Illustration inspired by the work of John Dewey

INSIGHTS INTO DIVERSITY, EQUITY & INCLUSION IN THE GLOBAL RESEARCH COMMUNITY

Report

Contents

1. Foreword

At Springer Nature, we are proud to play an active role in addressing diversity, equity, and inclusion (DEI) in research. As one of our highest strategic priorities, we are committed to integrating DEI values into how we work and what we create and publish – across our content, products, platforms, and services. Our commitment is to champion DEI in the communities we serve; eliminate barriers to creating, discovering, and using knowledge; and support equitable outcomes in learning and scholarship.[1]

As part of our ongoing efforts, we are pleased to publish this report on the perceptions and experiences of nearly 5,000 researchers, captured through an online survey and series of interviews. This report, inspired by our commitment to understand structural barriers, is by no means the first report on this topic. There have been several industry resources released to understand DEI in recent years,[2] and we hope this new data can further inform and advance collaborative action. Although the majority were from the US and Europe, the demographics of our respondents do represent a breadth of researchers in terms of career stage, gender, disability, race, and ethnic origin. Wherever possible, we have noted areas where opinions between groups of researchers differed from the aggregate, which we hope helps to illustrate that the experience of DEI efforts is not monolithic and as a result, solutions cannot take a one-size-fits-all approach.

Overall, there are some alarming headlines in our report. Corroborating findings from other surveys, there is widespread discrimination, harassment, and bullying reported by researchers across all demographics. Perhaps not surprisingly, researchers who identify as part of an underrepresented group – notably by gender, ethnicity, or race – are experiencing even more instances of such behaviours. In many cases, it appears that these experiences are going unreported, indicating that much more work is needed to reform the research climate. Many underrepresented groups feel that DEI initiatives are failing to meet their needs, which is a discouraging message for all those who support researchers and efforts to improve the research environment.

We also found it notable that there was limited discussion on the specific challenges faced by different geographical regions. This may reflect the predominantly Western demographics of our survey respondents, but nevertheless this indicates there is more to do to raise awareness among all groups, including those who may not be directly affected by barriers.

Ritu Dhand
Chief Scientific Officer, Springer Nature

Sowmya Swaminathan
Chair, Springer Nature Research DEI Programme

1. https://group.springernature.com/gp/group/taking-responsibility/diversity-equity-inclusion

2. https://www.alpsp.org/edi/Resources

We were particularly keen to draw out the views of early career researchers (ECRs). As a cohort, this group experiences higher levels of discrimination, bullying, and harassment;[3] we wanted to explore the particular DEI challenges and structural barriers that ECRs encounter, including in recruitment and career advancement. Our ECR interviews emphasise the need for ongoing, proactive discussions about DEI at all career stages, and active support by institutional leaders to foster more inclusive research cultures.

Springer Nature remains committed to improving the quality and impact of research, and to working collaboratively to reform research culture and create a more inclusive and equitable research ecosystem.[4] We unequivocally condemn harassment, bullying and discrimination and call on all stakeholders to redouble efforts to improve research culture. We are committed to understanding structural barriers to equality in the research communities we work with.[5] As a publisher, we see opportunities to embed inclusive publishing practices within our programmes, and raise awareness through education and training for editors, reviewers, and researchers. We recognise the potential impact that publishing on DEI topics can have on research culture and we are committed to advocating for these issues in the community. We are also committed to amplifying underrepresented voices and putting a spotlight on the need for representation in research through our journalism, our journals, and books publishing programmes.

Our report aims to shed light on the needs of underrepresented groups in the research community. To deliver a diverse and inclusive global research culture, it is critical to make all researchers – especially those from dominant groups – aware of the experiences of underrepresented communities. Exploring the specific needs of underrepresented ECRs and their suggestions for advancing DEI can allow us to take positive action. Together, we can shape a research future that has a positive impact for all.

3. https://www.nature.com/articles/d41586-022-04237-8

4. https://www.springernature.com/gp/advancing-discovery/springboard/blog/blogposts-sustainability-inclusion/furthering-diversity-equity-and-inclusion-commitment/19677418

5. https://group.springernature.com/gp/group/taking-responsibility/diversity-equity-inclusion

2. Executive summary

This report summarises findings from an online survey with close to 5,000 researchers as well as interviews with early career researchers (ECRs). It aims to examine how diversity, equity, and inclusion (DEI) are understood in the research community, identify barriers to achieving greater DEI, and highlight opportunities for change.

DEI in the research community is a topic that has been explored in other surveys and resources. Our goal in undertaking this new enquiry was to better understand structural barriers and add to the available data, exploring a broad range of researcher groups, notably by career stage, gender, disability, race, and ethnic origin. Our report finds alarming perceptions of DEI among underrepresented groups of researchers, with high levels of discrimination, harassment, and bullying in the research community, and low levels of satisfaction with DEI programmes and initiatives, particularly among ECRs who represent a diverse demographic group.

Key findings:

The biggest barriers to DEI were perceived to be prejudice, inertia, and unconscious bias.

- Lack of money and time were also prominent barriers.
- Bias in recruitment and career advancement were notable topics for ECRs.
- The peer review process was highlighted as a particular barrier within publishing.

DEI initiatives are not meeting the needs of underrepresented researchers.

- Although over half of respondents were aware of specific DEI initiatives or policies in their workplace, perspectives on the effectiveness of such initiatives differ significantly.
- Women, underrepresented ethnic or racial groups, and those with a non-visible disability were much less likely to think initiatives were sufficient, compared with all respondents.
- The majority of late-career researchers on the other hand believe at least to a moderate extent that current DEI initiatives are sufficient.

There is an alarmingly high rate of discrimination, harassment, or bullying in the research community, with the majority overwhelmingly uncomfortable with reporting such behaviours.

- Over 60% of respondents reported experiencing some form of discrimination, harassment, or bullying in the research community at least once a year.
- Negative experiences were noticeably higher for underrepresented groups, with over 60% of underrepresented ethnic or racial groups reporting 'being treated with less courtesy or respect than other people' and 'people acting as if you were less competent, trustworthy, or capable than others' more than once a year.
- Age discrimination, gender discrimination, and verbal microagressions were the most prevalent forms of discrimination.
- The majority of respondents (60%) felt comfortable to only a small or very small extent in reporting these behaviours or seeking resolution. This was even more the case for underrepresented groups.

Underrepresented groups including ECRs were less likely to consider the research community to be diverse, equitable or inclusive.

- 73% of respondents said that the research community is diverse, equitable, and inclusive to at least a moderate extent; however, only 59% of underrepresented racial or ethnic groups felt the same way.
- Underrepresented groups, notably ECRs, women, non-binary or gender diverse respondents, and those with a non-visible disability were more likely to say the research community was diverse or inclusive to only a small or very small extent.

ECRs identify roles for every stakeholder in the research community to support and advance DEI.

- Publishers can develop and communicate inclusive publishing practices, target underrepresented groups, tackle bias in peer review, publish a diverse range of voices, and support more authors to choose open access (OA).
- Institutions can support outreach and recruitment of a diverse cohort of ECRs, continue to build on training and workshops, ensure buy-in and action from academic leadership, and facilitate open dialogue on DEI.
- Individual researchers can provide peer networking and mentorship as part of supporting inclusive cultures.
- Funders and scholarly societies can provide targeted support for underrepresented groups and widen outreach programmes.

3. Introduction

The 'research community' refers to a wide range of communities involved in research, including researchers, authors, reviewers, editorial stakeholders, publishers, and funders. Efforts to improve DEI are increasing, with several individual and collective initiatives underway.[6] The case for DEI is clear: evidence shows that organisations embracing diversity and inclusion are performing better.[7] Yet many groups remain underrepresented in the research community, including women, minority ethnic groups, people with disabilities, members of the LGBTQ+ community, and socially disadvantaged populations.[8]

There are many reasons for such underrepresentation. Research on DEI highlights inequalities in recruitment and career advancement of underrepresented groups.[9,10] Reports on scholarly publishing have shown bias against underrepresented groups at many stages of the publishing process, notably in peer review.[11,12] Other research has highlighted experiences of discrimination and anti-inclusive behaviours,[13] and the impact of the pandemic on underrepresented groups, all of which impacts the retention of underrepresented groups in the research community.[14,15]

To tackle these barriers, to increase diversity, and to advance equity and inclusion in the research community, we need to understand what these concepts mean to researchers. As some commentators on the topic have noted, the terms diversity, equity, and inclusion are used interchangeably. Each concept requires individual examination to understand both the challenges and potential solutions, as viewpoints and interpretations vary widely depending on the lived experiences of different groups.[16]

To understand what the potential barriers are to achieving greater DEI, and to identify opportunities for change, in this report we have highlighted feedback from those identifying as underrepresented groups, as well as showing what most researchers in our survey felt about DEI. We asked about diversity, equity, and inclusion separately, explaining our definitions for each but also asking for respondents' own interpretations of these concepts.

6. https://www.alpsp.org/EDI

7. https://www.mckinsey.com/featured-insights/diversity-and-inclusion/diversity-wins-how-inclusion-matters

8. https://www.nature.com/collections/qsgnpdtgbr

9. https://www.cambridge.org/core/journals/social-policy-and-society/article/abs/what-do-we-know-about-black-and-minority-ethnic-bame-participation-in-uk-higher-education/D603F9ECA65148D8C583653E40DC02EE

10. https://www.ucu.org.uk/article/10360/Black-academic-staff-face-double-whammy-in-promotion-and-pay-stakes

11. https://www.rsc.org/policy-evidence-campaigns/inclusion-diversity/framework-for-action/

12. https://publicationethics.org/node/52156

13. https://www.emeraldgrouppublishing.com/news-and-press-releases/emerald-launches-its-2022-global-inclusivity-report

14. https://www.mckinsey.com/featured-insights/diversity-and-inclusion/diverse-employees-are-struggling-the-most-during-covid-19-heres-how-companies-can-respond

15. https://www.biorxiv.org/content/10.1101/2022.12.06.519378v1

16. https://scholarlykitchen.sspnet.org/2021/05/03/revisiting-the-problem-with-diversity-inclusion-and-equity/

How we defined diversity, equity, and inclusion

Diversity encompasses all the ways in which people can be different. That includes visible differences like race and ethnicity, gender, and age, as well as invisible aspects like our cultural background, class, religion, sexual orientation, disability (can be visible or invisible), language, cognitive differences, or life experiences. These differences influence our way of thinking and our perspective.

Equity is the fair treatment, access, and opportunity for all people by striving to identify and eliminate systemic or individual barriers that prevent the full participation and engagement of some groups and individuals. Improving equity involves increasing fairness within processes by recognising institutional and environmental systems of injustice and oppression as well as unequal distribution of resources.

Inclusion means creating an organisational culture where people can bring their differences to work and thrive professionally; where they feel that they belong and are valued, even if they're different from the majority. Inclusion means making sure that everybody is heard and able to participate. It also means perceiving people individually to treat them equitably.

3.1 Who is represented in our report?

We collected responses to our online survey from researchers who had previously agreed to take part in market research from Springer Nature. In total, 4,866 surveys were completed and analysed. Responses have been grouped based on a number of self-identified demographics, including country/territory, career stage, gender, disability, race and ethnicity. We did not collect demographic information about sexual orientation or religion. Springer Nature acknowledges the exclusion and discrimination experienced within the research environment on the basis of sexual orientation and religion and is committed to understanding and addressing challenges faced by these researchers in future surveys. The majority (63%) of respondents identified themselves as working at a university or higher education institute (HEI). It is perhaps not surprising, given the focus of this work, that many of our respondents represent dominant groups in research. The majority of respondents were located in Europe or North America; men; white; did not consider themselves from an underrepresented ethnic or racial group; and did not have a disability. In other words, researchers from underrepresented groups accounted for only a third of responses. Despite this, the distribution of responses still allows for testing of differences between groups of researchers, representing many socio-demographic factors. In most of the sections that follow, we will show both aggregated responses and where there are differences among underrepresented groups.

4,866 respondents

31% identified as professor

63% worked at a university or HEI

early career

late career

mid-career

Profession

34% Europe

29% North America

13% Asia

3% Middle East & Other

9% Africa

8% South America

4% Australasia
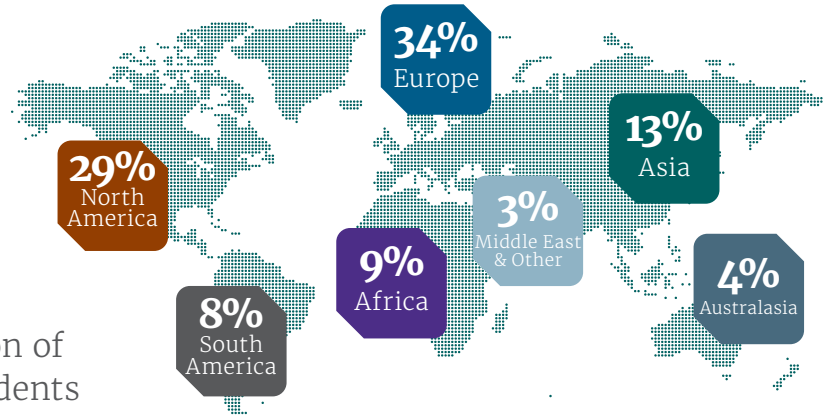
Location of respondents

Demographic details of respondents

55% man

36% woman

2% non-binary or gender diverse

68% did not consider themselves to belong to an underrepresented ethnic / racial group*

42% Western European ethnic origins or ancestry

53% white

23% considered themselves to belong to an underrepresented ethnic / racial group*

Asia or Pacific Islander	14%
Black	10%
self describe	9%
Hispanic or Latino/a/x	9%
prefer not to disclose	7%
Middle Eastern or North African	4%
Indigenous (e.g. North American Indian Navajo	1%
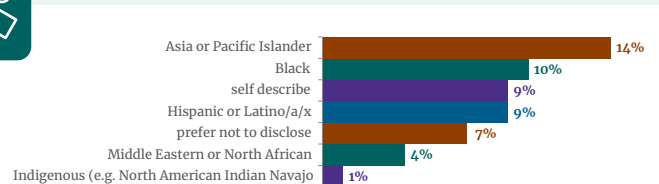
*9% preferred not to answer the question

77% do not identify as disabled

17% identify as disabled

3% visible, **14%** non-visible

In addition, we have focused on qualitative feedback from ECRs, who were graduates and postdoctoral researchers specifically from the UK and USA given that the majority of survey responses came from these regions. ECRs represent the most diverse community in research, yet there continue to be notable challenges for underrepresented groups among ECRs.[17] Exploring attitudes in this cohort can help to determine; the specific challenges ECRs face, where attitudes towards DEI are shifting among younger researchers, and the potential opportunities to embed DEI practices in research culture.[18] We interviewed five ECRs identifying as belonging to an underrepresented group (including Black, Asian, and white women and men from the UK and USA). The selection of these researchers was made based on recommendations from colleagues within Springer Nature. Their anonymised comments are included throughout the report as case studies.

17. https://ecologyandevolutionblog.wordpress.com/2020/06/09/barriers-facing-early-career-researchers-from-minority-groups/

18. https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3001680

4. Perceptions of DEI among researchers

4.1 How do researchers define DEI?

We asked researchers to describe what diversity, equity, and inclusion meant to them using their own words. Overall, it is evident that diversity to most people refers to the inclusion of different groups that make up a diverse population, such as gender, race, and ethnicity. It is notable that geographic diversity did not rank in the top topics for any definition, even though the research community is increasingly global,[19] with a growing number of research outputs from international collaboration.[20] This likely reflects the fact that most respondents were from the USA and Europe.

Many respondents did not distinguish between equity and equality, which may again reflect the demographic of our respondents, but also presents a specific challenge to addressing DEI. They defined equity as providing 'equal opportunity' and 'equal access' for everyone (over 1,000 mentions). They also emphasised the need for 'equal treatment' (including 'respecting' and 'valuing' others). Examples of where equal opportunity and treatment are needed included publishing research, attending conferences, or accessing research.

Respondents also linked equity to fairness in 'equal resources/pay' and 'everyone can participate'. Many acknowledged that underrepresented groups may require more support or assistance to achieve fairness. The concept of 'fairness for all' was often tied to 'merit' – judging a researcher or research based on its excellence. There seems to be some indication that inclusion is a way to move beyond diversity and take action. To create an environment where individuals from diverse backgrounds can thrive, there needs to be greater focus on fostering inclusive cultures in the research community.

There were negative views expressed in definitions of all three concepts (these were in the top ten topics for equity and inclusion). These negative themes often overlapped across the three concepts, for example suggesting that the terms were 'meaningless', or driven by agendas not supported by the respondent. It is relevant that 'merit' was a frequently mentioned topic for equity and inclusion, with many of the negative comments referencing the need to consider only expertise.

More details on respondent feedback can be found in the Appendix.

19. https://uis.unesco.org/sites/default/files/documents/unesco-science-report-towards-2030-part1.pdf

20. https://sciencebusiness.net/news-byte/international-science-collaboration-rise-and-it-leads-increased-productivity

CASE STUDY:
do ECRs feel welcome?

Several ECR interviewees highlighted the need to 'feel welcomed,' with many experiencing personal challenges connected to race and ethnicity, gender, language, and culture. Breaking into the accepted norms of academia is a notable barrier that is specific to ECRs and should be considered in developing successful DEI efforts.

"I've done my PhD in a South Asian country then I've moved to the UK for my post doctoral studies. So what I felt is it is very difficult to break into the research community when you are from a different place. It's really not a very welcoming space when you are from another ethnic minority, I mean it's really difficult to break into the space and to carve a space for yourself. The research environment should be more welcoming. It should be more open to people of different ethnicities, it should be open to everybody actually, but we have to talk about people of minorities because it is not being taken care of."
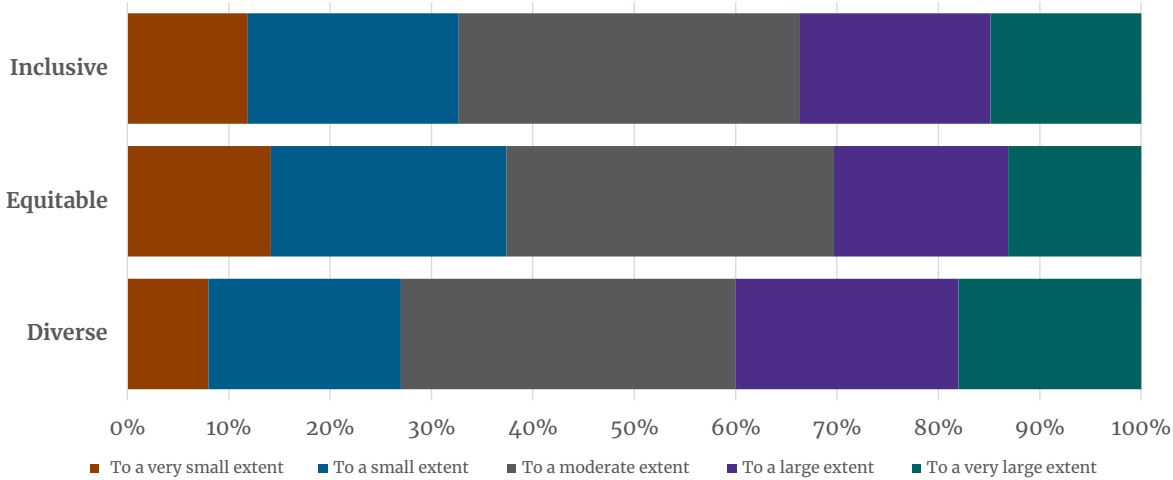
"There is a language of professionalism that I was never taught at any point in my career, and there's a certain culture that is expected of you at scientific conferences, for example, or when you start grad school. And if you're never taught that, it doesn't come naturally. It's kind of unwritten rules that not everyone is privy to. If you're not talking the talk, people aren't going to respect you as much. They're not going to think you're doing well, even if you're doing just fine. If you can't speak about it in a way that they deem as eloquent they're not going to think your research is good. It's about how you write. It's about how you present. I can only imagine it gets even worse for people with accents. I've heard some individuals talk about their experiences where they have an accent and people just immediately are like 'ohh I can't understand them. I'm not even going to try.' And that's just hindering their growth as a researcher and networking and everything."

4.2 How is DEI perceived by the research community?

We asked researchers to what extent they agreed the research community demonstrates diversity, equity, and inclusion.

Although most researchers agreed that they personally value the principles of DEI in the research community, there are stark contrasts between the opinions of dominant research groups and those from underrepresented groups. This is notably different for ECRs, women, non-binary or gender diverse respondents, and those with a non-visible disability. Many respondents from these underrepresented groups said they considered the research community to be diverse, equitable, or inclusive to only a small or very small extent.

To what extent is the research community...

Legend: To a very small extent · To a small extent · To a moderate extent · To a large extent · To a very large extent

Responses found the research community to be...

...Moderately diverse

73% all responses

59% underrepresented racial or ethnic groups

...Diverse to only a small or very small extent

41% women

38% of non-binary or gender diverse respondents

39% of researchers with a non-visible disability

...Largely inclusive

40% men

...Moderately inclusive

70% late-career researchers

...Inclusive to only a small or very small extent

40% early career researchers

45% women

It is concerning that far fewer respondents from underrepresented groups agree that the research community is diverse, equitable, or inclusive and suggests a strong connection between perception and lived experience when it comes to DEI. Understanding the experiences and views of underrepresented communities is therefore critical to learning what can be addressed to build an equitable and inclusive research culture.

5. Understanding the barriers and challenges to DEI in the research community

The previous section highlighted that experiences and attitudes towards DEI vary greatly in the research community. It is evident that respondents from underrepresented groups were more likely to feel that DEI is less valued, or that the research community does not demonstrate equity or inclusion to a sufficient extent. To better understand the reasons behind these perspectives, we explored the experiences and barriers faced by these groups in more depth.

5.1 Understanding the climate for DEI

We asked respondents about their treatment at work as a researcher. Alarmingly, a high proportion of respondents reported experiencing some form of discrimination, harassment, or bullying in the research community at least once a year (over 60%). Negative experiences were noticeably higher for underrepresented groups:

Researchers reported more than once a year...

Being treated with less courtesy or respect than other people:				
43% All groups	**50%** ECRs	**58%** Women	**60%** Underrepresented ethnic or racial group	**60%** Non-visible disabilities

Being threatened or harassed:			
18% All groups	**21%** Women	**26%** Underrepresented ethnic or racial group	**23%** Non-visible disabilities

People acting as if you were less competent, trustworthy, or capable than others:				
44% All groups	**55%** ECRs	**60%** Women	**61%** Underrepresented ethnic or racial group	**57%** Non-visible disabilities

The higher levels of discrimination and other anti-inclusive behaviours found in this survey are consistent with other reports exploring research culture, notably the experiences of women[21] and ECRs.[22]

We also asked respondents which forms of discrimination they had personally experienced. There were again notable variations to the extent of discrimination experienced by different groups.

Which of the following have you experienced in the research community?
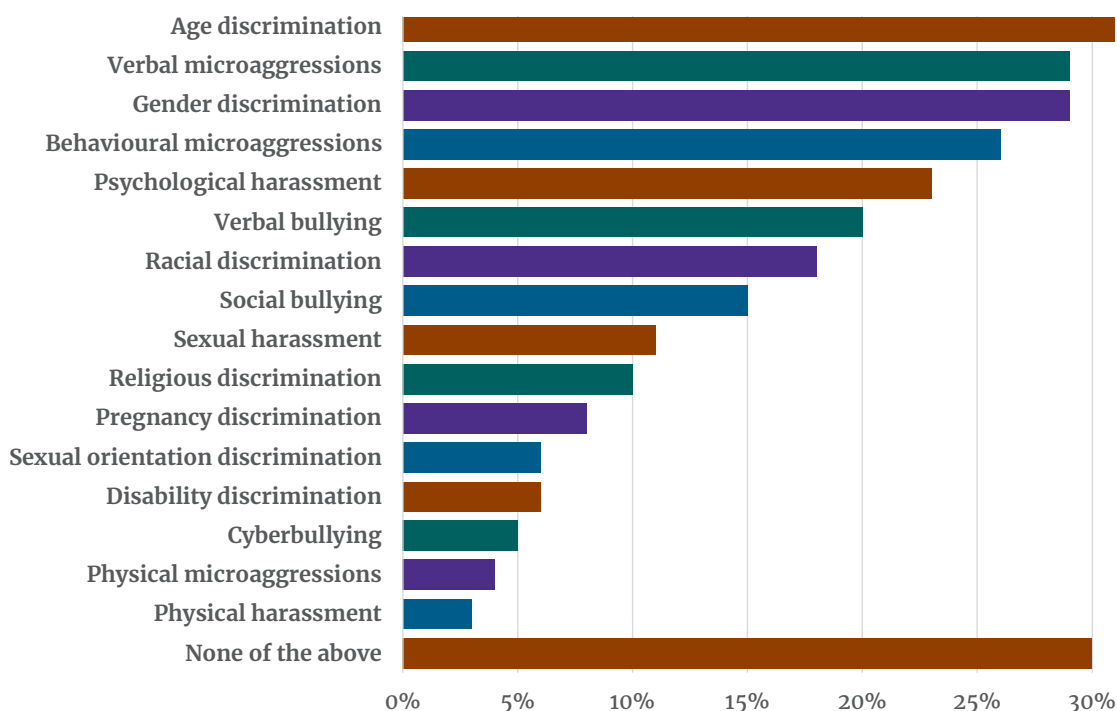
- Researchers who identified as belonging to an underrepresented ethnic or racial group reported experiencing racial discrimination the most (**46%**).

- Women (**57%**) and non-binary or gender diverse respondents (**45%**) identified gender discrimination as the most common form of discrimination, but also reported notably higher levels of microaggressions compared with the full sample.

- Men were most likely to report having experienced no forms of discrimination (**37%**).

21. https://www.emeraldgrouppublishing.com/news-and-press-releases/emerald-launches-its-2022-global-inclusivity-report

22. https://www.biorxiv.org/content/10.1101/2022.12.06.519378v1

CASE STUDY:
what is acceptable behaviour?

For ECRs, a particular challenge remains knowing what behaviour is acceptable, and what they can do if they experience bullying or harassment. Tackling the prevalence of such behaviours as well as making ECRs aware of what they can do if they see or experience them are both needed.

"I mean, there will always be some kind of microaggression which is going on around and people don't really realise this is happening because they are so used to it. I believe some kind of awareness should be spread out to early career researchers joining new positions so that they can be aware of what they should not be tolerating."

"There should be some mandatory kind of training or a workshop designed for early career researchers or people who join organisations in order to have a check on what they need to be watching out for, because sometimes people don't even know what is wrong behaviour."

5.2 Reporting harassment, bullying and discrimination

When it comes to reporting discrimination, harassment, or bullying in the research community, respondents across all groups were overwhelmingly uncomfortable with doing so. This was even more the case for underrepresented groups.

To what extent do you feel comfortable reporting these behaviours and seeking resolution?
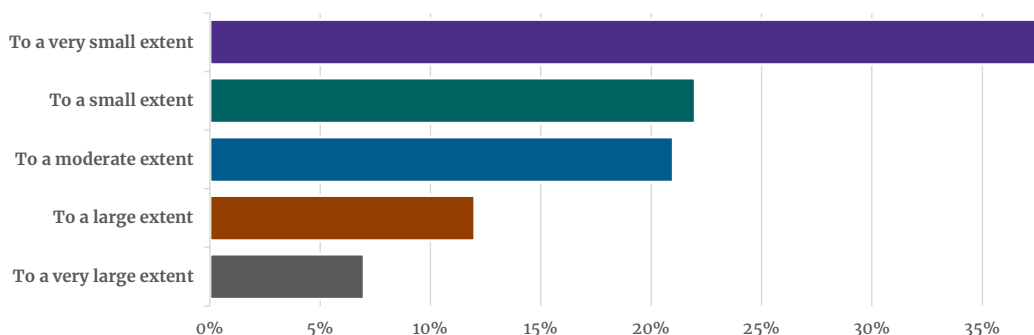
- • **Over two-thirds of researchers** who identified as women said they felt only comfortable reporting discriminatory behaviour and seeking resolution to a small or very small extent.

- • **Nearly half of researchers** from an underrepresented ethnic or racial group said they felt comfortable reporting behaviours to a small or very small extent.

Of approximately 10% of the total respondents who experience high frequency of discrimination and are willing to report the behaviours to a small or very small extent, the group consists of:

8%
Early Career Researchers

17%
Women

14%
Respondents considering themselves to belong to an underrepresented ethnic or racial group

14%
Respondents with a non-visual disability

Looking closer at groups that experience a high frequency of discrimination (a few times a month or more), it becomes evident that underrepresented groups are also less likely to feel comfortable in reporting these behaviours and seeking resolution.

Such low levels of willingness to report discrimination suggests that the likely levels of such behaviours are significantly higher than those reported.[23] The true extent is simply not known. The fact that underrepresented groups feel uncomfortable reporting discrimination, harassment, and bullying poses a major challenge to improving inclusion and DEI efforts at large in research environments. Research organisations and institutions must continue to create a safe environment for researchers to improve reporting.

CASE STUDY:
career progression and reporting

For the ECRs we interviewed, the support of their principle investigator (PI) or supervisor is critical to career progression. Many felt there was low confidence in reporting DEI issues, with the potential outcomes of reporting often perceived to be negative. As a result, low levels of reporting from ECRs can be directly connected to the challenges with retention in academia, which echoes similar research with this community.[24]

"*I think underreporting is a huge problem: as an undergraduate student you go to this person that you see as an authority figure that you trust. Let's say, of my closest friends in the scientific community, five of them have experienced this. You develop a relationship with your male advisor, and then they give you unwanted attention, and then you don't want to say anything or speak up because you need their recommendation in order to go to Graduate School. I don't know if we really have a system in place for people to get around that.*"

"*Even though there are anonymous reporting mechanisms, if you know you are the only Black student in the entire department and you report something and then you know your PI gets an email that says you have a racial diversity issue, it's not hard to figure out what the problem is, so a lot of students were fearing backlash. They weren't saying anything about their negative experiences, so they sat there and they sat there until they couldn't take it anymore then they left.*"
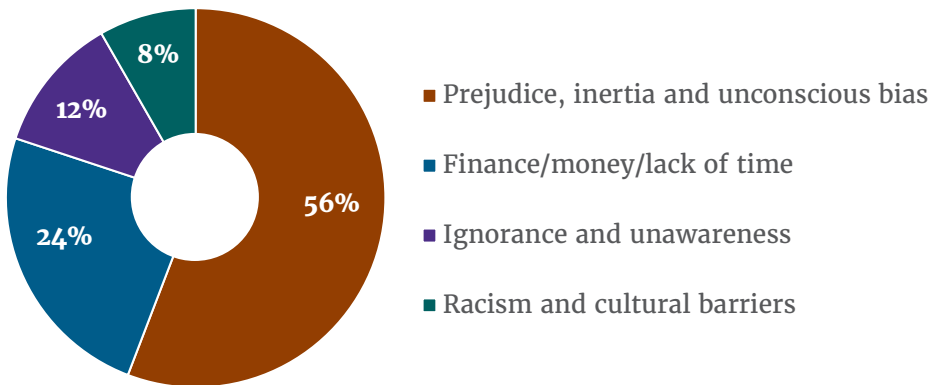
23. For example 34% of respondents to the *Nature* 2022 graduate survey had experienced gender discrimination: https://www.nature.com/articles/d41586-022-04237-8

24. https://www.nature.com/articles/d41586-022-04237-8

5.3 Perceived barriers to DEI

What are the biggest barriers to DEI?

- Prejudice, inertia and unconscious bias
- Finance/money/lack of time
- Ignorance and unawareness
- Racism and cultural barriers

Prejudice, inertia, and unconscious bias was the most mentioned (over 600 mentions) as barriers to DEI. Many comments pointed to the structure of the research community, where some felt power was often held by dominant groups.

"There is a backlash against DEI and it often takes the guise of "merit." We need to be cognizant of how the current structures and standards of "merit" were created in a biased, inequitable environment. Being more accessible, inclusive, and equitable does not mean reducing standards, but perhaps it does require changing standards." (survey response: professor, USA, woman, white)

Money and time were also noted in many comments, again reflecting the number of comments that highlighted equal access to resources and pay in definitions of equity. Funding in relation to OA publication was additionally highlighted in ECR interviews. For an ECR, missing out on the opportunity to publish in the most prestigious journals due to not being able to secure funding could have knock-on effects on career progression.

"I feel like if you are from a lab that doesn't have a lot of funding, you're not going to be able to pay these Open Access publication fees. So then when you go to publish in a peer reviewed journal that's not Open Access, people are not going to recognise your name as much." (ECR interview)

CASE STUDY:
senior researchers' impact on ECRs

For the ECRs we interviewed, it was evident that low buy-in from senior researchers and leaders in the institution is a particular barrier to DEI. Encouraging supervisors to play an active role in developing inclusive environments can make a real difference for those new to academia.

"*I have met some faculty who are pretty blunt about the fact that they are confident that they can do whatever they want in terms of how they treat students and how they run their labs. Academia is a very weird environment where it's not like an industry job where you have HR that's going to immediately swoop in, you know labs in academic spaces function very much in their own little microcosms, and I think it's a problem that causes some of these issues to be harder to address. I think it's going to take a large collaborative and collective effort to come up with an effective and equitable solution. But I do think finding ways to incentivise people in places of power and hold them accountable are going to be key. Students often ask in orientations 'if I'm being mistreated, if I'm being discriminated against, what happens?' A lot of times those questions don't have good answers. The answers aren't strong enough to make people feel safe enough to report things. An answer will be something like 'We'll investigate it.'*"

"*When I was doing my PhD, there were a lot of students coming from a lot of countries. We would have some specific groups for students with similar backgrounds but my supervisor always asked us to hang out together and spend the time to understand each other. So that experience is very positive to me. He made that kind of environment and atmosphere that helped me a lot in getting a better relationship with my team members and colleagues during my PhD.*"

5.4 ECR challenges: recruitment and career progression

Although these did not explicitly feature in the main barrier topics, it is important to highlight recruitment and career progression which were prominent in our interviews. While these may only represent a small number of voices, the topics merit further exploration.

Improvements in the recruitment of a diverse cohort into research were acknowledged by some of our interviewees, but efforts focusing on retention were considered to be lagging. Bias was seen as a significant barrier to progression for ECRs from underrepresented groups, once a PhD has been obtained.

"Where I think in recruitment we're doing well, retention is a big issue. That is making sure diverse researchers feel supported and included and their opportunities are equitable once they actually get in the room. I think where the research community at large is struggling is in terms of how do we make sure that students succeed once they actually enter the programme and they don't stand a larger chance of not finishing because they are experiencing negative things as a result of their diversity." (ECR interview)

"I think a lot of focus has been put on admissions committees and talent search committees to try and make sure that DEI is something they're thinking about as they're making decisions and as they're extending offers. So I think that is something that is starting to work pretty well." (ECR interview)

5.5 Bias in the publishing process

Challenges in the publishing process were highlighted both through the survey and our interviews. Peer reviewer bias was acknowledged to be a particular challenge, with double-anonymous review[25] and transparent review both offered as solutions.

CASE STUDY:
tackling bias in peer review

"If you know the name or you know the PI's name, you're going to think that person's inherently better. I think if there was a way to separate out the name of the individual publishing before sending to reviewers that could be really helpful. You always want to eliminate barriers, right? I think that there's a lot more bias that goes on in reviews than anyone will admit and I guess in addition to maybe getting rid of the author's name, another alternative solution which actually I like better is giving the reviewers' names. You're in science. Everyone knows how to critique everyone else. You should be able to put your name to anything you're saying." (ECR interview)

"The single blinded review process is not really good. There shouldn't be a bias at all on who is doing the research. I've volunteered to review for different publications, but what I've seen is that people from really good research groups try to publish papers without having substantial data. They are not being turned down by the publishers, because they are from a prominent group. Double-blind peer review should be in place so that people shouldn't be discriminating over the background they have, the scientific or ethnicity or gender or any kind." (ECR interview)

5.6 What role do DEI initiatives play?

In the perceived barriers to DEI, ignorance and unawareness featured as a notable theme, which is further reflected in respondents' knowledge and perceptions of DEI initiatives. Here again, we see a stark contrast between dominant and underrepresented groups in attitudes towards initiatives.

25. This is a relatively new industry term, and is referred to by many researchers as double-blind review; we have not edited these instances in quotes.

Researchers' awareness and perceptions of DEI initiatives:

56%
aware of DEI initiatives or policies

57%
consider themselves to have received training to at least a moderate extent

Effectiveness of DEI initiatives:

71%
believe DEI initiatives are sufficient to at least a moderate extent

Less likely to agree:

61%
Women

59%
Non–visible disability

64%
Underrepresented ethnic group

Although researchers' awareness varies across different groups, the large numbers of researchers who are not aware of DEI initiatives hampers opportunities for significant change. The notable difference in opinions among those who were aware of initiatives however suggests there is much more to do even where initiatives are in place.

Further efforts are needed to embed a culture of DEI, based on the perceived challenges noted in section 5.3. This is also reflected in how comfortable respondents felt about discussing DEI topics with their team. Only 62% felt comfortable to some extent talking about aspects of the current system that disadvantage specific groups of researchers (e.g. due to gender or ethnicity) with their team. Meanwhile only 63% of respondents agreed to some extent that they had access to enough resources to support and publish internationally.

CASE STUDY:
DEI initiatives and ECRs

For several ECR interviewees, the availability of DEI initiatives and policies was seen as a positive step, notably in shifting the culture through inductions of all new researchers and employees.

"I think a lot of universities have been creating DEI programmes, which I think is a really good step forward. It's spreading knowledge and this is something that should be prioritised. I think probably universities to varying degrees are successful at doing that, but giving opportunities to individuals of disadvantaged backgrounds or diverse backgrounds, giving them opportunities to be on panels, for example, and making sure that there are opportunities for individuals to present their research at the university. I think those are three areas that academic research is doing very well at this time."

The effectiveness of such programmes, as suggested in the survey results, is perceived to be limited. For some, making DEI training a mandatory part of inductions to institutions goes part-way towards making a change from the bottom up.

"Not only does [USA institution] have communities designed to come in and talk to faculty in a way where the message can get across about what they could be doing better, where they can support students. But they're also not necessarily focusing on changing the people who are already there as much as making sure that when people get there, it's an automatic expectation. Any faculty member who's coming in is automatically going to have a conversation about how important it is to treat the people in your lab well, and not discriminate and welcome everybody to the table and create reward systems for that."
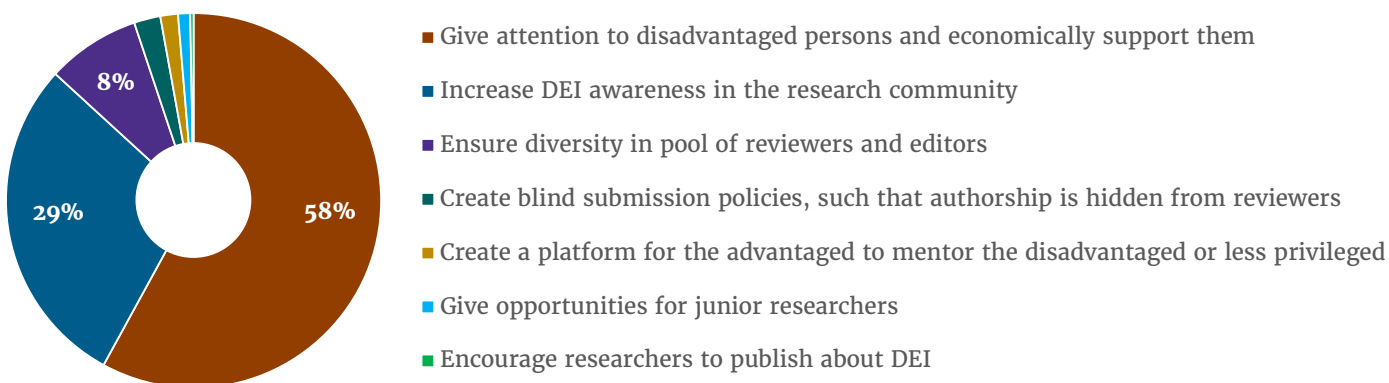
6. Addressing DEI

The fact that underrepresented groups – who experience the research environment as less hospitable – are less likely than others to agree that the research community is diverse, equitable, or inclusive shows that DEI initiatives are not working for those who need it most.

All actors in the research and publishing environment have a role to play in raising awareness of DEI initiatives; notably institutions, societies, publishers, and funders of research. All groups must consider how those who are not directly impacted by discrimination can benefit from learning about DEI and can participate in working toward broader change. As a publisher, we particularly asked respondents to the survey what our own role in supporting DEI in the research community should be. We also covered many aspects of the broader research community in our interviews with ECRs which are included, along with relevant quotes from the survey, in the following sections.

6.1 The role of publishers

Throughout our survey, respondents highlighted specific aspects of the publishing process where there needs to be greater diversity, equity, or inclusion.

What could publishers be doing to address DEI?

- Give attention to disadvantaged persons and economically support them
- Increase DEI awareness in the research community
- Ensure diversity in pool of reviewers and editors
- Create blind submission policies, such that authorship is hidden from reviewers
- Create a platform for the advantaged to mentor the disadvantaged or less privileged
- Give opportunities for junior researchers
- Encourage researchers to publish about DEI

Many respondents highlighted the need to give attention to disadvantaged groups. This could include active recruitment and inclusion of more diverse groups, for example targeting more authors, editors, and reviewers from lower and middle income countries (LMICs). Consideration of inclusion in research design and publisher policies and standards for editors and reviewers can provide support here, ensuring that these actively include underrepresented groups.

Many comments highlighted peer review as an area where publisher policy can support DEI, such as double-anonymous review and publishing reviewer names. There are also opportunities for publishers to help researchers understand appropriate research language, providing guidance for authors and reviewers. Economic support for disadvantaged communities was a further notable area of comments: to allow all researchers to participate, comments highlighted funding and grants, notably to support researchers in funding OA. Routes to enable more equitable OA include waivers for authors in low-income countries, and transformative agreements which centralise sources of funding at an institutional or national level, and could take the burden away from individual authors to help level the playing field.

Publishers can also support disadvantaged groups through increasing the attention on diverse perspectives related to DEI through its publications.

"I think the more negative experiences that students, faculty, Black postdocs or minority postdocs, diverse postdocs of any kind experience are heard and the more that they are exposed, the more accountable people are held. Publishers are people who can help in that scenario where you know someone is unfairly denied tenure and then their story gets picked up. I think that is the kind of thing that applies pressure to keep those things from happening." (ECR interview)

CASE STUDY:
tackling unconscious bias

Noting the high number of comments that mentioned prejudice, inertia, and unconscious bias in the survey, as well as the worrying levels of discrimination experienced by respondents, establishing a culture where these topics are more commonly discussed is important. As our survey suggests, dominant groups are less likely to see the challenges that underrepresented researchers are experiencing, which may be particularly difficult for ECRs.

"I think unconscious bias is a very real thing that not enough attention is drawn to. There was a workshop that I attended that walked you through unconscious biases. It made me really upset because a lot of people that I was around were making fun of it. This is important, learning about how this might happen and not only to you, but to other people and being able to recognise that and take that into consideration when you're listening to others' viewpoints. I've seen a lot of people just wave it off and not really take it seriously. I think that is in fact a real problem. No one wants to think that they're biased against people. But they don't want to take action to make sure that they're not. It's a level of, 'I don't do this, so it's not my problem.' A lack of empathy, lack of understanding is a real issue for a lot of people because they haven't experienced it themselves."

It was clear a culture of open dialogue was needed for ECRs to talk about DEI.

"I've always witnessed and felt it is very necessary to talk about this kind of stuff, but there is actually a lack of space to talk about such issues. So that is what I would like to see change, there should be more space available for early career researchers who are from diverse backgrounds, from diverse racial and genders to be able to express themselves with regard to career development."

Critically, a change in research culture will require more than a single introduction or training session on DEI, but rather an ongoing programme of engagement.

"There are awareness measures in my institution: when we join, we do have a mandatory course on equity, diversity, and inclusion, so that we understand what you need to be aware of. But still I see people talking, having some microaggressions. People are attending these courses, but it is not having an impact on people. The situation is not changing. Maybe more conversations should be in place, it shouldn't be a one-off activity. Everybody attends, everybody gathers some kind of knowledge, but it is not translating into their behaviour. The conversation should keep on going."

6.2 The role for institutions, scholarly societies and funders

Efforts to implement DEI initiatives and training are perceived to have varying degrees of success. Where ECR interviews highlighted improvements in recruitment, there is still more to do, including outreach and a stronger focus on retention. Buy-in from leadership and setting clear expectations of DEI roles were both highlighted as critical to delivering more inclusive environments for underrepresented researchers.

Workshops and training are offered at many institutions in the USA and UK, where our interviewees were based, but as noted these were perceived to be only partially successful in addressing awareness. Specific topics were flagged as important to these ECRs, notably cultural training, bias, and effective communication. While there were mixed feelings on whether making training a requirement was effective, what is critical is that such training is not a one-off. Increasing and normalising dialogue on DEI is needed at each stage of a researcher's education, in multiple settings both formal and informal.

Peer-to-peer support remains a key way to help individual researchers recognise that their experiences are not unique to them. Allyship among different cohorts of researchers, notably those from dominant groups, can also help to ensure all groups feel included.

Respondents and ECR interviewees highlighted the positive role that mentorship can play to support those from underrepresented groups, including young scholars. The impact was noted as particularly important as a way of offsetting the sense of being alone when experiencing discrimination, bullying, or harassment. It was also seen as critical to retention for those who may have had less exposure to science at school.

"In my personal experience, mentoring has been extremely valuable. It's one of the things that I think can offset some of the negative experiences, having a broad mentoring network of people who can guide you through certain experiences, guide you through certain decisions and guide you through certain places. I think having a mentor who can understand where you're coming from is a great way to increase the retention and the recruitment overall of diverse populations. And I think that is true even on the publishing side. Where you have someone who can reach out and tell you ways to be involved, certain kinds of pitfalls to avoid and you can learn from their experiences and not necessarily have to learn everything the hard way." (ECR interview)

Changing the culture from the top-down was a theme several interviewees highlighted. Where training, DEI roles, and policies go some way towards demonstrating a commitment to DEI, when this is supported by the institutional leadership – be that through making statements on events impacting underrepresented groups, offering space to speak, or participating in cases where DEI issues are raised – there is a knock-on effect on the culture of the institution.

"I think if we do a better job of changing the culture of the entire environment for the better, that we'd be surprised how many people hopped on the bandwagon. If you have all the faculty members speaking about diversity and caring about it in tangible, actionable ways from the top-down, I think a lot of people would naturally start to shift over and be less resistant to that change. If the Chancellor cares and the Vice Provost of research cares and the department chair cares, I think we'll see a lot less of those lone faculty members in the corner saying it's not important." (ECR interview)

A number of interviewees highlighted the importance of starting outreach much earlier, even earlier than university, to be able to attract potential recruits from a wider pool of backgrounds.

"I think a huge barrier is in recruiting people of diverse backgrounds at the high school age, to even start biology programmes or to keep those individuals in biology programmes in college. I remember I was at a conference and I actually got a diversity award and there was one individual that was African American and he was saying that he looks around and sees almost no one of African American descent at any point in his career, there are so few of them and that just made me really sad. And I feel like it's starting from that young age, there needs to be recruitment and accessibility from high schools." (ECR interview)

Although only mentioned in one interview, the role that scholarly societies can play in supporting DEI is worthy of note. A number of societies have developed robust DEI strategies.[26] As one interviewee noted, societies can show their commitment through their recruitment and policies, by prioritising a diverse cohort in attendance at conferences, and delivering outreach to potential researchers.

"They have so much interface with the academic community and can influence things from a very different kind of standpoint. I think when they also make it a priority it has a lot of power and weight. I think one thing they are in a unique position to do is outreach. I would love to see high school students at a Society meeting and I think outreach is something that some of the more independent organisations and larger funding organisations are in a unique position to make sure people see a community waiting for them, if they choose to pursue research." (ECR interview)

Funder commitments towards DEI was noted to influence the attitudes of other groups, as well as proactively supporting the underrepresented.

"I've seen there's a few grants for DEI. I think that could probably be improved, like there's only one small one at certain conferences, but I know the NIH is doing a whole series and you can only apply if you meet certain criteria of diversity or disadvantaged backgrounds. Those fellowship awards are promoting diversity and they're making sure that people from diverse populations have a little bit better opportunity to get funding." (ECR interview)

Funding support is also critical to retention of diverse cohorts. As one interviewee noted, there is a direct connection between funding and success. Having to work alongside studying takes a researcher (who may already be disadvantaged by their background) away from their ability to succeed.

26. https://labs.iospress.com/news-blog/
     how-are-academic-societies-
     managing-their-deia-initiatives

7. Conclusion and recommendations

Our survey and this report go part way towards identifying ways to address DEI in the research community. Our goal is to share knowledge and raise awareness among all stakeholders in scholarly communications, making DEI a normal part of the conversation, as we have done in the past for OA and reproducibility.

The report reveals a significant level of dissatisfaction within the communities that are most in need of support from DEI initiatives. The barriers identified by researchers – in particular those early in their career – emphasise the importance of raising awareness among all groups, including those who may not be directly affected by these barriers.

There is a role for every stakeholder in the research community to address the challenges raised in this report. By aligning and collaborating they can help ensure that DEI initiatives have greater impact. This includes further engagement with individual researchers to understand their needs, and adopting both top-down and bottom-up approaches to ensure DEI conversations are ongoing and not just a one-time occurrence at the start of an academic career. Joint initiatives such as the Joint Commitment for Action on Inclusion and Diversity in Publishing[27] and C4DISC[28] can support this alignment.

We have published our commitments and our progress online.[29] Our efforts to diversify our content have included guidance to editors on inclusive recruitment;[30] a DEI communications toolkit to support engagement with key stakeholders; and a range of policies ranging from enabling trans authors and others to change their names on their published works, to improving inclusion in research design and global research collaborations. We also continue to make improvements to peer review to proactively address DEI, notably offering transparent peer review and double-anonymous review on many journals.[31]

When it comes to supporting ECRs, we have a number of efforts underway including free access to Nature Masterclasses for researchers in lower and middle income countries;[32] ECR mentoring programmes;[33] Nature Masterclasses at minority-serving institutions in partnership with our Springer Nature Black Employee Network;[34] and internship programmes to open doors within Springer Nature.

We are also committed to ensuring equitable access for all. We have had waiver policies in place for many years.[35] Alongside this, our transformative agreements are proving instrumental in driving forwards OA equity globally, increasing OA uptake and content published across all disciplines, where OA was not an option before.[36] We continue to explore

27. https://www.rsc.org/policy-evidence-campaigns/inclusion-diversity/joint-commitment-for-action-inclusion-and-diversity-in-publishing/#:~:text=Joint%20commitment%20for%20action%20on%20inclusion%20and%20diversity%20in%20publishing,-Working%20together%20is&text=The%20Royal%20Society%20of%20Chemistry,diverse%20culture%20within%20scholarly%20publishing

28. https://c4disc.org/

29. https://www.springernature.com/gp/advancing-discovery/springboard/blog/blogposts-sustainability-inclusion/furthering-diversity-equity-and-inclusion-commitment/19677418

30. https://www.springernature.com/gp/researchers/the-source/blog/blogposts-for-peer-reviewers/diversity-inclusion-peer-reviewer-editorial-recruitment/23486026

31. https://www.springernature.com/gp/policies/editorial-policies

32. https://group.springernature.com/gp/group/media/press-releases/nature-masterclasses-online-research4life/23134918

33. https://www.nature.com/articles/s41467-022-31260-0

34. https://www.springernature.com/gp/advancing-discovery/springboard/blog/blogposts-sustainability-inclusion/nature-masterclasses-hbcus/20105186

35. https://www.springernature.com/gp/open-research/policies/journal-policies/apc-waiver-countries

36. https://group.springernature.com/gp/group/media/press-releases/transformative-agreements-playing-vital-role-in-oa-transition/25433850

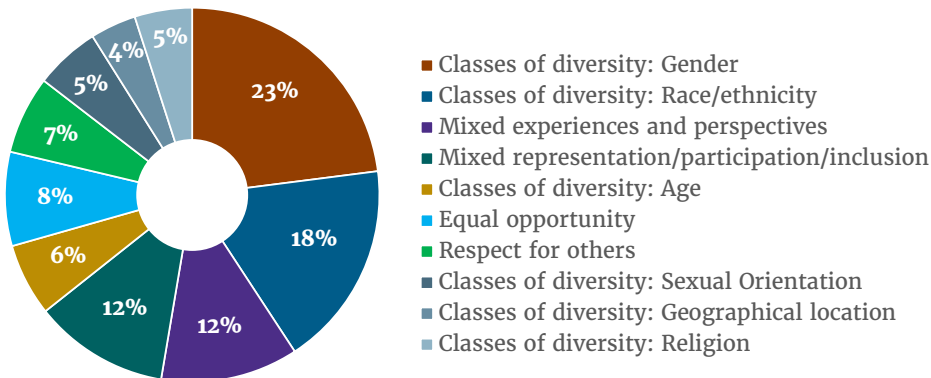and drive forwards these options to ensure all authors can benefit from publishing OA.

For the other groups referenced in section 6 there are many other considerations, notably for institutions and academic leadership. Support for DEI must continue to be more than just a statement or training course; creating an inclusive culture for all researchers requires a hands-on effort from individuals, leaders, and DEI teams.

It is important to note that our survey only goes part way to understanding what researchers may think about DEI in the research community. The heavy weighting towards dominant groups, notably in the West, must be acknowledged. We remain committed to understanding the broader perspectives of all communities globally and the specific challenges that need to be addressed in each context. Nevertheless, the findings in this report offer valuable insights, in many cases echoing and supporting other reports on the research community. As such, we welcome further dialogue on how to implement the points raised by researchers, especially in supporting the next generation by considering the ECR voices in this report. DEI is not merely a nice-to-have; it is a necessity for all parts of the research community. It must be an ongoing conversation.
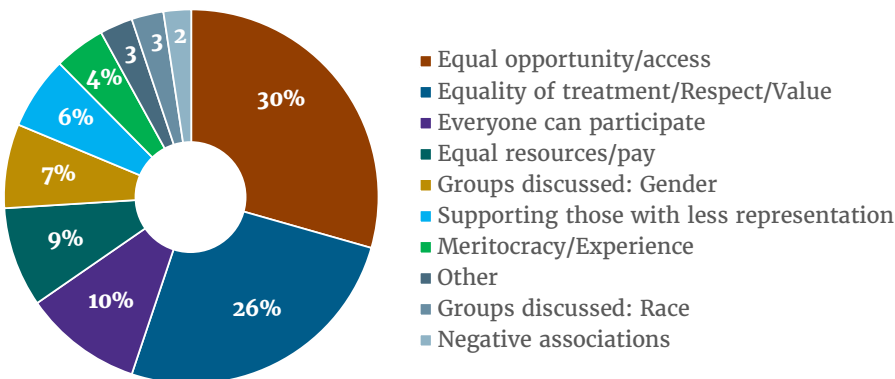
The survey data and interviews are not publicly available due to sensitivity of information.
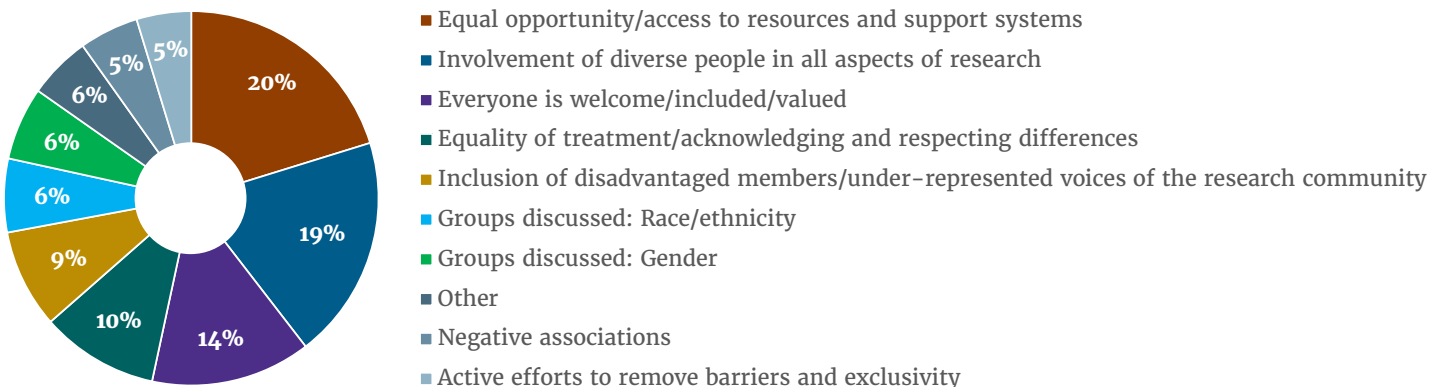
8. Appendix

## What does diversity in the research community mean to you?

- Classes of diversity: Gender — 23%
- Classes of diversity: Race/ethnicity — 18%
- Mixed experiences and perspectives — 12%
- Mixed representation/participation/inclusion — 12%
- Classes of diversity: Age — 6%
- Equal opportunity — 8%
- Respect for others — 7%
- Classes of diversity: Sexual Orientation — 5%
- Classes of diversity: Geographical location — 4%
- Classes of diversity: Religion — 5%

What does equity in the research community mean to you?

- Equal opportunity/access — 30%
- Equality of treatment/Respect/Value — 26%
- Everyone can participate — 10%
- Equal resources/pay — 9%
- Groups discussed: Gender — 7%
- Supporting those with less representation — 6%
- Meritocracy/Experience — 4%
- Other — 3
- Groups discussed: Race — 3
- Negative associations — 2

What does inclusion in the research community mean to you?

- Equal opportunity/access to resources and support systems — 20%
- Involvement of diverse people in all aspects of research — 19%
- Everyone is welcome/included/valued — 14%
- Equality of treatment/acknowledging and respecting differences — 10%
- Inclusion of disadvantaged members/under-represented voices of the research community — 9%
- Groups discussed: Race/ethnicity — 6%
- Groups discussed: Gender — 6%
- Other — 6%
- Negative associations — 5%
- Active efforts to remove barriers and exclusivity — 5%

Around our complex and interconnected world, the research community is advancing discovery for all of us. These illustrations celebrate some of the great minds who have helped advance discovery through history.
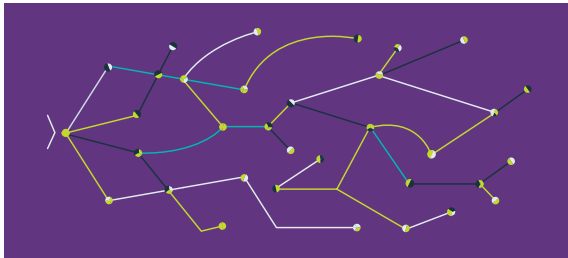
John Dewey (1859–1952)

John Dewey radically transformed fundamental approaches to teaching and learning. His ideas about progressive education emphasised the subjective quality of a student's experience and asserted that students must be invested in what they are taught; and prioritised learning through doing and experiencing and participation in classroom democracy.

For Dewey, the purpose of education was the realisation of one's potential and the ability to use those skills for the greater good within society. Dewey's emphasis on progressive education has had a vital and enduring influence on pedagogy, psychology and philosophy, revolutionising how we teach and learn.

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