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Changing the Culture of Peer Review for a More Inclusive and Equitable Psychological Science

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Peer review is a core component of scientific practice. Although peer review ideally improves research and promotes rigor, it also has consequences for what types of research are published and cited and who wants to (and is able to) advance in research-focused careers. Despite these consequences, few reviewers or editors receive training or oversight to ensure their feedback is helpful, professional, and culturally sensitive. Here, we critically examine the peer-review system in psychology and neuroscience at multiple levels, from ideas to institutions, interactions, and individuals. We highlight initiatives that aim to change the normative negativity of peer review and provide authors with constructive, actionable feedback that is sensitive to diverse identities, methods, topics, and environments. We conclude with a call to action for how individuals, groups, and organizations can improve the culture of peer review. We provide examples of how changes in the peer-review system can be made with an eye to diversity (increasing the range of identities and experiences constituting the field), equity (fair processes and outcomes across groups), and inclusion (experiences that promote belonging across groups). These changes can improve scientists' experience of peer review, promote diverse perspectives and identities, and enhance the quality and impact of science.

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Public Significance Statement
The peer-review process is a crucial aspect of scientific research that influences the quality of published work and the career trajectories of researchers. This article critically examines the current peer-review system, highlighting initiatives that aim to foster a more constructive, inclusive, and equitable review culture. By embracing these changes, the scientific community can better support diverse perspectives, enhance research quality, and create a more inclusive environment for scientists from all backgrounds. Implementing these recommendations holds the potential to benefit not only individual researchers but also the broader scientific enterprise and society as a whole.

Keywords: peer review, racial disparities, gender disparities, systemic bias, culture cycle

Consider these scenarios: A Black PhD student's paper on racism in social perception is desk rejected by a top social psychology journal, whose editor suggests "your focus on race is better suited for a specialist journal." A reviewer of a paper on gender bias in voting decisions writes, "this work is ideologically motivated, and therefore cannot be trusted." A paper is rejected at a second journal, and its first-generation early career author decides they need to prioritize other aspects of their job and never resubmits the paper elsewhere. A graduate student receives a revise-and-resubmit decision, but it is written so harshly that she does not realize it is actually good news.

Readers will see different levels of bias across these scenarios, but each reveals the potential for the current culture of peer review to create and perpetuate disparities in who continues in science and in what the topics and methods of that science look like. In this review, we turn a critical and constructive eye to the process of peer review in an effort to understand the systemic biases that are built in—intentionally or unintentionally—to its normative practices and policies. Peer review as a system deserves this attention not only for its problems but for its potential: For example, a longitudinal study of early career authors from several countries revealed that these authors readily name peer review as positively contributing to the development of their work, even as they experience difficulties (Rodríguez-Bravo et al., 2017). This finding suggests that even though peer review involves a great deal of rejection, these "negative" outcomes can be experienced as part of a positive, constructive process. To more fully realize the promise of peer review for a broader range of scholars and scholarship, we examine how the current culture of peer review can produce disparities in experiences and outcomes of historically excluded groups, and we point toward actions for change.

We write as Reviewer Zero (www.reviewerzero.net), a coalition of faculty and graduate students in psychology and neuroscience. We formed Reviewer Zero in Summer 2020 to address the need for greater equity in the peer-review process in psychology and related fields. In contrast to the dreaded "Reviewer 2," Reviewer Zero envisions a "reset" of peer-review culture in which the reviewing process primarily serves a formative rather than gatekeeping function. We also write as authors, reviewers, and editors who recognize that science is an inherently challenging process, where being wrong (and others pointing out where we are wrong) is essential to discovery. We do not advocate for "lowering the bar" or accepting articles indiscriminately. Rather, we aim to promote a more constructive and inclusive approach to peer review that simultaneously upholds the high standards of scientific research while fostering a supportive environment for a diverse set of scientists and topics.

Here, we seek to shed light on relationships between (a) normative peer-review processes and (b) disparate experiences and outcomes of minoritized groups.[1] As we detail, peer-review processes are essential to understand because of disparate outcomes. But there is also an urgent need to investigate peer review because of disparate experiences. It is not just that fewer papers or grants by members of historically excluded communities are accepted/funded (although that would be sufficient reason to act). Harsh or unprofessional reviews are commonly experienced by academic scholars (Silbiger & Stubler, 2019), and these problematic reviews are particularly demoralizing for minoritized groups, as we detail below. Trainees' experiences with peer review can thus contribute to their decisions to stay in the science, technology, engineering, and math (STEM) pathway, or to pursue other career paths. Peer review thus must be examined with an eye to diversity (does peer review contribute to increasing the range of identities and experiences constituting the field), equity (are outcomes and processes equitable across groups), and inclusion (does peer review offer experiences of fit and belonging across groups).

Constraints on Generality

We note from the outset that our analysis is primarily applicable to the current peer review system in psychological and neuroscientific research in the United States. The target populations for this analysis include researchers, reviewers, editors, and institutions involved in the peer-review process in psychology and neuroscience, with the hopes that the framework presented here will also be accessible and relevant across various disciplines. Although we are limited by the U.S.-based context that dominates available evidence, we anticipate that the core processes highlighted here are likely to occur in different cultural contexts: Researchers who deviate from some perceived or imagined norm shaped by powerholders in that society will be underserved by status quo systems. In some cultural contexts, inequities will manifest in similar ways as in the United States (see, e.g., Bornmann et al., 2007 for a review of biases favoring men in European as well as North American granting agencies). In other cultural contexts, inequities will manifest in distinct ways (e.g., based on caste). Mitigating inequities directed at identities

[1] We use minoritized or underrepresented to refer to groups who lack numerical representation in certain fields, contexts, and opportunities. We use the terms marginalized or underserved to speak to communities who are left out from current systems or positions of power, even if they are well-represented numerically, or if their representation is not documented.

beyond those explored here requires understanding the power structure within particular cultures.

We also note that we primarily focus on race and gender disparities, because the bulk of the evidence to date focuses on these groups (typically in isolation from each other). Where possible, we include data from intersectional identity groups or from other marginalized groups. In line with an intersectional perspective (Cho et al., 2013; Cole, 2009; Crenshaw, 1991), we seek to understand both how marginalized groups experience different barriers and impacts in psychology and neuroscience and how interlocking systems of oppression serve to reinforce the position of those already in power. As we move forward, it is important to note that the effectiveness of proposed initiatives may vary across different countries, research fields, cultural contexts, and stages of career development. Therefore, the generalizability of any specific recommendation may be limited in certain scenarios; we instead urge individuals to consider how the goals outlined here can be fulfilled with strategies appropriate to specific contexts and stakeholders.

The Status Quo Is Failing

Science needs to evolve and advance, and the path to a more robust, innovative, and useful science requires the active engagement of researchers from diverse backgrounds and identities (AlShebli et al., 2018; Lewis, 2021; Nielsen et al., 2017; Ruzycki & Ahmed, 2022; Yang et al., 2022). Numerous indicators demonstrate gender and race disparities in who engages in and advances in psychology and neuroscience, particularly in research-intensive careers. For example, the current system that privileges White individuals affects pathways to and gatekeeping of graduate admissions and faculty jobs (De Los Reyes & Uddin, 2021). Attrition from psychology doctoral programs occurs at a higher rate for Black or African, Hispanic or Latinx students than White or Asian students (Callahan et al., 2018). Racial disparities exist in grant funding (Chen et al., 2022; Ginther et al., 2011, 2018; Nguyen et al., 2023; Taffe & Gilpin, 2021), with at least some of the disparities in National Institutes of Health (NIH) funding arising from the grant criterion scores assigned by reviewers (Erosheva et al., 2020) as well as reviewer decisions about which grants to discuss and what research topics are preferred (Hoppe et al., 2019). Across STEM fields, gender and race disparities have been documented in citation practices (Bertolero et al., 2020; Kozlowski et al., 2022; Liu et al., 2023). Women compared to men in psychological science secure fewer tenure-track positions and earn lower salaries, among other gaps (Gruber et al., 2021).

Given disparities in who advances in science, there is an urgent need to understand and change current practices that may push minoritized scholars out of STEM fields (De Los Reyes & Uddin, 2021). We contend that peer review is central for creating and maintaining group disparities, because disparities in many domains related to peer review—funding, publication, citations—accumulate into larger disparities in who enters, stays, and advances in scientific careers.

Peer-review processes can contribute to disparities through multiple processes we elaborate below, but we note that systemic bias in peer review does not require individual implicit or explicit bias (see Sato et al., 2021 for a review of individual and systemic bias contributing to gender disparities in grant funding). Actions that create and perpetuate group disparities may not necessarily be intended by individual actors. Nevertheless, individuals who participate in the current system may contribute to the exclusion of marginalized scholars because the system itself will favor the qualities associated with its designers. Without critical attention to how the system is biased to recreate the values and images of its creators, so-called objective measures of merit can only produce a narrow field of knowledge.

Some have argued that peer review as it is currently practiced is a "failed experiment" and should be abolished (e.g., Heesen & Bright, 2021; Mastroianni, 2022). Yet there are both principled and pragmatic reasons to iterate the current system rather than abandon it. In principle, the expert and constructive input of peers can contribute to building a more robust and high-quality science. Pragmatically, abolishing any cultural system is difficult, particularly without consensus about what its replacement should be. In the near term, we expect that peer review will continue to be a key part of how academics are evaluated for hiring and promotion; given this, we focus here on how the system can be improved rather than replaced. Discussion of what an alternative to a peer-review system might be is beyond the scope of the current article.

How Does Peer Review Contribute to Disparities?

We explore peer review as a critical site for intervention to reduce group-based disparities in psychological science (Buchanan et al., 2021a). The culture of science is shaped by the identities of those who built it (i.e., economically advantaged, White, cis-male individuals; Buchanan et al., 2021a; Garay & Remedios, 2021; Ledgerwood et al., 2022; Lewis, 2021; Stanley, 2007; Thomas et al., 2023). Within psychology and neuroscience, the overrepresentation of people from Western, educated, industrialized, rich, and democratic (WEIRD) societies shapes the way research is done, who does the research, and which populations and questions are studied. The current system of centering White experience also affects the composition of participant samples (Avery et al., 2022; Henrich et al., 2010), the identities of the researchers who conduct and publish the findings of such research (Roberts et al., 2020), and the research topics pursued and published (Avery et al., 2022; Kozlowski et al., 2022; Settles et al., 2021; Syed et al., 2018). The dominance of the majority White perspective also shapes what counts as "good" science, such that studies of racism, sexism, or group disparities, and their impact on psychology, are deemed to be ideologically motivated rather than based on high-quality, concrete, and systematic evidence (e.g., Brown et al., 2022; Handley et al., 2015; Roberts, 2022). Consequently, the accepted values and practices in science can serve as roadblocks and barriers to the inclusion and advancement of minoritized scholars working on topics that are not prioritized by the majority White perspective.

Here, we first review evidence—from our work and others'—that negative peer-review experiences hold the potential to disproportionately harm scholars from underrepresented and marginalized communities. We then critically evaluate the current peer-review culture at multiple levels, from ideas and institutions to interactions and individuals. Next, we highlight ongoing initiatives that seek to improve peer review, from broader cultural ideals to specific individuals' actions. We conclude with a call to action, describing what institutions, editors, and reviewers can do to promote an inclusive and equitable culture in peer review. We consider how strategic, evidence-based, scalable interventions can help improve recruitment and retention of minoritized scholars in psychology, shift peer review practices and the opportunity for minoritized trainees to

successfully navigate peer review, and ultimately transform the scientific review culture.

Disparate Experience and Impact of Negative Peer Review

Forms of Bias in Peer Review

Ideally, peer review is a system promoting impartial evaluation where scientists self-regulate the evidence that is integrated into cumulative knowledge. Practically, impartiality is threatened by numerous biases, and so the self-regulation of evidence is threatened (e.g., Lee et al., 2013). Peer review is susceptible to bias in different forms, and at different stages in the process. Here we review numerous individual-level biases enacted by actors within peer review, but there are also systemic biases that occur given policies, practices, or positions that advantage some groups and disadvantage others (see Sato et al., 2021). Examples of individual bias are many: Reviewers are subject to confirmation bias (positively evaluating evidence that supports their preexisting views), negativity bias (focusing disproportionately on flaws rather than strengths), or overconfidence bias (inflating certainty about their opinion or expertise; King et al., 2018). Subtle biases can emerge in the use of nonneutral language (Parsons & Baglini, 2021): Statements that are in actuality subjective may be phrased as objective truth, without adequate acknowledgment of the reviewer's own subjectivity (e.g., "This paper is uninteresting" vs. "This paper is uninteresting to me").

Systemic biases can occur even if individual reviewers or editors act with fairness, if accepted practices favor some groups' experiences, presumed characteristics, or topics of study. For example, peer-review criteria that focus on the caliber of the scientist might contribute to gender disparities in funding success (Witteman et al., 2019), particularly if male advantage compounds so that male scientists possess greater resources. Furthermore, a threat to impartiality in the review process can be widely accepted, such as valuing or devaluing of certain topics or methods (King et al., 2018; Roberts, 2022; Roberts et al., 2020). Cognitive particularism (Travis & Collins, 1991) can lead traditionally accepted topics and methods to be seen as more meritorious or important, as we detail more below. Group disparities in manuscript placement in mainstream journals can therefore occur when underserved individuals are overrepresented in topics or methods that are outside of or complementary to mainstream psychology and neuroscience (e.g., epistemic exclusion, Settles et al., 2021). Subdisciplines of psychology that have a greater representation of editors and authors who are people of color (POC) tend to publish more research focusing on race (Roberts et al., 2020). Elevating some topics over others in journal pages corresponds to elevating some groups over others in scientific careers. Yet even when less-privileged topics are published in prestigious journals, their authors are disproportionately White (e.g., race-related articles published in prestigious psychology journals were more likely to be written by White authors than authors of color; Roberts et al., 2020). Furthermore, the impact and evaluation of research differ by author status: Work that is attributed to high-status authors is evaluated more favorably than identical work attributed to low-status authors (Huber et al., 2022), consistent with the "Matthew effect" where more eminent scientists receive disproportionate credit for collaborative work (Merton, 1968).

Another form of bias in the system is homophily based on author, reviewer, or editor identities (e.g., gender, race, country). For example, an analysis of *Frontiers* articles found that women editors were more likely to appoint women as reviewers, and women reviewers were more likely to review the manuscripts of women authors (Helmer et al., 2017). Homophily can be associated with manuscript outcomes: Authors who shared gender or country with reviewers were more likely to have their papers accepted (Murray et al., 2019).

Finally, a key way in which a system can perpetuate inequities in outcomes is when equivalent inputs produce disparate impacts. Here, a focal inequity is that unprofessional or hostile reviews exert a disparate impact on minoritized scholars. A growing body of research has documented unprofessional behavior in peer review (e.g., Gerwing et al., 2020). In a recent survey of over 1,100 scholars from a range of academic ranks (from masters student to full professor) and from a range of STEM fields, over half of the participants responded that they have received an unprofessional peer review (Silbiger & Stubler, 2019). Although survey respondents in different identity groups reported equivalent rates of receiving unprofessional reviews, members of underrepresented groups (women, nonbinary individuals, and POC) reported a disproportionate negative impact of these unprofessional reviews on their perceptions of their own aptitude, productivity, and career advancement. The impact of peer-review harshness may be amplified by identity threats when minoritized scholars are seeking cues about whether their work is judged impartially and whether their identities are respected in specific contexts (e.g., Park et al., in press; Purdie-Vaughns et al., 2008; Steele et al., 2002). For example, evaluative contexts can cue stereotype threat, in which an individual fears confirming a negative stereotype of their group, leading to anxiety, cognitive load, and underperformance on the stereotype-relevant task (Steele & Aronson, 1995).

In sum, peer review is a core scientific practice that affects who wants to stay, and who is able to stay, in research-focused careers. Yet the process of peer review is vulnerable to a range of biases—some that may not be explicitly known or intended (e.g., homophily effects in selecting reviewers), and some that may be assumed as valuable norms or standards in the field (e.g., valuing of specific topics and methods). It is essential to acknowledge that the system of peer review can produce disparate and unfair outcomes, even if individual actors intend to or actually do act fairly: Even a neutral input to a biased system will create a biased outcome.

Survey of Peer-Review Experiences in Psychology and Neuroscience

To examine self-reported experiences with peer review among early career researchers in psychology/neuroscience, we conducted a survey in Fall 2020. We surveyed individuals in academic positions in these fields (from undergraduate students to assistant professors) about their experiences with peer review. The survey (available at https://osf.io/u2d9j) was distributed via a variety of channels (university and community listservs, social media), with the goal of understanding the self-reported needs of individuals underserved by the status quo, especially with regard to the peer-review process. We explicitly note that this sample is deliberately nonrepresentative: We encouraged input from individuals who identified as underserved by the current system, and they self-selected into the study. Yet these individuals are precisely the ones who need to be heard to better understand how underserved individuals are experiencing and making sense of peer review.

We found (detailed results and methods at https://osf.io/jqy4k) that underserved individuals (i.e., those who identified as POC or female or nonbinary) reported significantly more negative

experiences and fewer positive experiences during peer review (unpublished data; total $n = 583$; 164 female/nonbinary POC; 265 female/nonbinary White; 49 cis-male POC; 80 cis-male White). For example, POC reported receiving less helpful feedback in reviews (particularly POC cis-males; 1–10 scale, 10 = *every review I have ever received has contained helpful feedback*; POC cis-male *M*: 6.5; White cis-male *M*: 7.1; $d = 0.50$). Furthermore, female/nonbinary respondents were more likely to: (a) report reduced belonging in science (1–10 scale, 10 = *my experience has definitely increased my sense of belongingness in science*; female/nonbinary *M*: 5.2; cis-male *M*: 5.8; $d = 0.32$); (b) become less confident about their work (1–10 scale, 10 = *my experience has made me much more confident about my work*; female/nonbinary *M*: 5.6; cis-male *M*: 6.2; $d = 0.30$), and (c) attribute negative reviews to themselves (e.g., lack of ability) rather than the reviewer (e.g., misunderstanding = 9 on 1–9 scale; female/nonbinary *M*: 5.7; cis-male *M*: 6.0; $d = 0.24$).

We also examined open-ended responses for more in-depth understanding of these experiences. In response to a question about their most memorable peer-review experiences, underserved trainees reported: (a) receiving harsh feedback about the quality of their work (e.g., the worst a reviewer has ever seen); (b) feeling demotivated and questioning whether they belong in science; (c) permanently abandoning projects after receiving critical peer reviews; (d) reviewer comments that question the existence of racism and microaggressions and/or the value of studying these issues; and (e) critical comments about their use of the English language.

The results of this survey of peer-review experiences echo the negative experiences reported in other fields (Silbiger & Stubler, 2019) and suggest that reform of peer review in psychology/neuroscience may help to promote the retention and inclusion of individuals from a range of identities. Any group-based differences documented here are likely to be an underestimate compared to what might be found in a representative sample, given that most respondents in this survey identified as underserved in some way.

Section Summary

Peer review is an integral part of academia—dissemination of findings via publishing in academic journals and allocation of grant funding both depend critically on the peer-review process. Despite the centrality of peer review to scientific processes, career success, and belongingness in science, learning how to engage with peer review remains part of the "hidden curriculum" (Calarco, 2020; Palminteri, 2023) that is not explicitly taught or discussed. Few people receive formal training in peer review (D'Arcy & Salmons, 2021; Hall et al., 2019; Publons, 2018), and there is rarely oversight to ensure that reviewers provide feedback that is constructive, helpful, professional, and culturally sensitive (i.e., delivered without further marginalizing underserved or minoritized scholars). Yet this vacuum of deliberate engagement also provides an opportunity for innovation. To support the intentional reconsideration of established systems and norms for greater equity, we next examine peer-review processes as a culture cycle.

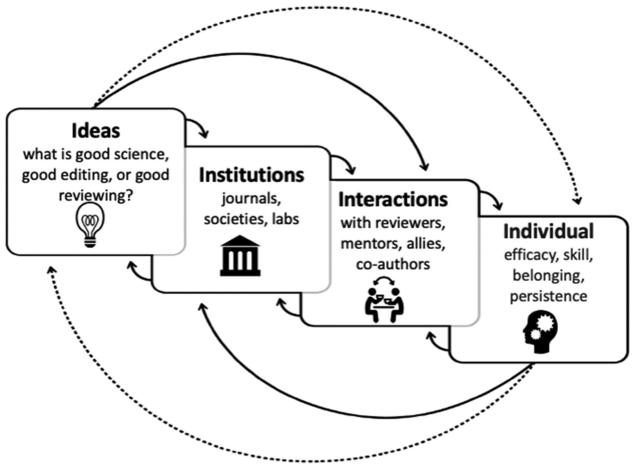
Examining Peer-Review Processes From a Culture Cycle Perspective

Disparities in scientific outcomes and experiences will not be closed simply by attempting to shift minoritized individuals to accommodate to the dominant culture. Instead, the culture needs to shift. Clear evidence of this need is demonstrated in an analysis of racial disparities in NIH funding: "all three of the factors that underlie the funding gap—preference for some topics over others, assignment of poorer scores, and decision to discuss an application—revolve around decisions made by reviewers" (Hoppe et al., 2019). Furthermore, reviewers' less favorable assessment of women principal investigators—as opposed to less favorable assessments of the proposed science—seems to drive the gender gap in funding (Witteman et al., 2019). Cultural change to close disparities means shifting the definition of what good science is, who decides what good science is, who is perceived to do good science, and the process by which science improves.

Here, we examine peer-review processes from a culture cycle perspective (Cheryan & Markus, 2020; Hamedani & Markus, 2019; Markus & Conner, 2014; Markus & Kitayama, 2010). Under this framework (Figure 1), institutional systems (e.g., peer review) interact with individual actors (authors, reviewers, editors). This culture cycle perspective is important both in understanding the current status quo and in understanding how to effectively initiate change. Initiatives to change culture will more likely succeed if they incorporate action at

Figure 1

Cultural Change Proceeds at Multiple Levels



Note. Ideas for change are more likely to succeed if they incorporate action at multiple levels. Institutional systems (e.g., peer-review processes implemented by journals) must interact with individual actors (e.g., editors, reviewers) who consider the broader culture in which the system is implemented. Figure adapted with permission from "Masculine Defaults: Identifying and Mitigating Hidden Cultural Biases," by S. Cheryan and H. R. Markus, 2020, *Psychological Review*, *127*(6), pp. 1022–1052 (https://doi.org/10.1037/rev0000209). Copyright 2023 by the American Psychological Association; "Understanding Culture Clashes and Catalyzing Change: A Culture Cycle Approach," by M. Y. G. Hamedani and H. R. Markus, 2019, *Frontiers in Psychology*, *10*, Article 700 (https://doi.org/10.3389/fpsyg.2019.00700). Copyright 2019 by Hamedani and Markus; *Clash!: How to Thrive in a Multicultural World* (p. 320), by H. R. Markus and A. L. Conner, 2014 (https://www.penguinrandomhouse.com/books/308774/clash-by-hazel-rose-markus/). Copyright 2023 Penguin Random House; "Cultures and Selves: A Cycle of Mutual Constitution," by H. R. Markus and S. Kitayama, 2010, *Perspectives on Psychological Science*, *5*(4), pp. 420–430 (https://doi.org/10.1177/1745691610375557). Copyright 2023 by the American Psychological Association.

multiple levels, and initiatives that do not take into account broader culture may backfire (Hamedani & Markus, 2019).

Table 1 contrasts the current peer-review culture to what an inclusive and equitable culture of peer review might look like. Below, we discuss the current and ideal future of peer review in more detail, at each level of cultural change: ideas, institutions, interactions, and individuals.

Ideas

What are the normative and widely accepted beliefs and values about peer review? First, we note that peer review is an inherently critical process where editors and reviewers are tasked with identifying weaknesses and strengths of manuscripts. The critical focus of this task can contribute to the normative negativity of peer review, or a shared tendency to disproportionately focus on flaws rather than strengths (Table 1, interactions in current culture). Added to this, peer review is typically construed as serving a gatekeeping function, in which the editors and reviewers judge what manuscripts are above or below the threshold for that particular journal. Such a gatekeeping function is necessary for identifying research that is flawed or poorly conducted—but gatekeeping can also be delivered or be perceived as an attack on an individual and their place in science. In contrast, a different view of peer review focuses on its developmental function: That the reviewers and editor work with authors to highlight strengths and to mitigate weaknesses in the work, with the end goal of improving the contribution of the manuscript. These different functions align with fixed versus growth mindset organizational cultures (e.g., Murphy & Dweck, 2010). A gatekeeping function is a hallmark of fixed mindset culture, in which individuals either possess ability or do not possess ability, and an evaluator's task is to determine and monitor the threshold. In contrast, a developmental purpose aligns with growth mindset culture, in which all individuals are seen as capable of developing skill, and an evaluator's task is to help cultivate that progress. In business and educational contexts, growth mindset organizational cultures are associated with substantial benefits, including increased employee commitment and trust (Canning et al., 2020). Especially relevant is that individuals asked to think about entering a growth-oriented organizational culture respond more proactively to critical feedback (Emerson & Murphy, 2015).

The ideals and values of peer review are in service of the ideals and values of science, because these ideas shape what reviewers and editors evaluate positively and negatively when considering manuscripts. As a consequence, understanding the culture cycle of peer review also requires inquiry into the ideals and values of the science that is the focus of peer review. As we noted early in the paper, contemporary psychological science and neuroscience were created and enacted by a privileged elite, and the topics, methods, and samples that predominate currently reflect a narrow slice of potential questions and epistemologies. The consequence is that research that examines questions or uses methods outside of the dominant mode can be devalued as lesser-quality science, even if the potential contribution is quite high. This epistemic exclusion (Settles et al., 2021) is a form of disciplinary bias where certain topics or methods are disadvantaged; because these topics are frequently pursued by minoritized scholars, this disciplinary bias can perpetuate group disparities. Indeed, Settles and colleagues found that women and faculty from minoritized groups (Black, Latinx, and Native American) report more scholarly devaluation of their research. Perceiving scholarly devaluation is associated with lower job satisfaction and perceptions of a more negative climate, which are associated with turnover intention. Notably, scholarly devaluation predicts negative outcomes across identity groups, but women and faculty from minoritized groups are more likely to experience it. It is important to note that disciplinary bias can be subtle, and does not always appear as uniform devaluation: For example, in archival analyses in the organizational psychology literature (King et al., 2018), diversity-related manuscripts were as likely to be accepted as other papers if they reached three rounds of review; however, diversity-related papers were evaluated more negatively in initial rounds of review and thus less likely to reach that stage.

The logical corollary of epistemic exclusion is that other topics are preferentially included. The term cognitive particularism describes the tendency to favor research topics and questions like one's own, leading to favorability toward work that is similar to the reviewer's (Travis & Collins, 1991). Research that focuses on dominant questions or employs dominant methods is likely preferred because it aligns with the perspectives, training, and expertise of the majority. Majority or dominant groups' topics or methods can be favored in both overt and subtle ways. For example, research on

Table 1
The Cultural Change Framework Applied to the Peer-Review System

Level of cultural change	Current culture	Inclusive and equitable culture
Ideas	Reviews serve gatekeeping function	Reviews serve constructive, formative function
	Excellent science means dominant topics, methods, samples	Excellent science requires diversity of topics, methods, samples
Institutions	Journals seen as more versus less prestigious, with intense competition to publish in certain journals to improve chances of obtaining jobs and grants; this perpetuates the gatekeeping function of peer review	Quality of science should be assessed directly through examination of the work, rather than through flawed proxies, for example, journal names and impact factors
	Journal/grant review processes are "black box" for trainees, with little to no training or discussion of peer-review processes	Illuminate hidden curriculum and provide training/discussion in constructive, rather than gatekeeping, review
Interactions	Reviewer/author interaction is anonymous; norms for negativity	Formative and constructive reviews
	Inequitable opportunities to contextualize reviews	Systematic opportunity to contextualize reviews
Individuals	Negative experiences and outcomes are common	Positive and supportive experiences are the norm
	Reviewers/editors write negative, depersonalized reviews	Reviewers/editors engage in more formative and personalized feedback
	Reviewers are gatekeepers	Reviewers are allies and role models

multiracial psychology continues to center Whiteness in multiple ways, such as assuming Whiteness as an unspoken standard or focusing disproportionately on perceptions or attitudes of White perceivers (Garay & Remedios, 2021). Archival analyses show that the race-related research published in prestigious cognitive, social, and developmental psychology journals is predominantly authored by White individuals (Roberts et al., 2020). It is essential to be aware that such preferences yield advantages if research focusing on dominant questions or employing dominant methods is perceived as more valuable.

A manifestation of disciplinary bias is that certain topics or populations of study may be deemed too "narrow" for high-profile journals, and instead authors of such work may be advised to pursue publication in "speciality" journals (Roberts & Mortenson, 2023). The perception of some journals as more prestigious than others, and the tendency of those journals to prefer some methods and populations of study over others, can lead to a feedback loop that reinforces both those journals and those methods of study—with consequences for how reviewers may perceive their role in the peer-review system.

Normative focus on the perceived prestige of journals—related to metrics such as the (flawed) impact factor (Brembs et al., 2013) and exclusivity (percentage of papers desk rejected vs. reviewed vs. published)—may contribute to how reviewers and editors perceive the primary function of reviews as determining whether a paper is good enough or novel enough to merit publication in a given journal (Brembs, 2019). This may lead to up-weighting of factors such as a study's perceived novelty, its riskiness, and how surprising the results are—factors that may be unrelated, or potentially even negatively related, to the reliability of the science (Brembs, 2019; Brembs et al., 2013). Indeed, journal impact factors are either uncorrelated (Brembs et al., 2013) or negatively correlated (Fraley & Vazire, 2014; Szucs & Ioannidis, 2017) with the statistical power of published studies. Acknowledgment of the limitations of impact factors has led to calls for more valid, fair, transparent, and reproducible approaches to indexing journal quality that take into account the range of functions of journals (i.e., registering, curating, evaluating, disseminating, archiving; see Wouters et al., 2019).

The perceived prestige of journals in which one publishes can in turn have consequences for one's career, such as likelihood of obtaining jobs, being promoted, or obtaining funding. For example, applicants to STEM faculty positions have more on-site interviews and job offers if they have a paper in *Cell*, *Nature*, or *Science* (Fernandes et al., 2020). Furthermore, at least part of the NIH funding disparity between Black and White principal investigators relates to differences in the impact factors of journals that publish their work (Ginther et al., 2018). These ideas about what good science is are enacted through institutional training, hiring, and promotion practices; changing peer-review culture will require change at the level of university and departmental hiring practices, which frequently use journal impact factor or reputation as a proxy for the quality of science.

Institutions

In considering the culture of peer review, relevant institutions include journals, professional societies, academic departments, and even faculty-led research groups. In general, the institutional level includes a wide range of organizational units, including more and less formal entities that engage in policies and practices that translate between ideas to interactions and individual experiences.

Institutional policies and practices reflect certain ideas about what good science is, or what good reviewing entails. For example, funding agencies are institutions that influence what topics and methods are highlighted in calls for proposals, in the allocation of funds to certain programs, and in appointing program officers. One safeguard to the cognitive particularism that perpetuates a narrow view of good science is to ensure support for funding agencies that employ a range of perspectives and priorities as well as evaluation methods (Travis & Collins, 1991). This strategy of diversification of resources can work against the tendency to perpetuate narrow assumptions about good science or good methods of evaluation.

Likewise, journals are institutions that state their aims and scope, and select editors who write editorials conveying their principles and values. Institutional practices at journals have important consequences for the type of work that is perceived as rigorous or valuable. Many practices at journals focus primarily on gatekeeping, that is, deciding which papers are appropriate for the aims of the journal or meet its definition of good science. Such gatekeeping may be done without adequate attention to the potential biases in the system or the development of papers through the editorial process. Without explicit guidelines about reducing bias or developing manuscripts, the normative focus on gatekeeping can perpetuate and exacerbate disparities in who publishes or receives funding. For example, several analyses have shown that women authors are underrepresented in invited submissions to high-impact psychology journals (relative to the proportion of women associate and full professors at high research activity [R1] institutions; Mackelprang et al., 2023).[2]

Professional societies and departments are institutional spaces that can enact policies and practices centered on peer review. Although some societies in psychology, neuroscience, and related fields provide options for peer-review training (see "Ongoing Initiatives" for further discussion), many others do not. Departments typically neither train nor incentivize high-quality reviewing among faculty, postdoctoral scholars, or graduate students. There are three separate but related issues here: Lack of training, lack of accountability and transparency, and lack of incentives for high-quality reviewing and editing (leading to reliance on unpaid labor).

Training and Skill Development

The gatekeeping function of peer review, upheld by current ideas and institutions, is partly due to the "black box" of peer review, reflecting a lack of training. New reviewers and editors rarely receive training or input to develop their skills. In part, this lack of training reflects a high level of trust in their expertise, and certainly, no training could completely prepare reviewers and editors for the range of challenges they will face. Yet, editorial and reviewing roles require skills that are separable from the skills needed to become a good creator of scientific knowledge. Developing reviewers' and editors' capacities to weigh different perspectives, communicate clearly, and cultivate excellent scientific output from a diverse range of

[2] The Carnegie Classification of Institutions of Higher Education (2023) awards R1 status to universities that meet benchmarks in research activity and expenditures. Benchmarks include things such as the number of research doctorates awarded and the number of STEM research staff, among others.

authors would move our science forward. Within departments and labs, illuminating the hidden curriculum of peer review can happen in formal ways, such as assignments or courses related to writing good reviews, or informal ways, such as brown bags or lab meetings focused on navigating rejection or responding to reviews.

Because of the current culture of peer review, new editors or reviewers may see themselves as gatekeepers unless explicitly redirected to be constructive, encouraging, and empathetic—a reviewer who provides authors with the opportunity for growth, rather than hurdles to jump. This requires not only illuminating the hidden curriculum of peer review, but overturning current ideas about its function in scientific and academic institutions. Without explicit guidance or attention, the interactions among reviewers, editors, and authors hold the potential to perpetuate and exacerbate bias, as we examine in the next section (see "Interactions" section).

Accountability and Transparency

Institutional practices around accountability and transparency can contribute to greater procedural fairness of the review process. For example, White scientists are overrepresented on editorial boards, whereas scientists who are Black, Hispanic, Asian, and Pacific Islander are underrepresented (Liu et al., 2023). Professional societies or publishers who ostensibly value diversity, equity, and inclusion should be monitoring and sharing the diversity of their editorial boards and reviewers. Journals could examine and share the representation of authors at every stage (submission, initial decision, resubmission, acceptance). Elements of the process could be made explicit: For example, if a rejected manuscript could be considered as a new manuscript with additional data or extensive rewriting, the decision letter could state that. Editors could also explicitly state whether they are open to conversations with authors or not. In the absence of these explicit guidelines, it is left to individual authors to negotiate another look at their paper, and individuals from advantaged groups may be more likely to do so. For example, a meta-analysis of the tendency to initiate negotiations finds a small but significant effect (Hedges' $g = .20$) indicating that men are more likely to initiate negotiations than women (Kugler et al., 2018). Yet a strong moderator of this gender difference is situational ambiguity: When it is unclear whether negotiation is appropriate, men are substantially more likely to negotiate ($g = .47$) compared to when negotiation norms are clear ($g = .16$). This meta-analytic evidence parallels experimental evidence demonstrating that explicit policy statements can reduce gender disparities in requesting extensions for assignment deadlines. Here, an explicit policy statement about deadlines led to women and men requesting extensions at equivalent rates (Whillans et al., 2021). Overall, this research suggests that ambiguities in the peer review process are likely to exacerbate disparities if minoritized authors feel less comfortable negotiating rejection decisions or asking for extensions.

Incentives for Reviewing and Editing

Unlike various types of departmental and university service (e.g., serving on committees or in administrative roles), there is usually no workload reallocation or monetary compensation for peer review. Editors often receive some compensation, but frequently not at rates that justify the time and effort devoted to these roles. In part, this tradition comes from seeing science as operating on a gift economy, in which scientists dedicate their expertise to the collective good without being swayed by a profit motive. Yet, receiving little credit for reviewing (whether monetary or other) means that some actors may abuse the system by reaping the benefits (e.g., advancing their own careers through publication) but not contributing.

The mismatch between the current scientific culture's need for peer review and the absence of rewards for reviewing contributes to the current "crisis" in peer review (Flaherty, 2022): It is becoming increasingly harder for editors to find peer reviewers, which in turn leads to substantial delays in publishing work. Such delays can affect career progression for those at critical inflection points (e.g., looking for their next position or promotion or trying to obtain funding), further harming marginalized scholars who already face multiple hurdles. Individuals who do agree to review may be juggling multiple, often uncompensated, review commitments; when added to other demands on their time, the resulting stress may make it difficult to provide constructive, equitable reviews. Furthermore, power differentials between minoritized individuals who are invited to review and editors who send invitations might make it more difficult for those individuals to decline invitations, adding to an already overly high service burden for minoritized groups (Domingo et al., 2022; Rodríguez et al., 2015; Social Sciences Feminist Network Research Interest Group, 2017).

Interactions

One of the consequences of the "black box" or hidden curriculum of peer review is that key interactions are often not considered explicitly, and some possibilities for interaction are not known by early career scholars (e.g., negotiating with editors after a rejection). Here, we walk through the possible interactions in a typical manuscript submission both to level the playing field, given varying levels of experience with the peer review process, and to provide a foundation for the culture cycle analytic lens.

An author submits a manuscript to a particular journal, and that interaction might include a cover letter highlighting the fit of the work to the journal, or suggesting reviewers to approach or avoid. An editor provides an initial evaluation of the manuscript as to whether it should be externally reviewed or not (desk rejected). If the manuscript is considered suitable for external review, the editor invites reviewers—in part based on their expertise, and in part based on social networks, availability, conscientiousness, and a whole host of other factors. Biases can enter in at this stage: For example, an analysis of more than 26,000 articles published in top psychology journals between 1974 and 2018 found that White editors (relative to editors of color) were less likely to publish articles about race (Roberts et al., 2020). An analysis of editors and reviewers across a range of scientific fields showed clear homophily by gender in reviewer selection: Male editors tended to select male reviewers, and female editors tended to select female reviewers, and this homophily emerged across scientific disciplines that varied in their gender representation (Helmer et al., 2017). Similar biases can emerge when editors invite reviewers based on the citations in a manuscript, given evidence for gender and racial inequities in citation practices (Bertolero et al., 2020; J. D. Dworkin, Linn, et al., 2020; Kozlowski et al., 2022; Teich et al., 2022; see J. Dworkin, Zurn, & Bassett, 2020; Zurn et al., 2020 for review).

The peer review itself is an interaction between a reviewer and an author, and that interaction is framed by a communication from the editor in a decision letter. The decision letter ranges from clear rejection to a revise-and-resubmit decision to (much less frequently on

the first review) acceptance without revisions. As outlined by Day (2011), the high rate of rejection at most journals means that the experience of rejection is ubiquitous, but it is rarely discussed openly (e.g., see Jaremka et al., 2020). If a rejection is received, the author then decides their next step, which can include continuing to interact with this journal, moving on to another journal, or (perhaps too common) leaving the manuscript behind.

A key point is that each of these interactions can be construed differently by actors with different standpoints, different roles, different information, and different motives. For example, in the current culture, editors hold more power than authors in that their role requires them to decide whether the manuscript should go forward at the journal. Yet authors can and do adopt proactive strategies such as requesting specific action from editors or reviewers; although not all editors heed these requests, some do. Some journals formally ask for this information in the manuscript submission process, and some leave it up to authors to suggest in their cover letters. Furthermore, editorial decisions might lead to different author actions if a decision is perceived as "the final word" versus a conversation or negotiation. Some authors are more likely to contest editorial decisions or request another chance; some editors are more open to considering these requests. Even in the case of a clear rejection from a journal, some editors might suggest other outlets or provide encouragement about the potential contribution of the research program; this type of communication sends a more strongly growth-oriented message about the value of the research and the researchers than a message that simply states that the manuscript did not meet the threshold for publication in that particular journal.

Typically, the identities of peer reviewers are not known to authors, unless the peer reviewer chooses to sign their review and the journal allows reviewer identification. The anonymity of reviewers is important to preserve particularly because it allows reviewers with less power in the system to critique those with more power, without fear of retaliation. In a five-journal study of a pilot program for open-review policies (in which reviews were published along with articles), only 8.1% of referees opted to be identified in their published review, and these identification decisions were much more likely when the review was positive (Bravo et al., 2019). Similarly, an analysis found less harshness in reviews for open-review biomedical journals, compared to a convenience sample of confidential reviews (Le Sueur et al., 2020). Although anonymous review holds value to protect vulnerable reviewers, its downsides should also be considered: Anonymity affords a harsher critique, and anonymity can lead to more aggressive or hostile responding (e.g., Zimmerman & Ybarra, 2016). Paired with the normative negativity of peer review, this anonymity can result in reviews that cause demoralization rather than provide constructive criticism. Reviewers who write anonymous reviews, and editors who deliver such reviews, can counteract the downside of anonymity by writing feedback that aligns with what they might share with an author face to face and revise or flag language that is unduly harsh.

Another potential interaction relevant to peer review is discussing the reviews that authors have received with others—mentors, coauthors, or peers. Such discussions can be useful in contextualizing the feedback, venting frustrations, and identifying the next steps. Early in training, authors are likely coauthoring with advisors or other mentors, and these mentors offer a valuable opportunity to put the reviews in context—that is, to flag inappropriate content, to offer perspective on the critiques, or to highlight concrete actions that could be taken from the review. Perhaps most important, mentors with more experience in the peer-review process can reassure newer authors that negative critiques may not be personal, may not be accurate, and are unfortunately encountered by everyone who submits work to peer review. Not all advisors will engage in this contextualization, and thus many early career researchers may interpret negative peer review as a diagnostic of their potential in the field, when in fact it is not. Furthermore, there may be a continued need to process and interpret reviews with the benefit of more objective eyes, but norms for independence may make early career researchers less likely to share their reviews—particularly harsh ones—with advisors, mentors, or colleagues who are not coauthors on the work.

Individuals

A wide range of individual-level processes contribute to inequities in peer review. It is important to note that these processes do not require individuals to intend to or even to be aware that their actions might result in inequitable outcomes. Indeed, individuals may be quite motivated to eradicate inequities, and yet their actions might contribute to inequities given the larger system. Importantly, however, individual actors vary in the level of power they hold in the system (and thus their ability to enact change at institutional levels). We focus here both on authors who navigate peer-review systems, as well as reviewers and editors who enact peer review.

As reviewers and editors, individuals are strongly predisposed to favor research results that align with their own expertise and expectations (Mahoney, 1977). One striking empirical demonstration of how judgments of scientific merit are moderated by group membership comes from Handley et al. (2015), who asked participants to provide an evaluation of an actual scientific abstract reporting gender bias in STEM. Male evaluators rated the research as lower quality than female evaluators, and male faculty in STEM especially rated the research quality poorly. Furthermore, an experiment that only varied the conclusion of the abstract (that gender bias was documented or was not documented) found that male evaluators' tendency to downgrade the research quality only emerged in the gender-bias condition. What evaluators see as "high-quality" evidence—or a novel contribution, or innovative methods—is therefore influenced by their own values and position. Indeed, acceptance rates are higher when reviewers and editors share gender or country identities with authors (Murray et al., 2019). Thus, although ideally the reviewer's task is to assess the scientific merit of the submitted manuscript, in reality, these assessments are influenced by one's own values, identities, and expectations. These empirical findings showcase how critical it is to have a diverse range of scholars participate in peer review—otherwise, the perspectives of only the dominant group will shape the assessment of submitted work.

The actions of reviewers and editors provide both opportunities and constraints to authors, and authors' own values, position, and experience will influence their actions. Authors interpret reviews and editorial decisions from their own standpoints, which are likely influenced by their history in authoring manuscripts, their sense of trust in the peer-review system, and their vulnerability to identity threat.

If a system is designed around the needs of a particular set of people, the goals, processes, and outcomes of that system will contribute to favorable consequences for that group—whether the actors in the

system intend for this to happen or not (e.g., Pérez, 2019). In this way, an editor who considers themselves "unbiased" may still contribute to disparate outcomes because the system of value in research favors particular groups and topics. Furthermore, even in the hypothetical case where feedback is equivalently negative toward two authors, that negative feedback can translate to disparate impact if one of those authors is contending with questions of identity threat (e.g., Murphy & Taylor, 2012). If biases in the system signal to one of the authors (but not the other) that they do not belong in science (e.g., their identities are numerically underrepresented, their ideas are questioned in other settings), then the "unbiased" review can contribute to disparate psychological experiences, and ultimately to unfair outcomes.

Section Summary

Invoking a culture cycle framework allows actors within the peer-review system to understand the multiple and intersecting ways that the current peer-review culture can create and perpetuate disparities in who engages in and advances in psychology and neuroscience. Understanding the many levels where systems of value are communicated and reinforced also provides an opportunity to question these values and to introduce new ideals. A cultural cycle framework provides insight into why change is hard, but it also provides insight to where change is possible.

Ongoing Initiatives

Given that cultures are created and changed at multiple levels, culture shift will be most effective when multiple levels are engaged through both short- and long-term strategies (Hamedani & Markus, 2019). Short-term strategies aim to change the ideas and practices of those who currently hold power in peer review: funding agencies, professional societies, journals, editors, and reviewers. Short-term solutions can also provide marginalized scholars with tools and strategies so that they can act as agents of change. Long-term strategies seek diffusion of cultural change by providing reviewers and editors with tools and knowledge to become agents of change in their own networks (e.g., labs, departments, professional societies), as well as providing concrete support for individual trainees through their developmental trajectory. Here, we selectively review some ongoing initiatives that seek to implement change across these different levels. We then describe how peer-review processes can and should change from institutions to individuals and provide a concrete call to action as a starting point for promoting this culture shift.

Peer-Review Guidance and Training

One approach to improving peer-review culture focuses on providing training to reviewers. Indeed, a recent survey of researchers across the globe in diverse fields indicated that 88% believe that reviewer training is important, and that 80% believe that more training will have a positive impact on peer review (Publons, 2018). Addressing this need, several ongoing initiatives aim to illuminate the hidden curriculum of peer review and provide formal training and discussion. Here, we highlight a select few to provide examples of the breadth and type of resources available. For example, books and articles introduce the peer-review process, along with tips on how to review and cope with receiving reviews (e.g., Hall et al., 2019; Kelly et al., 2014; Wager et al., 2003). The Committee on Publication Ethics (2022) provides tips for reviewing along with ethical guidelines that reviewers should follow. The Web of Science (2022) provides courses related to peer review.

Some resources are more discipline-specific. For example, the Equator Network (n.d.) provides several resources for peer reviewing in health research. These include links to training materials and guidelines, and a tool (Good Reports, 2020) that clarifies reporting requirements for manuscripts. The latter can help reviewers ensure that reviewed manuscripts describe the information required for reproducible and open science. Such resources would also be beneficial for psychology, neuroscience, and related fields. Although individual journals can provide similar guidelines (described below), the guidelines often differ across journals (Patel, 2014) and are not incorporated in formal peer-review training.

Many organizations provide training in peer review. Funding agencies frequently provide resources for reviewers, and some more intensive training opportunities exist as well. One example is the NIH Center for Scientific Review, which offers a competitive program for early career researchers (NIH Center for Scientific Review, 2023); under this program, junior faculty review NIH grants and discuss them at the appointed grant panel. Another example is the PREreview Open Reviewers initiative (PREreview, 2022) intensive workshop series that trains individuals in reviewing manuscripts, culminating in guided and collaborative reviews of preprints. This initiative has also started a similar program, Open Grant Reviewers, for reviewing grants (PREreview, 2021). Some professional societies also offer such training; for example, the Society for Neuroscience offers a Reviewer Mentor program to provide individuals with training in writing strong and constructive peer reviews (Journal of Neuroscience). The American Psychological Association [APA] (2022a) and the American Speech-Language-Hearing Association (ASHA Journals Academy, 2023) also offer peer-review training resources.

Increasingly, societies and journals are initiating programs and policies that directly aim to reduce race, gender, or other group biases in scientific publishing. For example, the APA offers resources specifically for inclusive peer review as part of a toolkit for journal editors (APA, 2021). The Society for Personality and Social Psychology (SPSP) has approved evidence-based recommendations from its Anti-Colorism/Eurocentrism in Methods and Practices (ACEMAP) task force (e.g., tracking diversity of authors, reviewers, and editors, requiring incoming editors to specify plans for increasing representation; instituting a new feedback form that provides a mechanism for authors to report exclusionary experiences to the Publications Committee; Ledgerwood, personal communication, 2023). The journal *Personality and Social Psychology Review* (PSPR) has created an Emerging Editor Board, which provides training in good peer-review practices to advanced graduate students and postdocs (PSPR, 2023). PSPR also has initiated an Emerging Editor Fellowship, which "seeks to create a supportive pathway to editorial leadership for psychologists from communities that have been historically excluded from these roles" (SPSP, 2023).

Several journals are making strides toward improving the quality and fairness of the peer-review process by putting forth specific guidelines for reviewers. These include Elsevier's certified peer-review course and fundamentals of peer-review modules (Elsevier Researcher Academy, n.d.a, n.d.b), as well as similar training initiatives by Taylor & Francis Editor Resources (2022), Springer Nature (2022a), the *British Medical Journal* (The BMJ), and the Society for Industrial and Organizational

Psychology and the Consortium for Advanced Research Methods and Analysis (CARMA, 2022). Springer Nature (2022b) additionally offers guidelines that consider race, racism, sex, and gender. For example, they note that race is a sociopolitical construct that should not be used as a proxy for other variables. They also explicitly state that editors reserve the right to refuse publication of racist content. A tool to help journals in this process is the Diversity Accountability Index for Journals (DAI-J; Buchanan et al., 2021b); journals can undertake a self-assessment to understand their strengths and weaknesses along several dimensions that contribute to diversity, equity, and inclusion in scientific publishing.

These resources are likely helpful for training individuals to become constructive and fair reviewers and editors. Yet, as with many interventions, systematic study of the impact of these resources is limited: Are these resources used, and if so, do they produce the desired outcomes? Some studies suggest that peer-review training can reduce interrater variability (Recio-Saucedo et al., 2022), and other studies indicate that such training may have little or only short-term impact on review quality (Bruce et al., 2016; Callaham & Tercier, 2007; Houry et al., 2012; Patel, 2014; Schroter et al., 2004, 2008). Yet clearer design and impact of interventions to improve peer review can be achieved with clearer theoretical grounding about what aspects of peer review are problematic and why they occur (Hug, 2022). Our theoretical framework highlights biases related to cultural norms and how they are reiterated in the culture cycle of peer review. Previous assessments of review quality, however, did not include explicit attention to cultural sensitivity or biases related to studying WEIRD samples (see "Call to Action" section). Thus, further work will be needed to determine whether and how reviewer training may affect not only traditional measures of review quality (Van Rooyen et al., 1999; e.g., highlighting strengths and weaknesses, providing constructive feedback, providing examples to back up claims, and detecting errors) but newer measures that incorporate cultural competence and recognition of work that does not use "dominant" approaches or WEIRD samples. Overall, we believe that working to improve peer review from theoretically and empirically based frameworks will strengthen efforts to improve peer review.

Another limitation of reviewer training is that engagement with such training resources currently depends on individual motivation, and those most motivated to take part in such training activities may be those who are already cognizant of the importance of fair review processes. In our "Call to Action," we will highlight ways that changes should be implemented more broadly to affect the culture of peer review.

Some journals have started to make such broader culture changes. For example, eLife and Nature Reviews Psychology have instituted editorial oversight policies intended to reduce the burden on authors from contradictory or unclear reviews. By attempting to have reviewers reach consensus and by having editors clarify to authors the revisions that are needed versus requests that can be ignored, these journals seek to make the path to paper acceptance clear and concrete for authors. More recently, eLife has changed its publishing model so that it no longer accepts or rejects papers; instead, all reviewed papers are published as "reviewed preprints" that include the manuscript, an assessment by *eLife*, and public reviews. This change removes the power that reviewers have to gatekeep papers; however, editorial decisions on what to review still remain. Although the pros and cons of this particular policy may be debated, it raises the point that radical measures may be needed to change the culture of peer review.

Editors wield a great deal of power in today's peer-review system—power not only over specific manuscript decisions, but over the process of peer review itself, including decisions about whether a paper is reviewed (or reviewed again), and what parts of the process should be made visible to others. Because of editors' formal and informal power, it is critical to ensure that editorial boards reflect the diversity of the population and our field. Indeed, some journals have made efforts to diversify their editorial boards (e.g., Cognitive Neuroscience Society, 2020; eLife, 2021b; Thomas, 2020)—in part to reduce biases related to reviewer–author homophily (Murray et al., 2019). Other journals have established mentoring of individuals to become future editors (some journals are supporting editorial fellowships to provide editorial experience and mentorship for individuals from historically excluded groups; APA, 2022b; SPSP, 2023). There are also resources to support English writing and translation for researchers from non-Anglo traditions (Arunachalam et al., 2022). Finally, more journals are joining the call to focus on topics that are relevant to individuals from underrepresented and underserved communities (e.g., Arunachalam et al., 2022; Bauer, 2023; Jimerson et al., 2021). Such changes are essential, because they move beyond reviewer-specific changes to broader, journal-wide changes that can impact the culture of review.

Services for Authors and Trainees

The resources highlighted above are primarily aimed at helping individuals become better peer reviewers. There are also initiatives that seek to help authors put their best foot forward in submitting their work for peer review (Moradi et al., 2023) or preparing a revision (Palminteri, 2023). For example, the peer review for inclusion, diversity, and equity (PRIDE, n.d.) initiative provides a database of volunteer reviewers who are willing to provide feedback on fellowship applications of LGBTQ+ and other minoritized students in STEM. Other organizations provide students with mentorship and feedback about graduate school applications. Examples of these organizations include Black in Neuro's Personal Statement Workshop (Black in Neuro, n.d.), the Stanford Neuroscience Application Assistance Program (SNAAP, n.d.), the Mentoring Aspiring Graduate students and building an Inclusive Community program (MAGIC, n.d.), the Graduate Student Mentorship Initiative by Cientifico Latino (Cientifico Latino, n.d.), and the Application Statement Feedback Program (ASFP, 2021). Other initiatives provide feedback to authors submitting manuscripts for peer review; for example, LingProof (GLOSSA Psycholinguistics, 2017) is a proofreading service offered by a community of linguists. They aim to combat linguistic discrimination in peer review by proofreading papers by scientists who are not native English speakers. Similarly, Reviewer Zero piloted a prereview program in which experienced reviewers provided formative feedback to students on their National Science Foundation graduate fellowship applications before their submission.

Although these initiatives are likely useful for individuals navigating the peer-review system, they are nevertheless limited. As we noted earlier, there is little data to speak to the uptake, experience, or impact of engaging with these programs. These efforts can provide important feedback to authors and potentially improve their experiences with peer review, but they do not aim to change the broader culture of the peer-review system. These initiatives can help more people

navigate the system as it stands; eventually, through generational shifts, advancing individuals from a wider range of positionalities and perspectives might result in changes to norms. But individuals tend to adapt to the norms and values upheld by current systems, and thus generational change is by no means assured. More critically, too much would be lost in waiting for that to happen. Instead, increasing diversity, equity, and inclusion within psychology and neuroscience is more likely to be realized by efforts aimed at multiple levels of the system (Hamedani & Markus, 2019) that engage institutional practice and policy. Author-oriented initiatives will therefore carry greater impact when combined with broader strategies aimed at reviewers, editors, policies, and normative practices.

Call to Action

In any multiactor and multilevel system, systemic errors, or bias, enter in at multiple points. Thus, following the culture cycle framework, specific strategies must be enacted at multiple levels to promote a more inclusive and equitable peer-review culture (Table 2). Here, we focus on three goals and describe concrete actions that reviewers, editors, and institutions can take in efforts to reach them.

Goal: Reviews and Editorial Decisions Serve a Constructive, Formative Function

The first row of Table 2 presents specific actions that might be enacted by reviewers, editors, and institutional leaders to increase the likelihood that reviews serve a constructive, formative function. Reviews and editorial decisions can be offered with an eye to what would make the work a stronger contribution, even while rendering a "reject" decision. Reviewer or editor feedback can communicate rigorous standards while simultaneously communicating belief that the particular manuscript or author holds the capacity to meet these standards. Indeed, research on such "wise feedback" (Cohen et al., 1999) illustrates the beneficial effects of pairing critical feedback with explicit mention of high standards and a statement of belief that the author can meet those standards. Such communication can resolve the potential that critical feedback delivered to minoritized authors is perceived as due to racial bias; indeed, wise feedback eliminated racial disparities in perceiving bias from the evaluator and racial disparities in task motivation. More recently, research on the delivery of critical feedback to at-risk middle schoolers shows that growth-oriented feedback leads to substantial improvements in students' rate of revising their written work and in the quality of student writing (Yeager et al., 2014). If similar processes occur among submitting authors, more constructive reviews would lead to greater author engagement, greater feelings of belonging, and greater persistence. Analyses of review content and subsequent author actions—and whether these differ across racial identities of authors—would provide insight into the impact of constructive feedback.

One way that wise feedback principles can be implemented in a manner that is not labor-intensive is by modifying the templates used to generate decision letters in many online editorial management systems. Such templates could communicate that the editor knows that it is disheartening to receive rejections when much effort has been put into the work; that rejections should not be taken as an indication that the work is not valuable or appreciated; and that the editor believes the authors have the capacity to contribute meaningfully to the scientific field. Editors can also point to the value of resubmission, for example, by noting that research on grant applications shows that among principal investigators whose initial submissions are rejected, those who revise and resubmit initially unfunded applications are more likely to receive funding than those who submit entirely new applications (Doyle et al., 2021). These modifications can be accompanied by surveys to assess how the feedback was perceived by the authors, whether the message increased their sense of belonging in science, and their subsequent actions regarding the manuscript and the research it reports. Such data analysis can show whether simple modifications to boilerplate emails can help ease the sting of rejection.

Goal: Underserved Trainees Have a More Positive and Supportive Experience

Current reviewing culture is normatively negative and often assumes that the function of reviews is purely gatekeeping. A cultural shift toward a positive, supportive peer-review experience may ameliorate the reduced sense of belonging and other negative experiences of underserved trainees (reviewed above). As shown in the second row of Table 2, this will require changes at all levels. At a very basic level, communicating respect for authors (e.g., using respectful language, articulating a clear rationale for editorial actions) helps signal that the reviewer/editor views the author as a valued member of the scientific community.[3] Diverse editorial boards also provide clear signals to scholars that their research is valued by the community (Auelua-Toomey & Roberts, 2022). Adopting a growth orientation (discussed above) will enable a supportive experience for authors, emphasizing their potential to meet high standards for journal publications.

Given how ingrained negativity and gatekeeping are in reviewing culture, these changes will not be easy to implement. Furthermore, the specific changes that are actually effective in providing underserved trainees with a more positive, supportive experience are not known, and different strategies may be more useful for different identity groups or different career stages. It is therefore imperative that journals, societies, and institutions gather and share data on what predicts trainee experiences and outcomes in the review process (see, e.g., *eLife* research discussed above; Murray et al., 2019). Such empirically based and systematic investigation may be revealing of systemic biases, and findings can be shared publicly and used to iteratively drive reforms. This work can reveal, for example, biases in whose papers are more likely to be accepted versus rejected, which research topics are prioritized, and interactions between author identity and research area that influence paper acceptance versus rejection (Roberts et al., 2020). Importantly, to reach consensus on systematic biases and inequities in the peer-review process, these investigations should be harmonized across journals, funding agencies, and societies, so that the operationalization of key variables and outcomes are consistent, enabling comparison across studies (Sato et al., 2021). Critically, such data collection and analysis must be accompanied by the development of theories of why and how such biases arise (Hug, 2022), which can then inspire approaches for counteracting them. Finally, it is important for data

[3] This goal can also be addressed by editors and reviewers proactively calling out racist, sexist, ableist, and so forth, content appearing in manuscripts, so that such harmful content does not enter the literature.

Table 2
Actions Reviewers, Editors, and Institutions Can Take to Develop and Promote an Inclusive, Equitable Culture

Inclusive and equitable culture	Actions to develop and promote inclusive, equitable peer-review culture		
	Reviewers	Editors	Institutions
Reviews and editorial decisions serve constructive, formative function	• Provide concrete, specific feedback; actionable suggestions • Evaluate the work, not the person • Evaluate scientific objectives, not writing style/language/grammar • Acknowledge strengths • Highlight potential and paths forward for work	• Articulate the purpose of the review process and offer tools to aid reviewers in operationalizing this (e.g., checklists) • Write decision letter templates that can authentically communicate recognition of author's effort or potential of the work • Implement gender + race citation balance checks • Reward excellence in reviewing • Make processes transparent • Do not allow hostile, unprofessional, or inappropriate reviews; communicate to review, redact, and/or frame as inappropriate for author	• Incentivize constructive, formative reviewing • Provide trainees with systematic opportunities to contextualize reviews
Underserved trainees have a positive and supportive experience	• Communicate basic respect for authors; provide prompt reviews • Emphasize potential contributions of an improved manuscript • Make clear feedback comes from place of high expectations that you think authors can meet	• Communicate basic respect; provide prompt decisions • Edit or have reviewers revise problematic reviews • Recruit and reward diverse editorial boards • Monitor and report outcomes and experiences of underserved authors • Accountability: Publicly report and iteratively revise processes based on monitoring results	• Provide reviewer and author training opportunities to illuminate hidden curriculum • Monitor and report outcomes and experiences of underserved authors
Adopt a more expansive view of "good" science	• Recognize and raise the importance of research that better represents the diversity of humanity • Consider differential burdens of working with different populations • Recognize value of applied as well as theoretically driven research • Use inclusive language • Include different writing angles and approaches	• Require all authors to justify sampled population, characterize demographics of sample, and explicitly state limits on generalizability • Incentivize diverse research samples via awards, special submission categories • Reconsider what counts as "specialized" versus "appealing to a general audience" • Critically reflect on what work is seen as interesting or novel (and why these are editorial criteria) • Select diverse reviewers/editorial board	• Provide resources and recognition for community-based, participatory research on diverse populations • Recognize high-effort work required to broaden populations participating in research • Change metrics and processes for assessing quality of work, focusing on holistic assessment of science • Promote, reward, and offer structure to support team science across cultures and sample populations

collection and analysis to track both immediate consequences of peer-review outcomes (e.g., feelings of confidence and belonging, manuscripts abandoned vs. resubmitted; biases in acceptance rates) and more distant consequences that affect who wants to stay or is able to stay in academia and what research fields they pursue (e.g., long-term funding, tenure outcomes, changes in research topics).

Goal: Promote a More Expansive View of "Good" Science

As noted earlier, many scientific fields were created by a privileged group of (White) individuals, and thus the topics, methods, and samples that dominate reflect a narrow slice of topics worthy of study. The consequence is that some research is determined to be of broad interest and importance, whereas research studying non-WEIRD populations and/or using nondominant methods is deemed (at best) to be of interest to "specialty" journals only (Roberts & Mortenson, 2023). Recently, Roberts (2022) recounted in detail a recent experience with this system, analyzing his case as exemplifying

> an intellectual echo chamber in which a single worldview held by the majority group (in this case, the editor, reviewers, and authors) formalizes itself in the permanent scientific record under the guise of a scientific debate. That single worldview is then used as the scientific metric by which to evaluate opposing worldviews, and to then accuse those opposing worldviews of being ideologically motivated and unscientific. By definition, then, what counts as "good" science is what only aligns with the ideological needs of the dominant group. (West, 2001, p. 8)

We, like others (Bauer, 2023), argue that good science is necessarily diverse science, that science cannot be rigorous and generalizable unless it studies the entire population rather than a slice (Majid,

2023; Roberts et al., 2020), and that there is value to the scientific enterprise in using methods that provide complementary insights (Lewis, 2021). Below, we discuss the importance of studying diverse populations using varied techniques (Table 2, third row). We note that diversity of scientists, perspectives, and methods are highly related. Individuals who are from minoritized groups may be more likely to have perspectives that are not well represented, study populations who are not well represented, and potentially use qualitative or cross-cultural approaches that are not mainstream. Promoting diversity of scientists without promoting diverse perspectives, samples, and methods does not fully address the myriad places in which diversity is critical, or acknowledge the multiple and intersecting barriers to achieving diversity, equity, and inclusion. We therefore advocate for a comprehensive and expansive view of diversity that considers the scientists doing the work as well as their perspectives, the populations they study, and how the studies are conducted. Furthermore, investigating how these factors intersect is essential: Such empirically based and systematic investigation may be revealing of systemic biases, and findings can be shared publicly and used to iteratively drive reforms. This work can reveal, for example, biases in whose papers are more likely to be accepted versus rejected, which research topics are prioritized, and interactions between author identity and research area that influence paper acceptance versus rejection (Roberts et al., 2020).

Who Is Being Studied? The Importance of Diverse Samples

To broaden representation and inclusion in science, it is critical for the stakeholders of the peer-review process to consciously counteract practices that center Whiteness (Garay & Remedios, 2021), rely on WEIRD samples as the "default" (Henrich et al., 2010; Prather, 2021; Ricard et al., 2023; Roberts & Mortenson, 2023), and, in centering a normative experience, marginalize the experience and cognitive properties of others (Majid, 2023; Thomas et al., 2023). One example of this bias in action is seeing samples from Majority World (non-Western) countries as a better fit for "local" journals (Draper et al., 2022) or requiring a White comparison group rather than centering non-White experiences. Reliance on WEIRD samples fundamentally limits the inferences that can be drawn, but this limitation is rarely noted (Decolonial Psychology Editorial Collective, 2021; Majid, 2023; Roberts & Mortenson, 2023). Clarifying the constraints on generality due to WEIRD sample characteristics aligns with a broader effort to encourage and incentivize authors to acknowledge the limitations and assumptions underlying their inferences (e.g., Simons et al., 2017). Editors and reviewers should recognize and normalize the value of studying non-WEIRD samples to build a more generalizable science (Decolonial Psychology Editorial Collective, 2021; Girolamo et al., 2022; Majid, 2023). Furthermore, even if a WEIRD sample is justified, attention should be given to the racial and ethnic composition of the sample to ensure it is representative of the population being studied. Indeed, others have proposed redefining WEIRD as "White, English-speaking, normatively-Invisible, Racially color-evasive, socially Dominant class" (Thomas et al., 2023). Such a redefinition brings to the foreground that the classic definition of WEIRD obscures that only some of the Western population (typically White individuals) are well represented in psychology studies.

When reviewing scientific work, editors and reviewers also need to acknowledge the importance and difficulties of data collection in populations that are rarely represented in psychological science. They should consider the differential burdens placed on researchers who work with such populations when requesting follow-up studies and abandon using WEIRD samples as a standard control population that serves as a precondition for publication (see Apfelbaum et al., 2014). Evaluation of scientific contributions will benefit from a thoughtful balance between the weights of the inevitable challenges associated with investigating an understudied population (e.g., sample size) versus the dire need for psychology and neuroscience to expand the understanding of diverse human populations. Diversifying the samples and culturally relevant ideas that journals publish can also provide greater pathways to psychology and neuroscience from a diverse set of players in science as a system, given that different topics in STEM are associated with author identities (Kozlowski et al., 2022).

For both accountability and transparency, authors can routinely justify sample populations, characterize the demographics of their sample, and explicitly state limits on generalizability (Girolamo et al., 2022). Relatedly, Rad et al. (2018) suggest that editors establish incentives such as diversity badges and set diversity targets in terms of the population studied. More broadly, institutions should support both etic (cross-cultural) and emic (culture-specific) research on diverse populations. Community-based, participatory projects that provide infrastructure for a geographically dispersed community to engage with research are emerging (e.g., Many Labs, Many Babies; Psychological Science Accelerator). For emic research, institutions should reward researchers conducting field research on diverse or rare populations, and partner with and support research labs in non-WEIRD global regions. Two examples include the Research for Indigenous Social Action and Equity Center (RISE, n.d.) and Busara Center for Behavioral Economics based in Nairobi, Kenya (Busara, 2022).

How Is the Research Conducted? The Importance of Diverse Methods

The dominance of certain techniques in psychological science means that the field may overlook the importance of other approaches that can yield critical insights. Studies in mainstream psychological science journals typically focus on carefully controlled experiments that test specific hypotheses with quantitative approaches. Although such studies are no doubt useful, important contributions are also yielded from research that is descriptive rather than experimental, or that prioritizes ecological validity (and is therefore less controlled). Numerous qualitative methods and analytic techniques exist within psychological research, and these can inform the field's understanding in complementary and distinct ways (Madill & Gough, 2008). The dominance of carefully controlled quantitative research, however, can lead to the devaluation of ecologically valid, descriptive, and/or qualitative research (Tafreshi et al., 2016). In turn, this devaluation of certain methods can lead to a harsher review of content areas that benefit the most from qualitative approaches (e.g., developmental, social, or cross-cultural psychology). Adopting an expansive view of what "good science" requires embracing the diversity of methods at our disposal and recognizing that some questions are better answered via qualitative or descriptive approaches (Brady et al., 2018; Kosie & Lew-Williams, 2022). Using multiple approaches allows better observation and characterization of

the diversity of human behavior in the myriad contexts in which it unfolds.

Inclusion of non-WEIRD samples will also require innovation to overcome methodological limitations arising from developing methods, measures, and techniques within a narrow set of participants. For example, as noted in a call to expand child development research around the globe, Draper et al. (2022, p. 7) note that "gold standard" measures are largely from Minority World (Western) countries, optimized for children who speak English as a home language, and compatible with typical environments in these countries that may not be as relevant in Majority World countries (e.g., nuclear families with educated parents).

Technological limitations arising from biases in methods development can also lead to overt exclusion from research: For example, Black participants may be commonly excluded from studies using functional near-infrared spectroscopy (fNIRS), electroencephalography (EEG), and functional magnetic resonance imaging (fMRI) (Girolamo et al., 2022; Ricard et al., 2023). The fNIRS signal is affected by skin melanation and hair type; EEG electrodes may not achieve adequate skin contact with coarse and/or curly hair; and fMRI head coils may not provide enough space for some hairstyles (and preclude scanning of individuals with metal in hair extensions; Girolamo et al., 2022). Addressing these limitations is not as simple as trying to recruit non-WEIRD samples; instead, the techniques themselves need to be adjusted. For example, hair braiding can reduce electrode-skin impedance, and EEG electrodes can be redesigned to further reduce impedance with coarse/curly hair (Etienne et al., 2020). This example highlights the importance of developing new methods, and taking advantage of existing methods, that allow the inclusion of many populations and enable insights not provided by mainstream techniques.

Subsection Summary

The goal of adopting a more expansive view of "good" science is inherently challenging because scientists train within particular epistemological and ideological perspectives; we value the particular way of knowing that we enact. The liability is that we cannot always see the water we swim in, and there can be a tendency (particularly with research that exists outside of the mainstream in some way) to consider other work as ideologically driven, but one's own work as not. Yet, every epistemology comes with assumptions and values, and thus a transparent, fair, and valid science is one that owns those assumptions and values.

Conclusions

Peer review is a core component of scientific progression at the level of the scientific field and at the level of individual scientists' careers. At the field level, peer review ideally propels scientific knowledge forward through critique by experts, thus demarcating certain knowledge as valuable and trustworthy. At the individual level, scientific careers are built on article publication, funding, and citation by other scientists. As scientists, reviewers, editors, and readers, we engage with peer review based on trust that the process is fair and impartial, and that it ultimately results in higher quality science. Yet, there are pervasive reasons to doubt whether this trust in peer review is warranted.

Peer review can serve a positive, constructive, and formative function when done with an eye toward improving science rather than gatekeeping it. Eliminating the biases built into the current system—biases in who is studied, how research is conducted, and what topics are deemed relevant and important—requires a cultural change across many levels, from ideas and institutions to individuals. This cultural change should prioritize peer reviews that are constructive, include and promote groups that are marginalized, and adopt an expansive view of what counts as "good science." These changes can improve scientists' experience of peer review, promote diverse perspectives and identities, and enhance the quality and impact of science.

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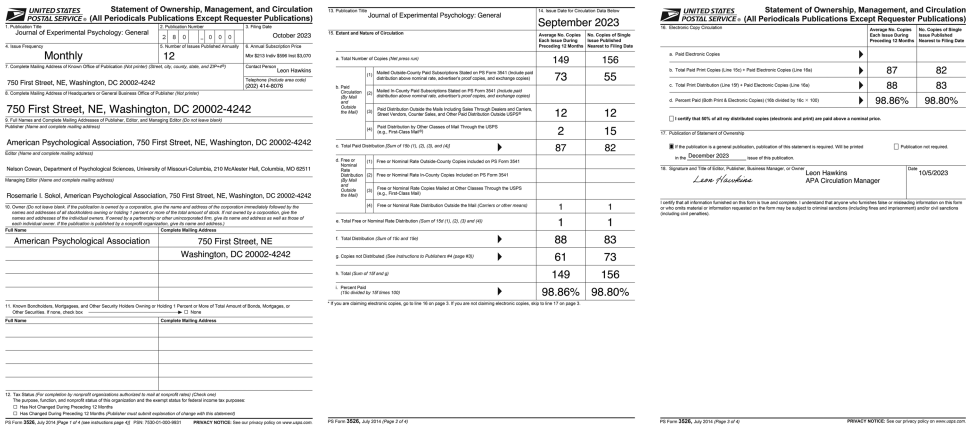

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