10%	18%	14%
Inaccessible	26%	33%	27%
Neither accessible nor inaccessible	26%	20%	28%
Accessible	28%	19%	21%
Very accessible	6%	3%	3%

Table 4: Source: RSC Review of Recognition Programmes Survey, 2018. Survey question: How accessible or inaccessible do you feel Royal Society of Chemistry prizes and awards are to you? Data shows responses from respondents who indicated they were familiar with the RSC's prizes and awards, segmented by sector (Academia, N = 427; Education, N = 100; Industry, N = 222).

“There is very little to reward those involved in education rather than research.”

Review of RSC Recognition Programmes survey response

It is important to have recognition and profile for teaching excellence that is much broader than the local or institutional recognition afforded by teaching excellence awards within universities. The RSC may wish to draw on the work by the Higher Education Academy on developing good practice benchmarks¹⁸ in developing criteria for prizes for teaching.

There was a sense that the current RSC Higher Education Teaching Award works well but that it would be beneficial to have more recognition opportunities, for example for people at different career stages. Another option would be to inaugurate RSC Teaching Fellowships to support individuals and to encourage departments to develop and support the development of excellence in teaching.

As with other domains of excellence, it will be important to consider diversity, the balance between recognition of individuals, teams and collaboration, and recognition of leadership.

It is also important for the RSC to recognise excellence in educational research with opportunities for individuals at different career stages. There was a sense that it would be useful to raise awareness with heads of department about RSC recognition mechanisms for teaching and for educational research.

¹⁸ Promoting teaching: Good practice benchmarks – The Higher Education Academy (2013) www.heacademy.ac.uk/system/files/resources/good_practice_benchmarks_web.pdf

Engagement and outreach

There was a strong view in the consultation that engagement with a variety of different audiences is important for science. People used the word “outreach” to cover a range of activities from sustained outreach partnership projects between schools and universities to public and policy engagement activities by individual researchers in universities or companies. Some individuals are employed in specialist educational outreach or science communication roles, others do “outreach” associated with another role, and others – for example, students and retired people – do outreach voluntarily alongside other commitments.

Outreach and engagement activities vary widely, depending on the purpose of the activity. Audiences vary accordingly and include members of the public, teachers and school students, and policymakers. Some of the reasons why outreach and engagement were viewed as important were:

- Encouraging and inspiring people to study chemistry in school, college or university
- Widening the diversity of people studying and working in chemistry both by ensuring audiences are diverse and by ensuring that the people doing outreach reflect diversity in a broad sense, including protected characteristics, socio-economic and cultural background, and diverse roles and career stages.
- Encouraging retention of professional chemists
- Raising the profile of chemistry within STEM
- Raising the profile of chemistry with public audiences
- Raising the profile of chemistry with policymakers and politicians for the purpose of securing funding and support for chemistry education, innovation and research
- Creating a way in which professional chemists “give back” to society by sharing their passion and excitement about chemistry, and sometimes the latest advances and discoveries.

Outreach featured less strongly in the survey than in interviews and workshops. It emerged eleventh in the activities selected by survey respondents as meriting recognition, with people working in education most likely to select outreach.

Views were mixed on whether there should be stand-alone recognition for outreach or whether it should be included in criteria for all other recognition. A sense that outreach should be a requirement for all prizes came from seeing this as a way of incentivising people to do outreach, and also as a way of tackling perceptions in academia about outreach as being less important than research.

As in other areas, there is also a distinction between recognising individual excellence in outreach, particularly in communication, and recognising a particular outreach project. Some saw recognising and developing individual excellence in outreach as a way of building outreach and public communication capacity in chemistry. This in turn would raise the profile of chemistry itself. Ideas ranged from deliberately setting out to identify a public “chemistry personality”, to developing mechanisms to recognise outreach that involve opportunities to shadow and learn from outstanding science communicators.

The review noted also the view that excellent researchers may not be excellent communicators and vice versa. While some individuals may very well be contenders for recognition in both spheres, it could be counter-productive and discriminatory to design prizes that require excellence in both.

In workshops and interviews the Review heard a range of ideas about how the RSC should recognise outreach. These reflected the many different objectives for, and activities that may be considered as, outreach or engagement. In recognising outreach initiatives there can be challenges in deciding how to evaluate the project, considering factors such as innovativeness, the scale of the input and the outcome.

The RSC currently enables educational outreach through its *Outreach Fund*. There is an opportunity to raise the profile of and use some of the outputs from these grants. Prospective prizes for outreach, facilitating access to funds or buying out time for delivery to enable outreach are also options. There may be opportunities to showcase outstanding outreach regionally, for example with winners of grants or prizes leading workshops to share good practice.

“Outreach is critical for social inclusion of many characteristics.”

Review of RSC Recognition Programmes interview

“Yes to recognising outreach, but does it fit alongside existing prizes? I am not sure.”

Review of RSC Recognition Programmes interview

“It should be part of every single prize. EPSRC currently expects that every award holder should be doing it as part of their portfolio.”

Review of RSC Recognition Programmes interview

“I would love to see this recognised more.

The question is how do you quantify success in outreach, how do you actually decide who is doing good outreach?”

Review of RSC Recognition Programmes interview

“A prize for outreach would look different to a medal or a certificate.”

Review of RSC Recognition Programmes interview

Innovation

The review heard that the RSC already recognises innovation, but that there is scope to do this more effectively. The RSC *Emerging Technologies Competition* is itself an innovative recognition mechanism giving profile to individuals and companies. Participants range from small companies participating in the competition to large companies who sponsor the competition and provide mentoring and advice for participants and winners.

There are some RSC prizes and awards for innovation and/or for industry, but the sense from the consultation was that the objectives for these prizes and awards are unclear. Related to this is the view that the criteria for these awards are broad, ambiguous and not always relevant to the area being recognised.

It is important for the RSC to clarify what it is aiming to recognise and why. “Innovation” and “industry” are both very broad categories and, while they overlap, are not the same thing.

The Review heard that, even for individuals working for large companies which have well-developed internal recognition schemes, recognition by the RSC can be important. The purpose of recognition could be to show that the RSC understands and values the work of its members based in industry, to support individual careers, and/or to develop role models and case studies.

Another purpose of recognition is to foster innovation by highlighting, supporting and connecting companies. In this case, the prevailing view was that the RSC should focus on small companies, as in its *Emerging Technologies Competition*.

There are also opportunities to recognise and celebrate innovations and technologies. These will involve both single subject and multidisciplinary teams that have played a key role in the development of a commercially successful technology process, product or service. Depending on the purpose of the recognition, teams could be within companies and/or collaborations between multiple partners across academia and industry. In this case, team members may be based in small, medium and/or

large companies and, as for other domains, may include individuals in a variety of roles and at different career stages.

Even for large companies, innovation awards can be valuable because technology teams within companies generally do not publish their results and there are fewer external measures of excellence. Recognising innovations and technologies provides an external benchmark of excellence and credibility, which can be useful for the profile of R&D units within a large company and for the company itself in the wider environment.

As part of the consultation, there was also significant discussion about the complexity associated with recognising applied research and innovation in industry and academia. Taking the example of the current RSC *Applied Catalysis Award*, there were differing perceptions about what “applied” means. These fell into two categories corresponding broadly to more academic and industrial perspectives, both of which are important. The first is that the award recognises research that aims to, or has the potential to, achieve or enable a particular application. The second is that the award recognises research that has demonstrably been applied in a successful process or product.

More generally, RSC prize rubrics and criteria should make clear to nominators whether a prize aims to recognise promising potential, delivered results, or more flexibly, research and innovation across the full spectrum in a science and technology area. This will depend on the purpose of the prize.

As in other domains, there are opportunities for the RSC to recognise different types of excellence. In the survey the highest proportion of respondents selected significant breakthroughs and innovations as worthy of recognition, with managers leaning slightly more towards significant breakthroughs and practising chemists leaning more towards innovation. A greater proportion of managers selected leadership and impact, compared with senior researchers and researchers who selected mentoring, positive societal impact, integrity and responsible science.

“In companies you can get promotion if you work hard, this [recognition from the RSC] is totally different from what you get from your company.”

Review of RSC Recognition Programmes interview

“Industry sometimes gets forgotten, so [we] need clearer industry awards for industrial chemists/researchers.”

Review of RSC Recognition Programmes interview

“The RSC is focussed on recognition for chemists working in academia or research; more focus should be placed on those working in industry and other organisations.”

Review of RSC Recognition Programmes survey response

“Prizes for good ideas... these sessions are a really good idea for early stage companies.”

Review of RSC Recognition Programmes interview

Research

The majority of RSC prizes and awards are for individuals for retrospective achievements or contributions to research. The scientific scope of these prizes and awards ranges from broad “pan-chemistry” prizes to awards for very specific sub-fields of chemistry given by some divisions and interest groups. There are naturally more awards linked with analytical, inorganic, organic and physical chemistry than with more recently constituted RSC divisions.

The review heard views that the scientific scope and balance of the RSC recognition portfolio has not kept pace with developments in science.

There was a strong view that the RSC should provide more recognition for aspects of research not clearly reflected in its current portfolio, especially emerging areas and those that lie at or across the interfaces between disciplines. There may be opportunities to create new prizes and awards that are shared by several RSC divisions, reflecting the fact that many members of the RSC are members of more than one scientific division.

Rather than creating new prizes for each emerging area or potentially new sub-field, an effective approach would be

to have prizes with broader scope, thereby creating space for recognition over time of an evolving range of active sub-fields of research within that scope.

In the survey, *significant breakthroughs* was selected most by respondents as the outcome meritorious of recognition by the RSC. Through interviews, workshops and roundtable discussions the Review also heard that a similar view that the RSC should aim to recognise seminal ideas, “game-changing” discoveries and research that opens up a new direction of research and innovation that have a significant influence beyond that of the original researcher or group.

The purpose of each prize again emerged as a crucial consideration. If the purpose of a prize or award is to support the awardee in their career or to create role models, then it may be entirely appropriate to recognise sustained excellence evidenced in a body of work by that individual. If the purpose is to incentivise, highlight and celebrate exciting areas of chemistry both within the scientific community and to wider audiences, then the focus will be on the scientific advances or breakthroughs themselves.

“It does not reflect sufficiently multi-disciplinary aspects of chemistry, still looking at organic/inorganic/physical divisions, which is not the way science is going.”

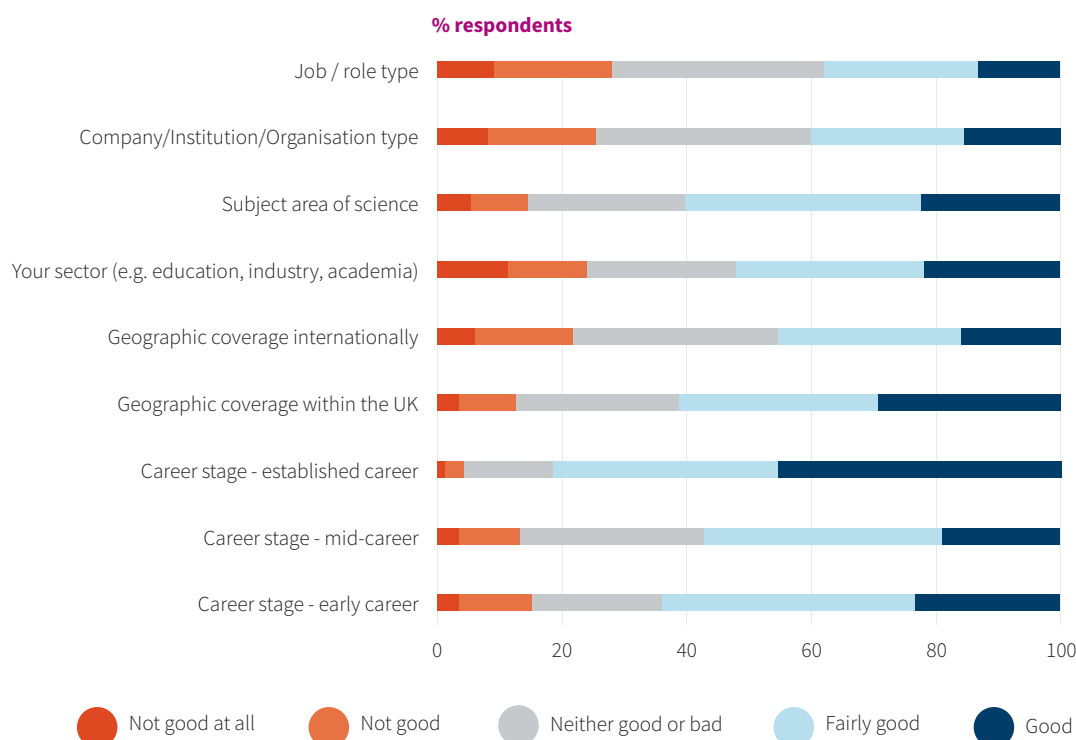
Review of RSC Recognition Programmes interview

Career stages

In 2018 the RSC moved from career-stage definitions based on age to definitions based on years of experience for its early and mid-career prizes. This change was welcomed across the board in the consultation.

Figure 11 shows views from the survey on how well the RSC recognises people at early, mid and established career stages. In the survey, no definitions were provided for career stages beyond the labels early, mid and established.

Figure 11: Source: RSC Review of Recognition Programmes Survey, 2018. Survey question: How well represented are the following by RSC recognition? Survey question was asked of those who indicated familiarity with the RSC's Prizes and Awards (N = 1163).



Currently within the RSC portfolio, only the prizes and awards for research have career stage stratification. A recurring theme in the consultation was that the RSC should extend opportunities at different career stages to other domains, particularly for early career chemists.

There was universal agreement on the importance of supporting and encouraging early career chemists. The overall sense was that this is working well for the prizes for research.

The review heard that the RSC should actively monitor diversity for the early career prizes and awards.

In interviews, workshops and roundtable discussions, the review heard that the RSC should expand its recognition opportunities for people at the mid-career stage, because it is important to encourage and recognise people throughout their career. This view was reflected also in the survey (Figure 11). There was a sense that the 5-year window used in the eligibility criteria for prizes such as the Corday-Morgan Prize is too narrow. A 10-year window would create greater differentiation between the early and mid-career prizes and extend the period of opportunities for mid-career researchers.

In the case of prizes for people at an established or very late career stage, the Review heard that it is appropriate to use minimum ages in defining career stages. It is important that these awards recognise recent work rather than lifetime achievement. There was also a sense that the expectations on recipients of established or very late career stage awards may be different as the purpose of the prize may be different, shifting from primary benefit to the awardee at an early career stage, to benefits to science, society and the RSC at later stages.

There was a strong view that the RSC should avoid a “prize escalator” where individuals who win prizes at the early career stage tend to be those that win prizes at mid and established career stages. People flourish professionally in a demonstrable way at different points in their careers. This is for many different reasons, including different career paths, differences in the type of scientific activity that an individual pursues, and the many different types of support and barriers people experience along the way. It is important that recognition by the RSC encompasses the totality of excellence, and that the RSC is proactive in showing that it is aware that excellence may be manifest at different points in a career.

The review also heard a degree of frustration that some individuals “collect gongs” and win numerous prizes and awards. There are of course extraordinary individuals who are excellent in multiple domains and in multiple ways and will rank top of the list for multiple prizes. This is not necessarily an issue, especially when the winner fulfils the expectations that may be associated with winning prizes.

However, there was a sense that where possible and in line with the purpose of the recognition, extending recognition to a broader group of individuals may be a more strategic use of the resources – both RSC financial resources and volunteer time – invested in running a recognition programme. This is because it would expand the pool of role models, ambassadors and advisors working for the wider benefit of science. Broadening the pool of winners could also work positively to encourage people who have not previously been nominated or made nominations to participate in prize schemes.

“Early career is the only group consistently singled out for special treatment.”

[Review of RSC Recognition Programmes survey response](#)

“We are not doing enough, most of the Division recognition goes to late career [scientists].”

[Review of RSC Recognition Programmes interview](#)

“I don’t think the recent changes are quite right.

Early career up to 10 years, mid-career up to 15 years – this implies the mid-career window is 5-years, which seems a bit short and means mid-career is not well represented.”

[Review of RSC Recognition Programmes interview](#)

“Too much early/late stage focus.”

[Review of RSC Recognition Programmes survey response](#)

How should the RSC recognise?

This section summarises findings from the literature and consultation about various aspects of how the RSC should recognise different domains and dimensions of excellence.

Legacy and clarity of portfolio

Prizes and awards are a very visible way in which the RSC recognises individuals and teams. Many RSC prizes and awards are named after individuals, of which only two are named solely after women.

There is a view, expressed also in the literature, that eponymous naming of prizes should be mindful of diversity, at the very least reflecting diversity. In the consultation there was agreement that being proactive in considering diversity will be essential for any new eponymous prizes and awards, and that any such prizes should include both forename and surname.

There is a degree of arbitrariness in eponymous naming of prizes. Every generation has many distinguished scientists so it is hard to establish criteria for selecting individuals after whom prizes are named. Historically prizes have often been named in association with donations and bequests as a way of commemorating an individual, rather than based on a strategic decision to inaugurate a prize for a particular purpose.

It is also important from the point of view of accessibility to ensure that the name of every prize, eponymous or not, makes clear what the prize is for. This is so that there are no tacit assumptions about what potential nominators know already about the RSC prizes and awards.

Views on the question of renaming existing RSC prizes and awards were mixed, but the overall sense from the consultation was that the current eponymous prizes and awards reflect the history and heritage of chemistry and should mostly be kept as they are, with the addition of a description of what the prize is for. The fact that many existing awards use an individual's surname only and that in most cases people considering making a nomination are unfamiliar with that individual mean that in fact very few of the awards are associated with specific individuals in the minds of nominators.

The prevailing sense from the consultation was that what is most important is the diversity in the winners each year and the profile given to those winners. Many of the current eponymous prizes are very prestigious and a collective goal for the RSC and its community should be that the "lineage" on the winner lists becomes more and more diverse.

There may however be opportunities for some renaming after an individual or individuals and by introducing double-barrelled naming for prizes and awards currently named after just one individual.

In eponymous naming or renaming of prizes and awards it is also important to be mindful of the potential pitfall of reinforcing unhelpful differences in perception regarding status and prestige associated with different domains and types of excellence.

In considering future naming there is an opportunity to break with the tradition of posthumous naming as a way of widening the diversity of the pool of individuals after whom a prize is inaugurated. An example is the RSC Materials Chemistry Division's *Stephanie L Kwolek Award*, first awarded in 2010.

One suggestion is that having a larger group of people looking at prize names in "batches", rather than having an individual or small group looking at them one at one time, will enable more effective consideration of diversity in the choice of names for eponymous prizes and awards. This approach allows for flexibility and inclusiveness, creates a sense of collective responsibility, and can involve people with different perspectives and expertise in informing and making the decision.

While it makes sense to decide about creating or re-naming eponymous prizes in batches, it would be advisable for the RSC to wait until it has decided on any actions related to creating, stopping or evolving its prizes and awards before naming or renaming awards. This would then create an opportunity to decide the names associated with a larger set of awards at one time.

“The purpose of the award is an historical thing; the names reflect the history of chemistry, which is fine.”

[Review of RSC Recognition Programmes interview](#)

“Change the name of the awards, the majority are male.”

[Review of RSC Recognition Programmes survey response](#)

Hierarchy & portfolio structure

Ideas about hierarchy and recognition in a general sense arose in different ways in the consultation. One idea is that of bronze, silver and gold prizes corresponding to excellence at different levels of contribution defined by, for example, increasing breadth across a domain or increasing scale of impact. There can also be hierarchy associated with advancing career stages, allowing also more prizes at the early career stages for the purpose of supporting careers.

Views about the importance of hierarchy were, for some, related to perceptions about prestige. The latter can arise in different ways, including from the profile given to winners with different audiences, in some cases as the result of deliberate efforts by the organisation awarding the recognition. Alternatively, a prize may be considered

to be very prestigious within a small community and the prestige associated with recognition by expert peers. Views on the desirability of hierarchy in prestige naturally depend somewhat on individual motivations and preferences.

The overall sense was that hierarchy of different types may be useful within the RSC portfolio, but that it is important that this relates to the purpose of a set of prizes and that the rationale for any hierarchy is clearly communicated.

Feedback from consultation suggests that more generally clearer delineation between the different segments of the RSC recognition portfolio would be helpful. The structural complexity, combined with the number of prizes and awards, can make the whole portfolio inaccessible for people who come to the RSC website cold or without inside information.

Recognition mechanisms

Prize money, medals and certificates

The RSC currently gives prize and award winners a combination of one or more of the following: a medal, certificate and cash prize of £500 to £5,000, depending on the prize.

The overwhelming response from the consultation was that while the financial reward is welcome, it is not a key factor for prize-winners, particularly at mid and established career stages. Important aspects of winning are an internal sense of pride or validation and the external kudos associated

with winning, as well as professional and networking opportunities and funding for specific activities. This reflects the general sense that recognition can go beyond the “transaction” of simply receiving a prize.

While early career chemists also valued recognition itself more than prize money, the funds can be more significant for people at that career stage, for example covering the expenses associated with attending a conference in their area or contributing to other costs, such as childcare, to facilitate their work.

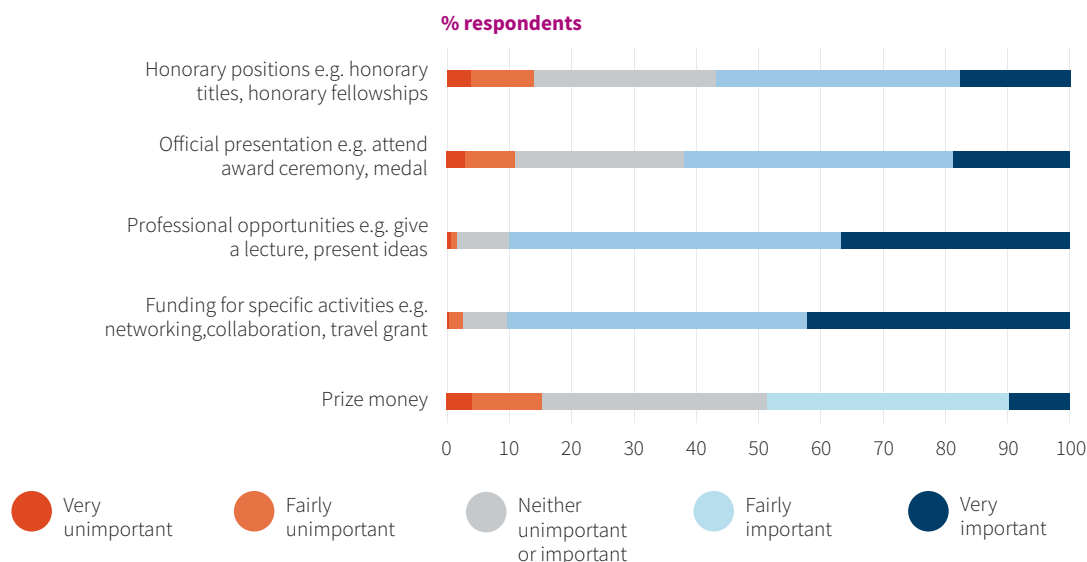


Figure 12: Source: RSC Review of Recognition Programmes Survey, 2018. Survey question: How important do you think the following forms of recognition are? Data shown from all who responded to the question (N = 1819). Responses of ‘don’t know’ are not included.

Winners reported that medals are appreciated as an element of winning, and mean more than the cash prize. Whilst the certificate was appreciated, winners were less likely to mention it as being an important element of the prize.

“The monetary benefit is unimportant; it is the medal and prestige, etc.”

Review of RSC Recognition Programmes interview

Lecture tours

Feedback from winners was that university lecture tours are a very positive and valued aspect of the prize, although not all prizes have associated university lecture tours.

For prizes where the RSC arranges university lecture tours, winners saw their visits as beneficial for making connections, raising their profile and also learning about different universities around the UK. Lecture tours are also beneficial to the departments that host winners.

There was a view that international winners should visit a wide range of institutions because part of the purpose of the lecture tours is to give students, faculty and other staff at universities the opportunity to hear presentations by and to interact with leading international scientists. Winners also reported valuing the opportunity to meet with early-career scientists including PhD students and post-doctoral researchers.

Benefits included making links with potential post-docs and the opportunity to advise UK-based PhD students and post-docs about research systems in other countries.

Whilst the lecture tours were widely valued, flexibility is important. The RSC should be mindful that for some individuals the requirement of a lecture tour that can extend over one week may be limiting the diversity of nominations, for example for individuals with caring responsibilities or people with disabilities for whom travel is challenging.

Depending on the purpose of the prize, there may be opportunities to extend the concept of lecture tours beyond universities to schools, science museums and companies. There may also be opportunities to make prize lectures available more widely, for example by streaming, broadcasting and recording them.

“[The most valuable element of winning was] the opportunities for networking and also the lecture tour.”

Review of RSC Recognition Programmes survey response

“Speaking opportunities are valuable: both for a department bringing in a prize winner, and also visiting institutions as a prize winner.”

Review of RSC Recognition Programmes interview

“When I won the award there was no travel fund for lectures, I felt that was a bit of a shame.”

Review of RSC Recognition Programmes interview

Lists

The Review heard some support for the idea of publishing lists of shortlisted nominees for prizes and awards as a way of broadening recognition to a greater number and more diverse group of people each year. Overall the view was that for individual prizes this may deter people from putting

themselves forward, but that it would be sensible to publish non-ranked shortlists for team or project awards based on collective input.

There was some appetite for the idea of recognising cohorts such “top 10” or “top 20” lists, although a view that it would need to be clear how nomination and judging would work.

“Not shortlists, I am against this, just show the winner – [it’s] not good to be on the shortlist for 2-3 years!”

Review of RSC Recognition Programmes interview

“I think the idea of top ten lists is a good idea. Not as big as an award, but highlights something done and that is a good idea.”

Review of RSC Recognition Programmes interview

“Publishing non-ranked shortlists could be positive – e.g. IChemE have prizes developed around projects and teams. There is a global list of finalists, who all come to an event. Great profile even to be a finalist.”

Review of RSC Recognition Programmes workshop – RSC Division Council

Prospective and retrospective prizes

RSC prizes and awards currently recognise past achievement, which was considered important in interviews, workshops and the survey (Figure 13).

There was also support in the survey for the idea of recognising potential and incentivising behaviours or projects, although this did not emerge as strongly in

interviews and workshops. The recognition mechanisms are likely to be different and the RSC may wish to amplify current schemes such as its *Emerging Technologies Competition*, *Outreach Fund* and *Researcher Mobility Grants*. There was little support for challenge-based large cash prizes, but several consultees referred to prospective prizes such as the Royal Society *Rosalind Franklin Award*.

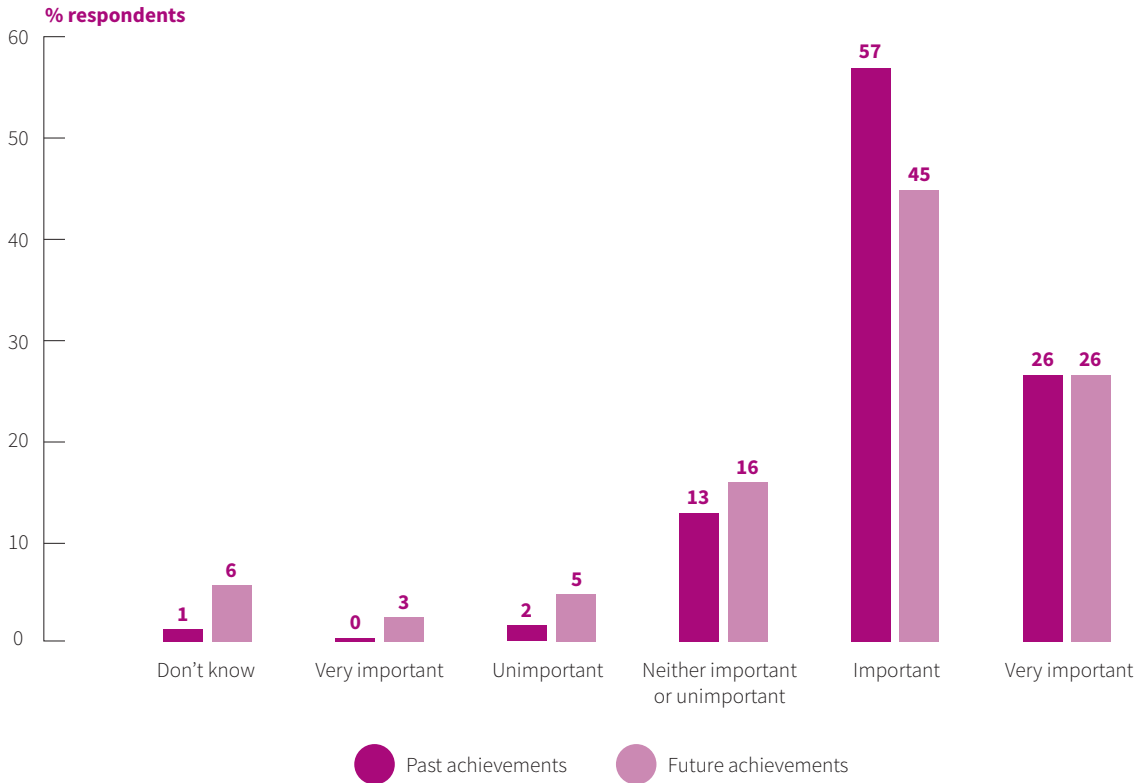


Figure 13: Source: RSC Review of Recognition Programmes Survey, 2018. Survey questions: How important or unimportant are prizes and awards that recognise past achievements; How important or unimportant are prizes and awards that recognise future achievements? Data shown from all who responded to the question (N = 1823).

Celebration and publicity

Celebration events

There was a strong theme through the consultation that the RSC should use recognition and its celebration of winners as a way of raising the visibility for chemistry within science and with wider audiences.

There was an understanding that it would not be pragmatic to present the large number of RSC prizes and awards at a single event. The Review also heard an assertion that receiving a prize publicly at a large event with a general audience is not necessarily meaningful or important to all winners.

The Review heard various suggestions for different and important purposes and audiences for celebration events:

- Celebrating the chemical sciences within the chemical sciences community, inspiring, highlighting achievements and role-models
- Enabling winners to showcase their work to one another and to network with other winners
- Celebrating and promoting the chemical sciences to society
- Encouraging school students to study chemistry
- Supporting teachers in their continuing professional development

Once the RSC is clear on the purpose and audiences for each prize or award, there are many aspects to consider in developing celebratory events, such as:

- Options for physical and virtual celebrations
- The selection of winners participating in different types of celebrations and communicating the rationale for different types of celebrations
- Accessibility and exclusivity of events e.g. in terms of time of day, formality, venue, size and location

- Guest list for events from the point of view of inclusion and diversity within and beyond the chemical sciences community
- Use of traditional and social media
- Use of different RSC channels
- Developing case studies and follow-on stories about winners to support inclusion and diversity, highlight role models and ambassadors or to share the achievements of winners within and beyond the chemistry community
- Ensuring events are designed in a way that is mindful of inclusion and diversity, both from the point of view of audiences and of the winners that are presented with their prize or award
- Public events and live-streaming to raise the profile of both the winners and their achievements
- Hosting lectures by selected winners at prestigious venues to showcase their work
- Hosting events in schools

Ambassadors and role models

Winners described how winning an RSC prize can have the positive effect of helping them assume the role of ambassadors or role models for the chemical sciences, even though currently this is not something that is explicitly sought by the RSC. Highlighting role models was mentioned particularly in the context of supporting diversity, although with the caveat that this should not result in additional time commitments being expected of individuals from under-represented groups relative to other prize winners.

There was a general view that becoming an ambassador for chemistry and the RSC applies particularly to established career prize winners.

“The Division Council felt that the lecture tours and media promotion associated with the RSC’s prizes and awards were very positive, and suggested that the lectures could be delivered in other faculties and not solely chemistry departments.”

Review of RSC Recognition Programmes workshop – RSC Division Council minutes

“I do like to think I have done a lot. I have always helped the RSC. I have gone into schools, done outreach. I am more of an ambassador than a role model. I am passionate about science and I feel I want to promote it.”

Review of RSC Recognition Programmes interview

“Being a winner gave me a sense of achievement and the motivation and opportunity to become a role model.”

Review of RSC Recognition Programmes survey response

How should the RSC organise its recognition programmes?

Nominations

Figure 14 shows the results of the survey on the question of barriers to being nominated.

The Review heard that removing some of these barriers may involve raising awareness of and confidence in aspects of the nomination and judging process rather than changing the process itself. A specific example is the identity of nominators. Following guidance from its Awards Working Group, the RSC has for several years had a strict policy that the identity of nominators is not shared with any members of its judging panels, including panel chairs. The Review heard however a widespread perception that the identity of nominators is important. This can deter individuals who do not have networks or supporters who they think, or are advised, are “suitably senior” nominators.

Another example, specific to academia, is the role of departments. Nominations for RSC prizes and awards are formally made by individuals. In practice, many departments decide who they wish to be nominated. It is important for everyone to be clear that any individual can be nominated by any RSC member and that the nomination does not require agreement from their employer.

The review heard widespread support for the decision by the RSC to track and publish the gender diversity statistics for nominees and winners of its prizes and awards.¹⁹ This has facilitated discussion about the importance of the diversity of the nominee pool.

There was almost universal agreement that there is an issue regarding diversity of winners and that a key factor in changing this is the diversity of the people nominated. However, views differed on the aspects of diversity in the nominations that are most important in the context of prizes and awards and on how to change the demographics of nominee lists.

There were divergent views on the question of quotas applied to all prizes and awards. Some people think that

the RSC should apply a baseline gender quota to all awards, below which an award does not run in a given year. Even if inconvenient, uncomfortable or unpopular with some people, this approach would trigger an intervention and enable an understanding of and decision about diversity in the context of that award; for example, deciding to proactively canvass nominations or that the scope of the award is too narrow. Another view is that it is important to understand and accept that the demographics of the potential nominee pool for different prizes will vary and therefore to consider each one separately. This may be the case, for example, for established or late career awards. From a pragmatic point of view, quotas may be challenging to implement because diversity data is provided on a voluntary basis by nominees and therefore the RSC does not know the actual gender distribution of nominees.

Another perspective is that focussing solely on increasing the proportion of people from under-represented groups in a nominee pool is not enough and in fact, if pursued in isolation, can lead to tokenism or disappointment as people are nominated “just to fill quotas on nominee lists”.

Prizes are by definition competitive and winners are selected by panels who are judging against specified criteria. Therefore, in the absence of conscious or unconscious bias, in order to win any nominee will be competing against other people on an equal basis according to those criteria. It will also serve any nominee well if their nominator addresses the criteria and any other guidance associated with the prize.

The review also heard that where there has been an under-representation of certain groups in winner lists relative to the associated demographics in the nominee pool, the RSC may expect to see an over-representation of those groups in the nominee and winner pool for some time as there will be a backlog of previously-unrecognised excellence.

19 2019 RSC Prizes & Awards Gender Diversity: www.rsc.org/globalassets/07-news-events/rsc-news/news-articles/2019/04-april/prizes-and-awards-2019/inclusion-and-diversity-data-prizes-and-awards-2019.pdf

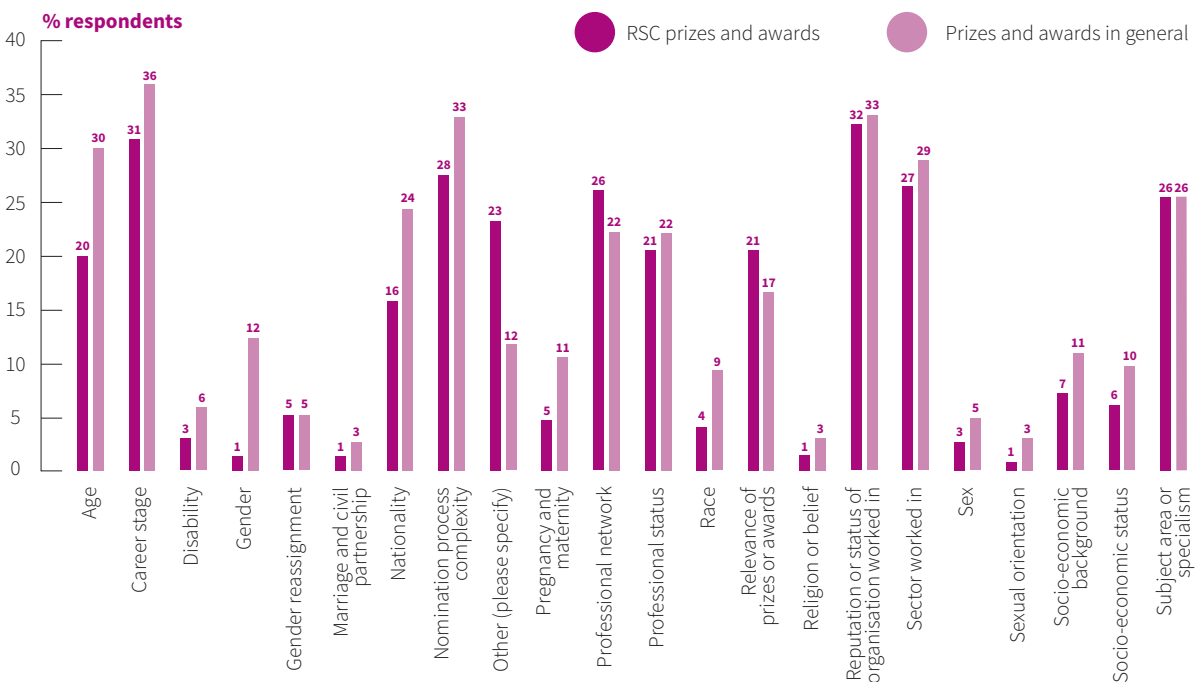


Figure 14: Source: RSC Review of Recognition Programmes Survey, 2018. Survey questions: In your experience, are there any barriers to being nominated for RSC prizes and awards (asked of those familiar with RSC prizes and awards, N = 871); In your experience, are there any barriers to being nominated for prizes and awards in general (asked of those unfamiliar with RSC prizes and awards, N = 508)? Survey respondents were asked to select all that apply.

The review also heard mixed views on the idea of self-nomination, currently not allowed by the RSC. There are some views in favour of introducing self-nomination in combination with the policy of not sharing the nominator's identity with judging panels. This could provide a nomination route for people who do not know any RSC members who they feel they could approach and ask to nominate them, which can be an issue for foreign nationals who have recently moved to the UK and for individuals based in environments where there are few RSC members.

There was also a sense that self-nomination may be a way of addressing the issue, often associated with under-represented groups but also dependent on personality and environment, that some people are reluctant to approach someone to ask them to write a nomination. The Review heard, however, the counterargument that individuals who are reluctant to ask to be nominated are even less likely to nominate themselves or to prepare a nomination that confidently evidences their excellence. There was also a concern that allowing self-nomination may have the unintended consequence of increasing the number of nominations of individuals who need no encouragement to put themselves forward.

There was more convergence on the question of self-nomination for prizes for teams. There was a sense that, much like short-lists, the collective nature of the nomination changes the dynamic and may make self-nomination the most appropriate nomination mode for some team prizes.

One suggestion, as a way of addressing the related issues of lack of access to potential nominators and of reticence in proactively seeking nomination for individual prizes, is to raise awareness among managers, and in particular heads of department in universities, about techniques to consider all potential nominees in their unit. These can include developing mechanisms to review all CVs annually, expand the pool of people within departments who are willing to make nominations and provide support for individuals who are preparing a nomination for the first time.

There was also a sense that it is the responsibility of the community, individually and collectively, to be proactive in broadening the pool of both nominators and nominees. Division councils have an important role to play in encouraging and supporting nominations, although there needs to be a very strict separation, in reality and in perception, between canvassing and judging. RSC interest groups, local sections and industry representatives could all play a role in raising awareness about the opportunity to nominate and in encouraging and supporting nominations.

References are currently requested for early and mid-career awards, and the identity of the referee is shared with judging panels. There are some concerns that this works against people who do not have a network, in particular when there is a perception that the seniority or status of the referee is important.

In recent discussions, judging panels have taken the view that references are important and also beneficial for nominees, especially for early career researchers where their specific contribution to a body of work may not be clear from their publication record or nomination. This is particularly important for early career researchers who have always worked collaboratively. The value of a reference letter is the referee's ability to comment in detail on the specific contributions made by an individual. This means that the identity of the referee may be evident anyway as the nominee will, for example, have worked as a postdoctoral researcher in their lab.

Putting the range of views on referees together suggests that the RSC should clarify the purpose of reference letters and make clear that it is the content and authenticity of the reference that are important in supporting a nominee.

For most of the RSC prizes and awards, nominators use an online system to submit a one-page nomination letter and a one-page CV.

The survey indicated that, particularly in education and industry, the nominations process is a barrier to nominations. In interviews, workshops and roundtable discussions, some people expressed the view that the nominations process is complex and time-consuming. Some people consider that simplifying and streamlining the process may improve accessibility and increase the diversity of nominations.

The review heard that there may be opportunities for standardisation, for example moving to a standard nomination form with signposting to relevant rubrics and criteria for each section. This could reduce the time taken to make nominations, ensure that the information provided is the same for everyone and that it addresses the criteria.

There was also some resistance to the idea of standardisation and a sense that it may in fact take more time because nominators could not "recycle" letters and CVs used for other purposes.

Smaller nomination packs would also reduce the time required for judges to review the nominations, although it is important for nominees that judges have sufficient information to meaningfully form a judgement against criteria.

There is room for the RSC to provide more guidance on writing nominations. In some cases, this guidance is in fact available but there may be ways of making it more prominent to ensure that all nominators read it.

One option, used by some organisations, is that the RSC could rollover nominations for up to three years, with an opportunity each year for nominators to update their nomination. In addition to reducing the time associated with making nominations, this could also ensure that individuals remain on the nominee list and are not deterred or disheartened if they do not win the first time.

“Not passing on the name of the nominator to awards committees was a positive development.”

Review of RSC Recognition Programmes workshop – RSC Division Council

“On self-nomination – the plus side is that it may mean that someone who doesn’t want to ask to be nominated may feel they can nominate themselves.”

Review of RSC Recognition Programmes workshop – RSC Division Council

“I wouldn’t allow self-nomination or nomination from a home institution.”

Review of RSC Recognition Programmes survey response

“It is not just up to the departments to encourage more nominations, the community should take responsibility.”

Review of RSC Recognition Programmes interview

“Judges will not be immune to the power of additional letters after a name, as much as we would like them to be so. This definitely adds to the exclusive nature of an awards process and we have seen proof that it will mean that the best person for the job is not writing the reference as they are not seen as being important enough. It also creates the horrible situation where it is who you know rather than what you do, which will disproportionately impact those that are already struggling in the system.”

Review of RSC Recognition Programmes interview

“Some nominators could benefit from more guidance in writing their nomination, and the nomination form itself could be more directive.”

Review of RSC Recognition Programmes workshop – RSC Division Council

“I have looked at the application/nomination process for several awards and it is far too long and complex for anyone who is busy or lacks close professional friends to support it to bother with.”

Review of RSC Recognition Programmes survey response

Judging

The review heard that judging and eligibility criteria should be clear, transparent and relevant to the domain and type of excellence being recognised. In particular, the RSC should continue to its work to ensure criteria are relevant for awards aiming to recognise people working in education and industry, and in a range of different roles.

There was a strong view that criteria should not be based on metrics.

Eligibility criteria for career-stage related prizes should provide clear guidance regarding career breaks and non-traditional career paths, encouraging and normalising nominations from individuals with diverse career trajectories.

The review heard some concerns about judging panels in connection with diversity. Some people expressed the view that the composition of judging panels should prioritise diversity, others that it should prioritise expertise in the area of excellence being judged, and others that panels should balance both insofar as is practical or possible.

There was also a concern that prioritising diversity on judging panels may make the pool of individuals from under-represented groups eligible to nominate or be nominated even smaller because panel members can neither make nominations nor be nominated for awards. Furthermore, such individuals are frequently under more pressure than others to participate in appointment or grant committees and similar activities in other arenas.

While the review found no evidence of bias, nepotism or impropriety in judging, there is room for the RSC to set out its judging process more clearly in the interests of accessibility and transparency. For example, it would be valuable to describe in one place who is eligible and ineligible to nominate and be nominated, what the process is for judges to declare conflict of interest, and the process for reviewing and discussing nominations.

It is important to have clear criteria combined with expert judgement. The consultation found that some people favour judging based solely on scoring, voting or ranking, without any discussion, on the grounds that this may reduce actual or perceived bias in judging.

On balance, the view was however that the benefits of having a panel discussion outweigh and may even reduce the impact of any potential biases which should anyway be reduced insofar as possible, for example through unconscious bias training and independent observers. So it is preferable to have a judging panel and for the panel to meet and discuss, rather than to have simply voting or scoring.

It is also valuable to have a balance of continuity and rotation in panel membership so that good practice and lessons are passed on as new people join.

Ultimately it is important to trust in the integrity of judging panels, to appreciate that all panel members are giving their time to serve the RSC, and to understand that there is no “right decision” but rather the best decision a group can make based on their expertise, experience and judgement.

“Reduce the focus on numbers, focus on impact.”

Review of RSC Recognition Programmes interview

“Aim for diversity in the selection panels and you may get diversity in selection...

Instead of the RSC’s usual complement of old men!”

Review of RSC Recognition Programmes survey response

5

Recommendations and summary

Recommendations

The recommendations should be viewed as a whole, working in concert with one another and with the *Principles of Recognition* in Section 2. For example, it is important to begin with a clear understanding of the purpose of recognition, the recipients of recognition and the target audiences for the celebration of winners. This understanding will enable informed and deliberate decisions about the most effective recognition mechanisms

in a particular area and the most meaningful ways in which to celebrate winners.

The Review Group aimed to make recommendations that are sufficiently specific to enable the RSC to take action based on them. Implementing certain recommendations will need the RSC to consider multiple options, dependencies and perspectives, while some recommendations have financial or legal implications.

Framework Recommendations

These strategic recommendations underpin the recommendations for action that follow:

- Recommendation F1:** The RSC should clarify the purpose or purposes of its recognition portfolio and of each of the elements within it.
-
- Recommendation F2:** The RSC should clarify the audiences it aims to reach through its recognition activities.
-
- Recommendation F3:** The RSC should embed the *Principles of Recognition* in the design and implementation of its entire recognition portfolio.
-
- Recommendation F4:** The balance across the domains and types of excellence that the RSC recognises through its recognition mechanisms, viewed as a whole, should be deliberate.
-

Through consultation, literature review and discussion, the Review identified several reasons *why* organisations have recognition, summarised in Table 1. Although any prize may satisfy multiple purposes, F1 and F2 suggest that achieving clarity on the *primary purpose* of each recognition activity will enable strategic decision-making about all aspects of the recognition portfolio, from choosing a recognition mechanism to seeking nominations to celebrating winners.

About 70% of the current RSC prize and award portfolio consists of retrospective prizes for individuals for academic research, often in specific research sub-fields. This portfolio is too narrow and restrictive, a view supported by the consultations, where we heard many views about *what* the RSC should recognise.

The review recommends in F4 that the RSC should name and recognise the diverse domains, and the different types of excellence within and across them, that the RSC believes

are important for science and its translation into societal benefit. The review took “science” to refer to the range of scientific activities encompassed within the RSC mission, including education, research, innovation and engagement.

In broadening its recognition portfolio the RSC can constructively contribute to reshaping perceptions about status and prestige by confidently asserting its own values and understanding of the achievements and contributions that matter for science.

It is important to think beyond a “one size fits all” approach. There is an opportunity to design a diverse portfolio of recognition mechanisms and celebratory activities that achieves a range of purposes and has meaning for the individuals and communities being recognised. Rather than adding new thinking to an old model, there is an opportunity to incorporate the valued and valuable parts of the current model into a new mould.

Recommendations for action

Recommendation 1: the RSC should deliberately intensify its efforts to ensure that its recognition reflects the diversity of people and contributions in science.

Reaching a point where recognition accurately reflects the diversity of people and contributions to science will require a sustained effort and a holistic approach. Diversity cannot be considered in isolation as a single issue that one set of isolated measures will address. The recommendations aim together to make prizes more relevant and significant for everyone and for science and society as a whole, and throughout this report we signpost ways in which Recommendations 2 to 16 will also work in favour of the many facets of diversity.

Recommendation 1 focusses on the observation that increasing the diversity of nominations is a necessary condition for increasing the diversity of the winners of that prize. It is important that nominee pools reflect the diversity in an area that is being recognised and that the excellence of nominees is evidenced to judging panels. The RSC should:

- Develop mechanisms to encourage people making nominations for the first time as a way of expanding the pool of people making nominations, ensuring they are supported in preparing a nomination if needed.
- Consider creating minimum diversity thresholds in nominee and nominator pools, triggering an intervention in the event that that minimum is not reached.
- Continue to encourage and normalise non-traditional career paths, for example in the language associated with calls for nominations, in eligibility criteria and by highlighting role models.
- Proactively engage with heads of university chemistry and other departments, as well as institutes and companies, in an effort to increase nominations of under-represented groups.
- Endeavour to broaden its recognition to a wider range of higher education institutions; in the UK, particularly beyond Russell Group institutions.
- Continue to recognise those working to encourage and promote greater inclusion and diversity.

The review also makes a number of operational recommendations, in some cases building on processes already in place, around areas such as unconscious bias training for judging panels and monitoring and sharing of information on equality and diversity.

The review concluded that, on balance, there is *not* a strong case for the RSC to create awards, such as “women-only” awards, specifically for groups with protected characteristics.

Recommendation 15 sets out further more detailed recommendations on nominations.

Recommendation 2: the RSC should increase its recognition of teams and collaborations.

Collaboration and teams are integral to most areas of scientific activity – across education, engagement, innovation and research. Traditionally the focus for

recognition, and prizes in particular, has been on individuals. In academic research there are concerns that this focus on individual recognition is one of several influences negatively impacting research culture. The increasingly multidisciplinary and cross-domain nature of research, innovation and education mean that advances in those domains are more often than not a collective effort.

The RSC should continue to recognise individuals, and there are important purposes achieved by such recognition, but it should give significantly greater emphasis to teams and collaboration. It should:

- Increase its recognition of teams as a core component of its recognition programme across all domains.
- Recognise specific projects, initiatives and breakthroughs, made by either an individual, collaboration or a team.
- Ensure where possible and appropriate that recognition of teams includes scope to recognise team members at all career stages and in diverse roles.
- Ensure that individuals whose contribution to science is through collaboration are not at a disadvantage in terms of opportunities for recognition.
- Consider recognising departments or employers, especially in the case of schools and small companies.

Recommendation 3: the RSC should establish a programme to recognise leadership in science that spans different domains and is accessible to people at different career stages.

The review recommends that the RSC should name and recognise excellence in leadership in science. There is an opportunity for the RSC to use recognition as a positive incentive, articulating its own values, its narrative about what leadership in science looks like and why it is important.

The recognition and celebration mechanisms will likely differ from traditional prizes and should aim to showcase different types of leadership, demonstrated at different career stages and in different domains. For example: initiating and sustaining transformation with, for and through others; building enduring interdisciplinary, cross-sector or international partnerships and structures; successfully championing emerging areas of importance; achieving change on the ground or beyond a person’s direct area of responsibility or benefit.

Recommendation 4: the RSC should require that winners comply with its professional code of conduct.

The RSC should reserve the right to rescind recognition if it is confirmed that a winner has violated its professional code of conduct. The Review Group understands that this recommendation will be challenging to implement. Nevertheless, this is an important step in light of Principle 9 (that recognition is associated with certain duties or expectations for recipients) and the findings about the *purpose of recognition*, which point to the visible position of prize winners as role models and as ambassadors for science, as well as the benefits that accrue to winners in terms of career progression and esteem.

A first step could be that the RSC asks nominators to declare that to the best of their knowledge there is no confirmed or potential impediment to their nominee winning from the point of view of that individual's professional standing. Winners could be asked a similar question. There may be opportunities for the RSC to work in partnership with other scientific organisations in this area. For example, the American Geophysical Union has introduced self-reporting requirements for recipients of AGU awards.²⁰

Recommendation 5: the RSC should increase its recognition of education in schools and colleges.

The RSC should increase and tailor recognition of teaching in schools and colleges to effectively recognise excellence, taking into consideration views and suggestions gathered during the consultation. The review sets out a number of suggested approaches for the RSC's recognition of teaching in schools from recognising and badging supportive departments through to awards to enable teachers to have more time to spend on professional development or projects. The RSC should be mindful in developing these suggestions that individuals might consider themselves to be teachers first and chemists or scientists second.

Recommendation 6: the RSC should increase its recognition of education in higher education providers.

The RSC should increase and tailor recognition of education and educational research in higher education. The review sets out a number of suggested approaches for the RSC's recognition of teaching in higher education, including recognition for people at different career stages and in different roles, including teaching fellows, and recognition of leadership. Progressing and developing the suggestions for recognition in higher education, the RSC should be mindful that, as in other areas, relevant mechanisms might go beyond traditional prizes and will include both individuals and teams.

Recommendation 7: the RSC should increase its recognition of science engagement, particularly outreach.

The RSC should name and recognise excellence in outreach and communication as a distinct domain that is important for science and society. By encouraging outreach the RSC can create ambassadors for chemistry, ensure that exciting areas of scientific research and innovation are shared with citizens, and inspire the next generation of people to develop STEM skills that will be vital in ensuring economic prosperity and solving global challenges. The RSC should tailor mechanisms to recognise excellence in outreach, taking into consideration views and suggestions gathered during the consultation. The RSC should consider that impactful and meaningful recognition of outreach might not be simply a medal but alternatives such as raising the profile of recipients of its substantial *Outreach Fund* grants, or recognition mechanisms where the prize involves public engagement opportunities, networking or mentoring.

Recommendation 8: the RSC should review its recognition of innovation.

Recognition of technological innovation should include opportunities for both academia and industry. The RSC should develop its mechanisms to recognise innovation building on views and suggestions gathered during the consultation. The RSC should consider opportunities to connect and amplify existing schemes, such as its individual and team awards and its *Emerging Technologies Competition*. It should also note some differences in perception around what constitutes applied research among academic and industrial researchers, and the spectrum of activities from initial translation of a research result beyond the original lab through to a commercially successful product or process.

Recommendation 9: the RSC should review its individual prizes and awards for research in light of Principle 10 (it is critical to recognise contemporary and emerging science in addition to past achievements).

The RSC should review its current portfolio to ensure that it provides sufficient opportunity for recognising contemporary and emerging science, as well as established science. The RSC should provide more recognition for aspects of research not clearly reflected in its current portfolio, especially emerging areas and those that lie at or across the interfaces between disciplines. To avoid proliferation of prizes, rather than having a prize or award for every sub-field, an effective approach would be to have prizes with broader scope thereby creating space for an evolving range of sub-fields within that scope.

In the survey *significant breakthroughs* was suggested as the number one outcome meritorious of recognition by the RSC. Considering also F1 and F2, and Recommendation 2, the RSC should review the extent to which its current portfolio recognises "game-changing" ideas and research that opens up new directions, having an influence beyond that of the original researcher or group.

Recommendation 10: the RSC should ensure its recognition supports scientists at all career stages.

The review recommends that the RSC, having moved away from age-based criteria, should continue to use definitions of career stage based on experience and to monitor the effectiveness and any unintended consequences of these definitions. The RSC should ensure that it provides recognition opportunities for early career chemists in areas beyond academic research.

Given that individuals may flourish at different points in their careers, the RSC should proactively signal that a record of accomplishment of winning early or mid-career prizes from the RSC or other organisations is not a requirement to be in contention for mid or late career prizes respectively. This relates also to Recommendation 1 regarding encouraging and normalising non-traditional career paths.

The RSC should expand its recognition opportunities for people at the mid-career stage, which we suggest should be characterised typically by a 10-year window. Minimum ages should be retained for prizes and awards dedicated to the recognition of very late or established career stages and it is preferable that these awards recognise recent work rather than lifetime achievement.

Recommendation 11: in line with Principle 8, future recognition by the RSC should respect the history of the current RSC prizes and awards, but the structure of the recognition portfolio should be rationalised and clearly articulated.

The review has identified a number of recommendations relating to the size, structural clarity and naming of prizes of the portfolio.

- The RSC should reduce the size of its recognition portfolio.
- The RSC should clarify its recognition portfolio structure.
- Hierarchy of different types within the RSC recognition portfolio should be deliberate and the rationale for it clearly communicated.
- The names of prizes should specify the domain and type of excellence they seek to recognise.
- The RSC should generally retain eponymous naming of prizes and awards where the existing prize or award is part of the history and heritage of chemistry. If eponymous naming is continued for new prizes and awards, the RSC should seek to name prizes and awards in a way that reflects diversity. When prizes are named after an individual it is preferable to include the person's forename and surname. It may be useful to do eponymous naming or renaming of prizes in batches rather than one at a time.

Recommendation 12: recognition mechanisms should be tailored to be most effective for different domains and types of excellence and in line with the identified purpose.

The RSC should continue to award competitive retrospective prizes, which currently constitute the bulk of its recognition portfolio, but should also think more creatively and consider, in line with F1 and F2, a broader range of recognition mechanisms such as prospective prizes and grants, cohort recognition and highlight lists. The RSC should continue to arrange lecture tours for winners where that aligns with the purpose of the prize, but provide flexibility to ensure this requirement is not a barrier to nomination. The RSC should ensure that UK and international winners visit a diverse range of institutions, meet with diverse audiences including early career chemists and that hosting institutions receive appropriate guidance regarding expectations for hosting a winner.

Recommendation 13: the RSC should develop its celebration and publicity activities in a strategic way that is linked to its purpose(s) and audience(s) for recognition.

The RSC should overall aim for significantly higher visibility for chemistry by using its recognition celebrations to raise the profile of chemistry with audiences beyond the chemistry community, for example policymakers and the public.

The review recommends that the choice of celebration and publicity activities should be deliberate and reflect the

purposes, audiences and principles for recognition, as well as the domains and types of excellence being recognised. It is not practical to award all winners at a single event because of the number of prizes currently given by the RSC each year. Moreover, receiving a prize at a large event with a general audience may not be attractive for all recipients, and the RSC should be mindful that presenting prizes to winners in certain ways can create a sense of exclusivity and disappointment. It is therefore important that the RSC deliberately decides and communicates the rationale for different presentation and celebration occasions.

Recommendation 14: the RSC should continue to strengthen the governance of and guidance about its recognition portfolio to ensure appropriate oversight and consistency.

The RSC should separate judging from oversight of evolution of the portfolio, but ensure that expert insight from judging panels is passed to any oversight group. The oversight group must be outward looking while considering the multiple perspectives of the RSC membership. Adopting a strategic perspective, the remit of the group must derive from and reflect the mission of the RSC to advance the chemical sciences for the benefit of science and humanity. The RSC should annually review its recognition mechanisms, to ensure they are consistent with current RSC best practice in equality & diversity, nominations and judging. The RSC should also provide its interest groups and journals with guidance on equality & diversity, nominations and judging to ensure their recognition mechanisms meet RSC standards of good practice.

Recommendation 15: the RSC should continue to step up its efforts to increase the diversity of nominations received.

In addition to Recommendation 1, the Review identified a number of more specific recommendations aimed at increasing the diversity of nominations. These include: the development of mechanisms to canvass nominations of people from under-represented groups in situations where there has been concern about the diversity of the nominee pool, the introduction of self-nomination for team awards, simplification and standardisation of the nomination process and allowing roll-over of nominations.

Recommendation 16: the RSC should continue its work to review and evolve judging processes.

The review makes a number of recommendations in relation to the judging process because it is crucial to have the best possible practices and procedures in place if prizes are to achieve their purpose. These are detailed in Section 4. These cover specific areas such as the evidencing and judging of excellence, the relevance of criteria to different domains, the diversity, expertise and integrity of judging panels and the nature of the support and guidance provided to them.

20 eos.org/agu-news/agu-revises-its-integrity-and-ethics-policy

Conclusion

There are significant imperatives and opportunities for the RSC to evolve its portfolio so that it reflects the achievements and contributions that are important for science today and in the future. This conclusion needs to be taken together with a confidence that the RSC should keep the valued and well-tested aspects of its current portfolio and an awareness that many of the issues related to RSC prizes and awards apply to science prizes in general.

RSC prizes matter to the individuals and teams who receive them, to the wider community and for science itself. The RSC prize portfolio has evolved organically over a period of 150 years. Many people with good intentions have been involved, influenced by society and the scientific environment at the time each prize was created. There have sometimes been other considerations such as the wishes of families and communities developing prizes to commemorate an individual and their work.

Recognition, and more specifically prizes, is itself a complex subject. Prizes can be associated with intended objectives and unintended consequences, both positive and negative. The importance, meaning and emotions associated with recognition vary by individual and community, depending on motivations, culture, priorities and preferences. Prizes can deliberately or unintentionally be linked to status and hierarchy, both of which can be quantifiable, intangible or perceived.

There is an exciting opportunity to see the evolution of the RSC recognition portfolio as a contribution to ensuring that recognition reflects, celebrates and incentivises the positive practice of science today and in the future. If the RSC continues with the status quo there is a risk that its prizes will be increasingly irrelevant and ineffective, or worse, reinforce and perpetuate assumptions and behaviours that have a negative impact on science.

The review suggests that if a scientific organisation were to start with a blank slate, a crucial first step in thinking about establishing a recognition portfolio should be to make decisions about the purposes of its recognition activities and the audiences within and beyond its own discipline.

A next step is to decide who and/or what the organisation wants to recognise in order to achieve each purpose and/or reach each audience. The Review offers a set of potential *Purposes of Recognition* in science and a *dimensions of excellence* framework (Figure 1) in Section 2, along with a set of *Principles of Recognition* to underpin all thinking.

There is a subsequent set of decisions about how to most effectively implement a recognition portfolio. This includes decisions about what the most effective recognition mechanisms are, considering different purposes and audiences as well as what is meaningful for the communities and individuals being recognised. There are also operational considerations about how to deliver, evaluate and review recognition activities.

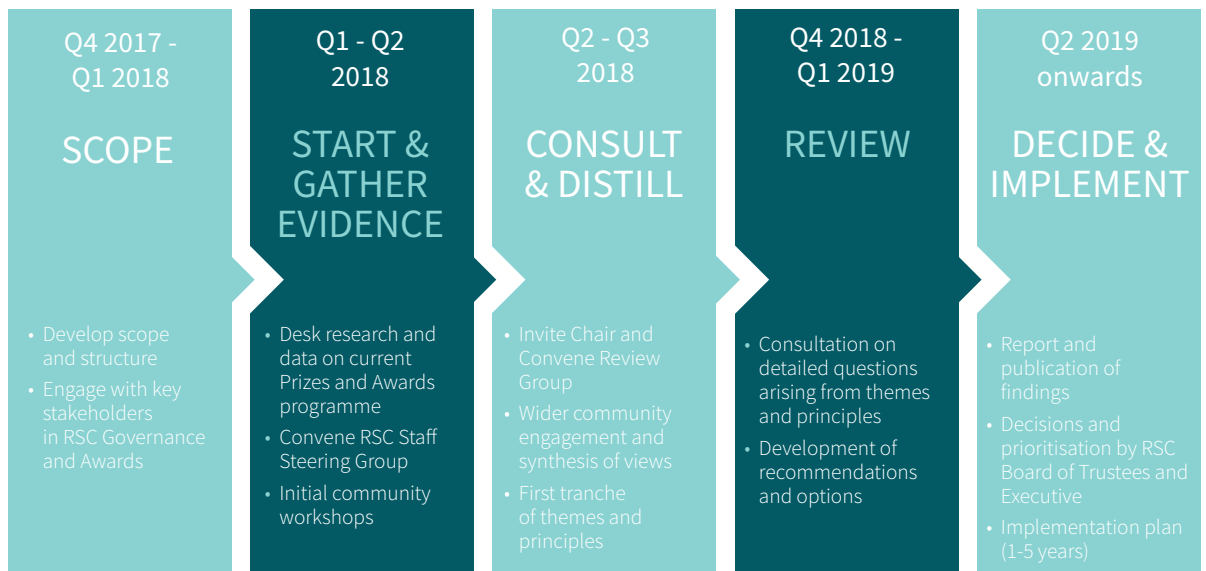
This sequence of considering why, what/who and how to recognise is summarised in Figure 2 and in the *Framework Recommendations*.

The RSC is of course not starting with a blank slate, and the Review heard strong support for many aspects of the current RSC prizes. This included pride, a sense of lineage and place in the history of chemistry associated with some prizes or awards. There was also an awareness of the extent to which RSC members and staff have endeavoured to develop and uphold high standards of judging and transparency.

In its *Recommendations for action* the review intends to achieve a balance between what might be theoretically ideal and what is, with commitment and ambition, achievable. The Review has deliberately stayed away from detailed recommendations about specific prizes within the current portfolio as there are many ways in which the RSC might set itself on the path proposed in the *Framework Recommendations* and *Recommendations for action*.

The Review Group wishes RSC members, staff and wider community every success in evolving the RSC recognition portfolio and is optimistic that in doing so, the RSC will develop solutions and share learning that will be positive for chemistry, for science and for society.

Figure 15: Timeline for Review of RSC Recognition Programmes



Scope

The scope was based on: (i) feedback from the community – including judges, nominators, winners and staff; (ii) guidance from senior members of RSC Governance and Awards Working Group and (iii) observations about changes in the scientific environment and in recognition.

Methodology

The review was informed by three categories of input:

- Views obtained through a combination of workshops, round-table discussions, interviews, a survey and direct feedback from the community
- Literature and information from comparator organisations
- Data and insights from the 2014 – 2018 RSC prizes and awards programme

The six-stage methodology (Figure 16) incorporated an expansive phase of consultation and feedback, then consolidation through analysis and synthesis, followed by discussion to develop final recommendations.

Professor Sanders met with members of RSC staff several times before, between and after Review Group meetings to discuss the Review methodology, structure and consultation findings, and to oversee the preparation of this report.

The Review Group was supported by an RSC Staff Steering Group drawn from teams at the RSC that are linked with prizes, awards and other recognition mechanisms. Steering Group members were: Dr Aurora Antemir (Industry Manager), Dr Deirdre Black (Head of Research & Innovation, Project Leader), Janet Dean (General Manager, Journals Operations), Sheena Elliott (Manager, Member Communities), Dr Carole Hardick (Programme Manager Awards Review, Project Manager), Maria Huber (Head of Financial Planning and Analysis), Dr Sandra Macaskill (Senior Programme Manager, Science Programmes), Nicole Morgan (Education Policy Manager), Dr Laura Norton (Senior Programme Manager, Inclusion & Diversity), Rebecca Quine (Events & Exhibitions Manager).

Dr Carole Hardick, Programme Manager Awards Review, managed the Review project, working with Matt Cude, Senior Insights Executive, on survey design and data analysis. The report was written by Carole Hardick, Deirdre Black and Andrew Jeskins (Awards Programme Officer).

1. Scope and develop theme cluster framework

- Literature review
- Data from current RSC Prizes & Awards
- Workshops with RSC Awards Working Group and RSC Science Education & Industry Board

2. Expand theme clusters

- Workshops with RSC divisions and Inclusion and Diversity Committee
- Initial interviews

3. Define purpose and overarching principles

- Review Group discussion of initial findings and themes
- Agree purpose and overarching principles

4. Expand evidence

- Expand evidence through detailed qualitative and quantitative feedback from interviews and survey

5. Analysis and synthesis to formulate draft recommendations

- Draft recommendations discussed and refined by Review Group

6. Develop final recommendations and options

- Final recommendations reviewed and agreed by Review Group

Extensive communication and consultation with members of the RSC community formed a major part of the review, summarised as follows:

- Workshop with Science, Education and Industry Board (Jun 2018)
- Workshop with Awards Working Group (Jul 2018)
- Email to interest group chairs seeking feedback (Sept 2018)
- Roundtable discussion with Inclusion & Diversity Committee (Oct 2018)
- Roundtable discussions with RSC division councils (Oct 2018)
- Workshop with Education Division Council (Oct 2018)
- Telephone and in-person interviews (Aug – Dec 2018)
- Teleconference with regional education co-ordinators (Nov 2018)
- Dedicated mailbox for feedback or views in confidence
- Member Communities Board meeting (Nov 2018)
- Member Networks Conference (Oct 2018)

- Survey conducted via targeted emails and promoted widely through coverage in *Chemistry World*, *Grapevine* and through *Twitter* and *LinkedIn* (Oct/Nov 2018)
- Coverage in *Voice* and *Chemistry World* and via *Education in Chemistry* website (Oct/Nov 2018).

The following figures summarise the demographics of the different consultation stakeholder groups. Workshops and roundtable discussions provided insights from groups with specific interest and expertise in areas of research, innovation, education, prize judging and inclusion and diversity. Approximately one-fifth of all workshop and roundtable participants were employed by companies; the remainder work in schools and colleges, universities and research institutions.

Interviews provided detailed experience-based views from individuals in key stakeholder groups, including RSC division council presidents, previous winners and interest group representatives. The survey (N=2130) provided structured and free text perspectives from members and non-members from a wide range of geographies and included winners (N=136) and RSC interest group members (N=344).

Figure 17: Participant breakdown by group for workshops and roundtable discussions. Some participants took part in more than one workshop but are only counted once, according to where they first participated (chronologically: Science, Education and Innovation Board; Awards Working Group; division councils; Inclusion and Diversity Committee).

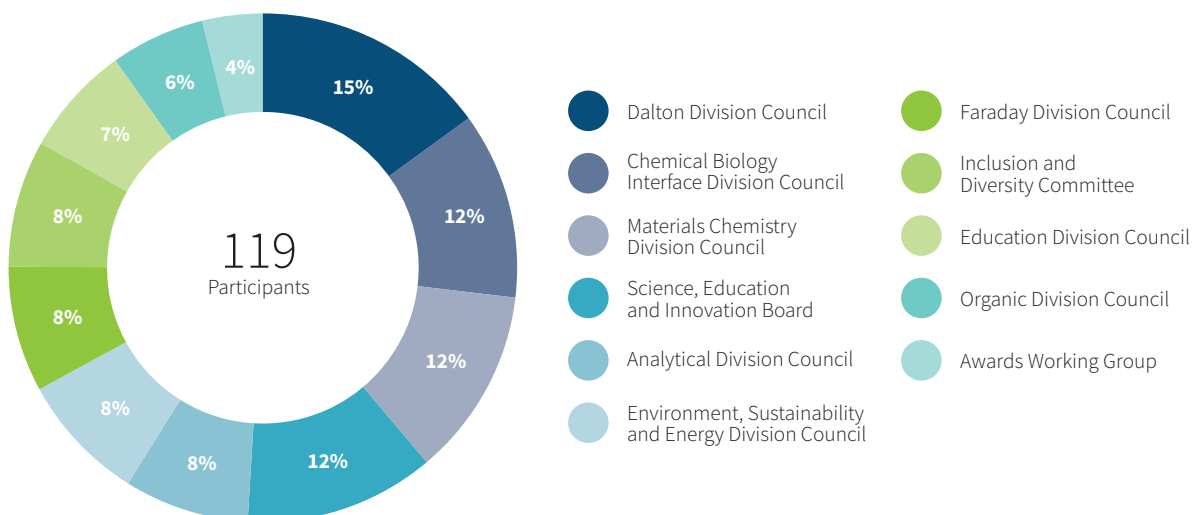
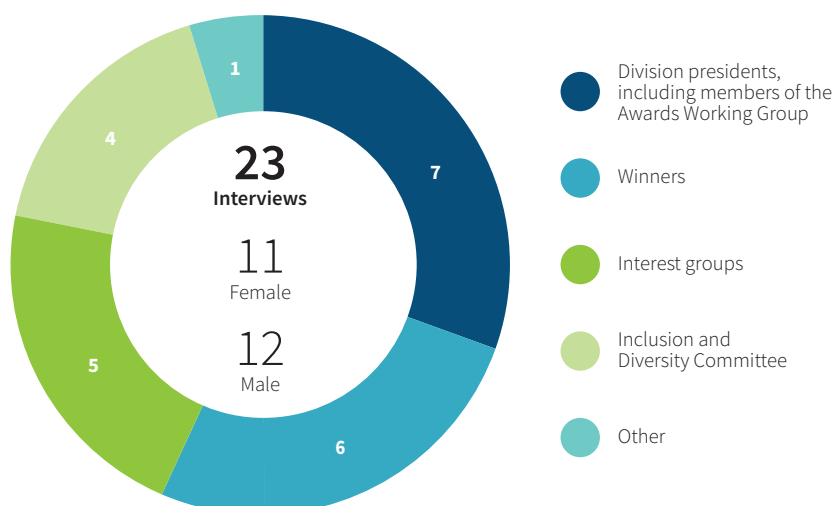


Figure 18: Interviewees – breakdown by target cohort and gender.



We issued the survey via email to RSC members and non-members. Key target audiences included teachers, academics (including heads of university chemistry departments), individuals working in industry, technicians, previous RSC prize and award winners and members of RSC divisions and interest groups. 2,130 individuals responded to the survey.

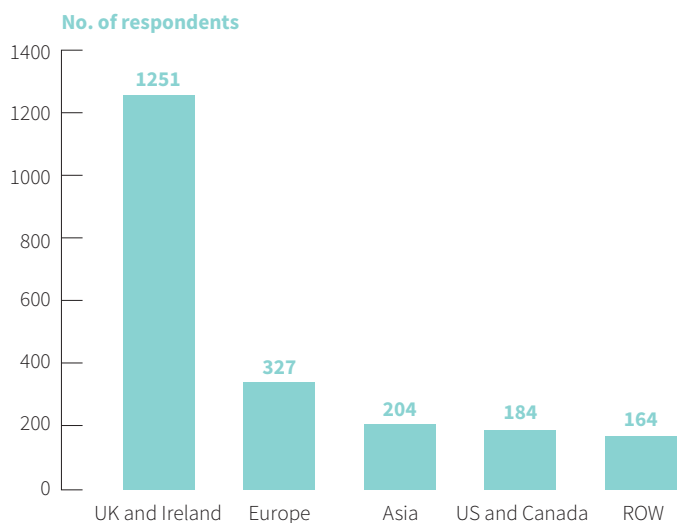


Figure 19: Survey respondents by geographic region (2,130 respondents from 89 countries).

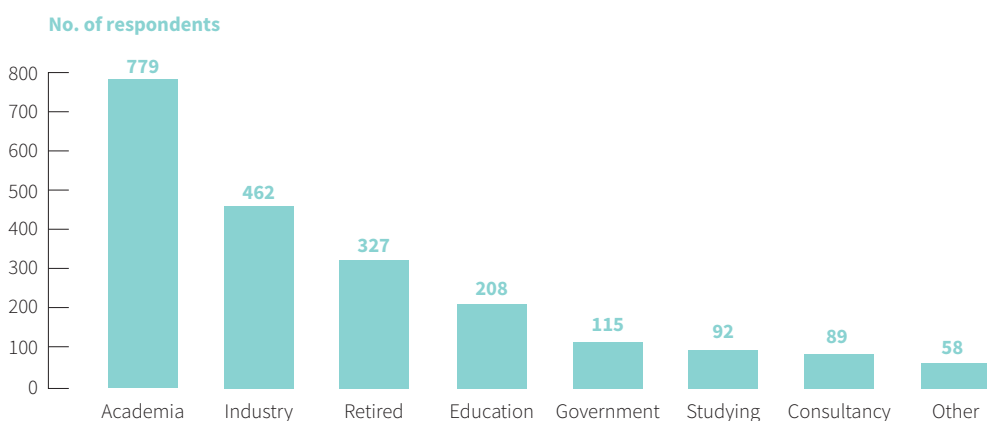


Figure 20: Survey respondents by sector.

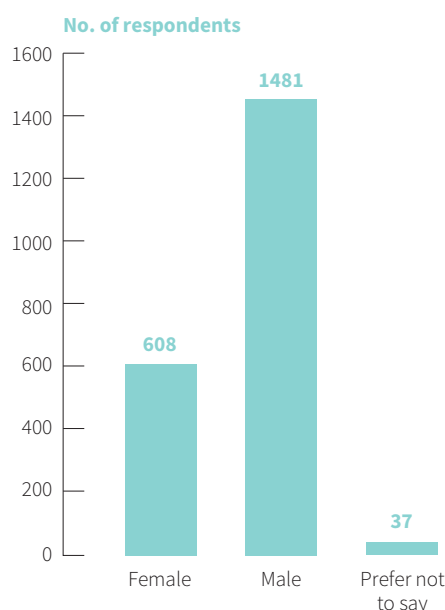
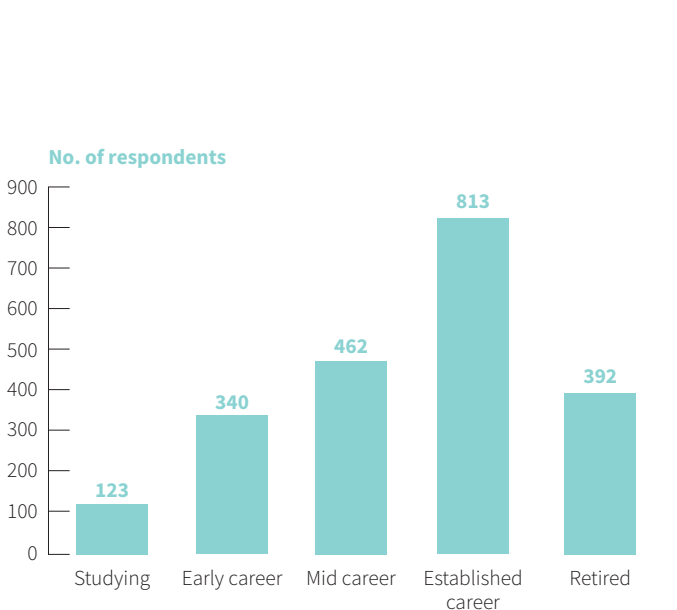


Figure 21 (left): Survey respondents by career stage. Respondents self-identified in the absence of any definitions of categories.

Figure 22 (right): Survey respondents by gender. Respondents self-identified. This is consistent with the RSC membership demographic: as of November 2019, 29% of RSC members were female and 71% were male.

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