COMMUNITY PERSPECTIVES ON JUSTICE, EQUITY, DIVERSITY, AND INCLUSION IN OCEAN SCIENCES

A TOWN HALL DISCUSSION

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ABSTRACT. Professional and scientific societies are increasingly engaging in efforts to create a science community that manifests justice, equity, diversity, and inclusion (JEDI). However, progress assessment is challenging, and opportunities for community feedback are limited. During the 2022 Ocean Sciences Meeting, the Oceanography Society (TOS) JEDI committee led an interactive Town Hall to collect feedback from conference participants and TOS membership on three themes: challenges, initiatives, and opportunities related to advancing JEDI in ocean sciences. This Town Hall was preceded by a survey that was administered to the TOS membership. Survey respondents and Town Hall participants provided valuable observations and synthesis on the past, present, and future of JEDI work in ocean sciences. Discussion included both positive efforts and outcomes of JEDI work as well as harmful and ineffective practices. This paper synthesizes feedback received and highlights ways in which the ocean sciences community and professional and scientific societies can advance similar work. Gatekeeping, a system of implicit or explicit cultural and institutional constraints to and requirements for entry into a field, was identified as the most significant challenge to diversifying the ocean sciences. The majority of survey respondents agreed that efforts to broaden participation have been successful, and identified specific initiatives that have been effective, including the development and support of mentorship and training programs and partnerships with minority-serving institutions. Some challenges to advancing JEDI initiatives include targeted recruitment from the most "elite" institutions and "parachute science." Respondents agreed that professional and scientific societies have an important role to play in advancing JEDI in ocean sciences. Participants discussed strategies to broaden participation, including efforts that can be employed by professional and scientific societies such as regular data collection on demographics, improved information sharing, and stricter codes of conduct at professional meetings. We conclude by summarizing some new TOS-led initiatives that are designed to promote JEDI in ocean sciences and beyond.

BACKGROUND

Generating solutions to the most complex global problems facing our planet today requires optimal participation of all individuals trained in science, technology, engineering, and mathematics (STEM) disciplines. Groups of people from diverse backgrounds outperform homogeneous teams, as the former are better at problem-solving, innovation, creativity, and resilience (Hong and Page, 2004; Page, 2017; McGee, 2020). However, in the United States, systems and cultures in STEM favor people who are white and/or are men; these systems and cultures are perceived to be unwelcoming to people from marginalized and underserved groups, including individuals who identify as women; Black, Indigenous, and People Of Color (BIPOC); and members of the lesbian, gay, bisexual, transgender, queer, intersex, asexual, and other gender (LGBTQIA+) communities (Fry et al., 2021; Powell et al., 2020; Casad et al., 2021). Among Earth sciences, the lack of racial diversity is most prominent in ocean sciences (Table 1 in Bernard and Cooperdock, 2018). While ocean science fields are making progress toward reaching gender parity, more advanced career stages remain disproportionately male and white (Bernard and Cooperdock, 2018; Legg et al., 2023).

People in positions of power have substantial opportunities to catalyze positive reforms and systemic changes. Scientific and professional societies play an important gatekeeping role by establishing disciplinary norms, distributing rewards and incentives, creating opportunities, and envisioning culture change (Ali et al., 2021). In 2020, The Oceanography Society (TOS) established a justice, equity, diversity, and inclusion (JEDI) committee to comprehensively examine the role that the Society can play in fostering positive reforms and systemic changes in ocean sciences (Meyer-Gutbrod et al., 2021). The ordering of the

words in the committee name is intentional, so as to center the quest for justice and equity over a "check box" exercise for increasing diversity (Martinez and Truong, 2021), though we recognize that using the JEDI acronym is not without contention (Hammond et al., 2021).

The TOS JEDI committee's charge is to facilitate the recruitment, participation, and retention of diverse individuals in the TOS membership; address injustice, discrimination, and harassment in ocean sciences and related disciplines; and ensure that the benefits of ocean sciences are accrued by all members of the Society (https://tos.org/diversity). Since its formation, the TOS JEDI committee has been leading several initiatives to raise awareness about JEDI issues; amplify existing JEDI efforts to eliminate bias and unfair treatment; share tools, information, and resources; support TOS leadership; and engage the ocean science community to advance the committee's goals. For example, the committee has started a regular column in *Oceanography* to highlight relevant topics, hosted listening and training sessions at the Ocean Sciences Meeting, advised the TOS Council on improvements to award nomination and evaluation procedures, and started collating resources for the JEDI committee page on the TOS website. The committee is also part of TOS's recent commitment to assessing organizational equity as a member of the third cohort of the Amplifying the Alliance to Catalyze Change for Equity in STEM Success (ACCESS+) program.

During the 2022 Ocean Sciences Meeting in San Diego, California, the TOS JEDI Committee convened an interactive Town Hall entitled "Diversity, Equity, Inclusion, and Justice in the Ocean Sciences: Challenges, Initiatives, and Opportunities." Our goal was to listen to the community and provide a platform for sharing ideas and perspectives that would benefit the committee's mission as well as other host organizations of the Ocean Sciences Meeting. The event focused on three major themes broadly organized around challenges, initiatives, and opportunities in advancing JEDI in ocean sciences, in particular, the role that professional societies such as TOS can play in broadening participation in our field.

Before the Town Hall, a brief survey was advertised via email to all participants in the 2022 Ocean Sciences Meeting. This survey included four multiple choice questions and three open-ended questions. A total of 38 survey responses were collected. Eighty-five participants attended the virtual Town Hall using video conferencing software. In addition to sharing their thoughts orally and in the chat window, participants provided written feedback using the anonymous, interactive, web-based application Padlet. Identifying information and demographic data were not collected for either the survey or the Town Hall discussion to give participants the opportunity to share ideas anonymously. The Town Hall organizers took notes to summarize the oral portion of the discussion, and all responses from Padlet were downloaded and organized into a spreadsheet. The hour-long event generated a wealth of ideas for each of the three themes. This paper summarizes the feedback received from the community using the survey instrument as well as the interactive Town Hall. We conclude this paper by highlighting some ways in which the professional societies and the ocean science community can utilize the community feedback to broaden participation and advance JEDI in TOS and in ocean sciences.

Town Hall Theme 1: Challenges

Discussion focused on the "challenges" theme indicated that despite some well-intentioned broadening of participation efforts, women, BIPOC, LGBTQIA+, and other marginalized groups continue to encounter enormous challenges to their participation in ocean science and related fields (Kappel and Thompson, 2014; Orcutt and Cetinić, 2014; Bernard et al., 2018; Núñez et al., 2020; Pourett et al., 2021; Johri et al., 2022; Legg et al., 2023). To understand these challenges, we asked the community the question: "What is the most significant challenge that you see to broadening participation in ocean and coastal sciences?" and asked them to choose from the following list:

- Recruitment (opportunities exist but not explored)
- Opportunities (plenty of recruits but not enough options)
- Training (potential recruits are not prepared)
- Funding constraints (opportunities and recruits exist but there is a lack of human or financial resources to compensate practitioners)
- Gatekeeping (barriers to entry, exclusion, lack of a welcoming environment)
- Cultural (how ocean science is viewed by potential recruits)

Of these choices, gatekeeping was identified as the most significant challenge by survey respondents (**Figure 1**) and in the Town Hall discussions. Funding constraints and recruitment were the second and third highest ranked challenges, respectively, in the surveys. Cultural challenges were also noted by several respondents. None of the survey respondents considered training to be the primary challenge to broadening participation, and few identified inadequate opportunities.

Gatekeepers in science, including mentors, advisors, researchers, editors, peer reviewers, board/committee members, and meeting conveners (e.g., Mekonnen et al., 2022; Muller-Karger et al., 2022; Osborne et al., 2022; Osiecka et al., 2022; Wapman et al., 2022), all act to legitimize research findings, determine professional rewards, establish criteria and professional standards, allocate resources, and influence policies for science. Gatekeeping is exercised both in the process and the content of decision-making and can substantially influence the culture of science, including driving people into or out of the field. In the Town Hall discussion, participants reflected that homogeneity in the Earth sciences

(e.g., Bernard and Cooperdock, 2018) can make it difficult for BIPOC, LGBTQIA+, and individuals from other marginalized groups to envision themselves joining the ocean sciences community. For example, a perception unique to ocean sciences is that participation requires swimming and diving skills; this is false, but the persistence of this idea may exclude individuals with disabilities or those who have never received this training.

The Town Hall discussion indicated that gatekeeping is closely aligned with cultural values of individuals, institutions, the field of oceanography, and Earth sciences more broadly, and the governing bodies that support oceanography. In other words, it is aspects of the cultures of the people, the field, and the institutions involved that allow gatekeeping to occur and that keep individuals from marginalized and underserved groups from engaging with or staying engaged in ocean science. Participants discussed forms of gatekeeping that directly suppress diversity. For people who have entered into ocean sciences, interpersonal experiences of uncivil behavior, racism, sexism, ableism, and general elitism, often (but not exclusively) instigated by senior members of the field, limit success and retention of individuals from marginalized and underserved groups (Miner et al., 2017). Such behaviors negatively impact the mental health and overall well-being of people (Verkuil et al., 2015; Evans et al., 2018). Other forms of gatekeeping indirectly reduce participation of minority groups, including unpaid or low-paid training opportunities and reduced entry or funding opportunities for international participants (Vercammen et al., 2020).

The lack of accessibility was brought up in various contexts as another form of gatekeeping. Some participants noted that certain aspects of ocean sciences affect recruitment. For example, fieldwork may seem inaccessible to people with disabilities, those with caregiving responsibilities, or discriminated groups such as women or people of color who may be unsafe in a fieldwork setting (Nash et al., 2019; Pineiro and Kitada, 2020; Amon et al., 2022). Requirements to conduct or participate in fieldwork can be exclusionary—and are often unnecessary, because much ocean science research is actually done in more accessible settings such as labs and offices.

Another form of gatekeeping that emerged from the discussion is inadequate or exclusive knowledge sharing. Critical information or advice from mentors can significantly impact an individual's ability to advance in the field of oceanography, including knowledge of relevant job postings, tips on applying to grad school, lists of relevant funding opportunities, and other support for professionalization (e.g., Pensky et al., 2021). Systems for distributing this information in family, school, and institutional settings often favor privileged, white, male individuals from the United States or Western European countries. Limited access to insider knowledge or high-quality mentorship or support networks effectively reduces recruitment, participation, and retention of individuals from marginalized and underserved groups.

Limited financial support for JEDI efforts was also identified as a barrier to broadening participation in the ocean sciences. The dearth of institutional support for these efforts was nearly universally acknowledged. Cultural and institutional change requires funding to support training, staffing, data collection and analysis, workshops and seminar series, and dedicated financial resources for recruitment. Current ocean science personnel also face lack of incentives to engage in critical JEDI work, and instead may be expected to focus their efforts only on research and teaching. This is particularly true for tenure requirements where JEDI work is considered to be a distraction. This is an indirect funding challenge, because ocean science employers do not regularly budget for the advancement of JEDI initiatives in new hires or in the descriptions and responsibilities associated with salaried employees. This disincentivizes the pursuit of JEDI initiatives, which may not include support for traditional metrics of advancement and promotion such as peer-reviewed papers.

Although respondents did not highlight lack of training or opportunities as the most significant barrier to broadening participation in the ocean sciences, discussions on gatekeeping and cultural norms in the field indicated that existing opportunities are neither well communicated nor are they accessible to diverse

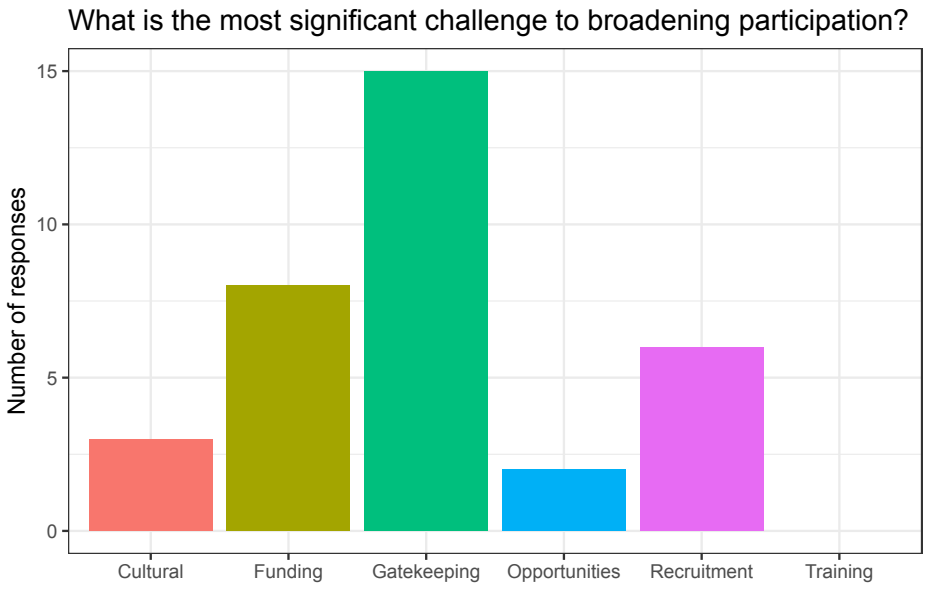

FIGURE 1. Responses to the survey question "What is the most significant challenge that you see to broadening participation in ocean and coastal sciences?" A total of 34 responses were recorded.

participants. As we distinguish equity from equality (see Figure 1 in Craig and Bhatt, 2021), it is clear that a focused effort to communicate educational and career opportunities to individuals from marginalized and underserved groups is critical to overcoming this barrier to diverse participation.

Town Hall Theme 2: Initiatives

Poll questions and discussions also focused on the second theme, recent and ongoing initiatives to advance JEDI goals in ocean sciences. The goal of this theme was to gather community input on the types of initiatives that have been implemented, and whether these initiatives have been successful in addressing JEDI issues. We asked the participants to respond to the question, "Do you feel that any efforts to broaden participation in ocean and coastal science have been successful?" Respondents selected among the following choices:

- Things have become worse
- Not at all, I have not seen any changes
- Things have improved somewhat
- Things are much better

The majority of survey respondents agreed that things have improved somewhat due to ongoing JEDI initiatives (89%; Figure 2).

Town Hall participants were invited to highlight effective JEDI initiatives as well as ineffective or harmful initiatives. The goal of this framing was to collate and present feedback on JEDI efforts to the ocean sciences community so that successes can be celebrated and replicated, and failures can be noted, addressed, and not repeated.

Participants noted a number of effective JEDI efforts across institutions and within the community, including:

- Developing partnerships with HBCUs (Historically Black Colleges and Universities) and other groups or institutions that serve individuals from marginalized and underserved groups
- Persistent reminders to engage in JEDI work from grant agencies, conference organizers, professional societies, and many other sectors
- Removing barriers to entry at a variety of levels, for example, by removing the GRE (Graduate Record Examination) as a requirement for acceptance into graduate school
- Specific recruiting efforts, such as seeking a broader applicant base, consideration of how ads are worded, and targeting recruitment efforts to underrepresented and historically excluded groups
- Developing and supporting targeted mentorship programs, for example, Mentoring Physical Oceanography Women to Increase Retention (MPOWIR), American Geophysical Union's (AGU's) Bridge program, Minorities in Shark Sciences (MISS), Black in Marine Science (BIMS), Significant Opportunities in Atmospheric Research and Science (SOARS), and Science, Technology, Engineering and Math Student Experiences Aboard Ships (STEMSEAS), among many others
- Providing funded training programs and scholarships, for example, Research Experiences for Undergraduates (REUs), internships, and the Woods Hole Partnership Education Program (PEP), all of which target recruitment of individuals from marginalized and underserved groups
- Training programs designed to educate participants about JEDI issues and solutions, including Unlearning Racism in Geoscience (URGE)

Enthusiastic discussion of successful initiatives, and the wide variety of these initiatives, indicate that increased emphasis on advancing JEDI goals in academic communities has had a positive impact. The significant value of this discussion is that it provides support and direction for additional JEDI efforts. These types of initiatives can be implemented or expanded by a variety of community members, with a range of actions that are appropriate for institutions, department chairs, faculty members, funding agencies, and professional societies.

Initiatives or behaviors that were identified by participants as either ineffective or harmful to JEDI efforts include:

- Actively ignoring the problem of participation by individuals from marginalized and underserved groups
- Resisting culture shifts in our field through status quo practices, such as prioritizing elite schools in recruitment, explicit and implicit bias against BIPOC and women, and maintaining unwelcoming work environments for individuals from marginalized and underserved groups
- Valuing minority status over merit in the recruitment process, for example,

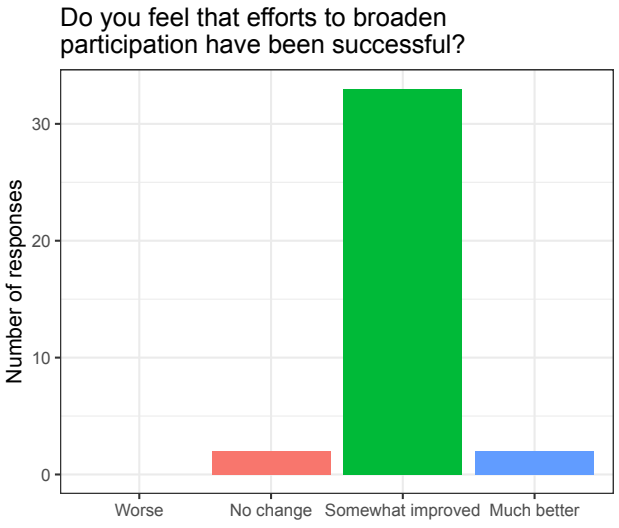

FIGURE 2. Responses to the survey question: "Do you feel that any efforts to broaden participation in ocean and coastal science have been successful?" A total of 37 responses were recorded.

by instituting quotas without consideration of systemic issues (i.e., "checking the box")
- Recruiting individuals from marginalized and underserved groups into unwelcoming or toxic environments
- Implicit and explicit barriers to implementation of JEDI policies, such as parental leave offered as a partial semester teaching release
- Unintended consequences of JEDI policies, such as expectations of increased productivity associated with parental leave or tenure clock extensions
- Engaging in scientific research in underserved regions without effective community integration or concrete goals to benefit these regions (a.k.a. "parachute science")
- Failure to incentivize or acknowledge JEDI work

Some of these behaviors, such as under-emphasizing homogeneous environments or tokenizing people of color (Azhar and McCutcheon, 2022), are used to protect an institution from developing a reputation of being unwelcoming or biased. Resistance to addressing JEDI issues often occurs because institution leaders choose to avoid uncomfortable conversations. Some institutions avoid actions that directly increase diversity or equity in fear of detracting from a focus on academic excellence (Shaw, 2009), although both of these goals are compatible (Sternberg, 2008). Finally, policies designed to support underrepresented groups can have deleterious effects on retention or promotion (Antecol et al., 2018; Gottenborg et al., 2018).

While both the successful and the ineffective initiatives discussed were largely based in institutions or departments, the Town Hall discussion also considered the role of professional societies in supporting these efforts. It was suggested by a number of participants that coordination and communication among related societies would greatly benefit the advancement of JEDI in ocean sciences, and geoscience more broadly. For example, the two societies that biannually host the Ocean Sciences meetings, along with TOS, AGU, and the Association for the Sciences of Limnology and Oceanography (ASLO), each have efforts to enhance JEDI within their societies. Progress is likely to come from increased discussions among the relevant committees and members working on these issues.

Town Hall Theme 3: Opportunities

For the third theme of the virtual Town Hall, "opportunities," discussion centered on future directions for JEDI initiatives in the field of ocean sciences and what role professional societies could play in them. In the pre-conference survey, participants were asked: "How important do you think that professional societies such as TOS are for changing the culture of ocean science to be more just, equitable, diverse, inclusive?" Respondents selected among the following choices:

- Not at all
- A little bit
- Very important

Survey respondents universally agreed that professional societies have a role in changing the culture, with the majority (61%) responding that these societies are very important (Figure 3).

Participants in the Town Hall provided a variety of ideas about how we can build on the work that has already been done to enhance JEDI in ocean sciences. Concrete ideas brought forth include:

- Increase recruitment of women and people of color into leadership positions.
- Develop and disseminate information about best practices for advancing JEDI work at all career stages and for all members of the ocean science community. Resources might include documentation of best practices for recruitment of students, faculty, and staff; information about just and equitable hiring practices that generate diverse applicant pools; tips for creating a welcoming and inclusive environment.
- Host training sessions for JEDI work.
- Host affinity group events to foster a sense of belonging and identity in ocean sciences.
- Support the design of equitable and transparent processes around publication, funding, awards, and leadership selection processes.
- Highlight and promote JEDI efforts throughout the ocean science community, such as research on JEDI work, success stories about JEDI efforts, and speakers and seminars focused on practitioners of JEDI work.
- Host listening sessions for community members to provide direct, personal support and to promote a sense of inclusion.

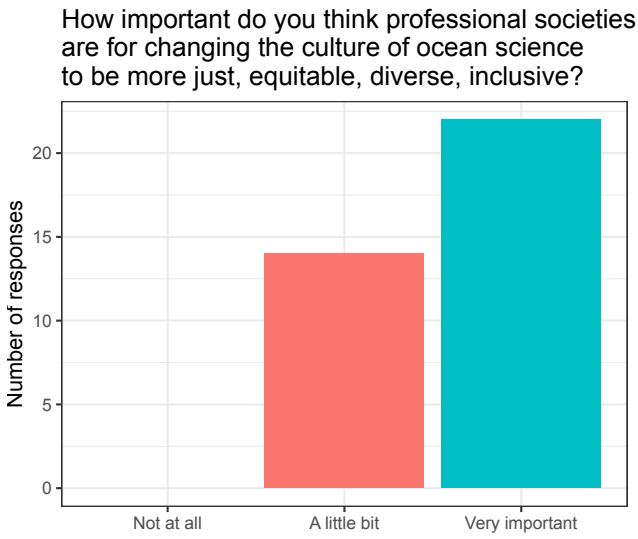

FIGURE 3. Responses to the survey question: "How important do you think that professional societies such as TOS are for changing the culture of ocean science to be more just, equitable, diverse, inclusive?" A total of 36 responses were recorded.

- Perform regular data collection and assessment of the state of JEDI metrics and initiatives.
- Provide support for students and early career ocean scientists through efforts such as mentorship programs, networking opportunities, training, and funding.
- Encourage efforts to increase inclusivity, such as including audio and subtitles to support vision- or hearing-impaired participants, language support for international members, developing an ocean sign language dictionary, and others.
- Develop policies and procedures to evaluate and enforce breaches of the code of conduct for professional societies.

Suggestions for future JEDI work again include efforts that can and should be implemented at a range of levels, including committees, departments, organizations, and professional societies. Many of these suggestions overlap with existing initiatives; however, this indicates that such efforts should be expanded and amplified. For example, the 2021 URGE pod program was a transformative and productive exercise for training and designing solutions to tackle JEDI work at individual institutions, but it is imperative that this type of programming be extended, replicated, and improved to ensure that such efforts move forward (e.g., Burton et al., 2022). Other suggestions, such as creating spaces for affinity groups at conferences and other community events, have been implemented previously, but must be further facilitated and amplified to improve their effectiveness (e.g., Le Bras, 2021).

CONCLUSION

The TOS JEDI Committee took a few key points from the Town Hall and the surveys that were administered to gather feedback from the community. There is broad agreement among participants that efforts to broaden participation in ocean sciences have been effective, at least somewhat. However, based on the nature of the many efforts still ongoing and the persistence of the demographics of the field, more work is needed to make ocean science truly diverse, inclusive, and equitable. Another important take-home message from the Town Hall was that gatekeeping in the field is viewed as the biggest hurdle by participants, followed by funding and recruitment. Many of these issues intersect; gatekeeping acts at a variety of levels to bar recruitment into the field, and some of those "gates" could potentially be alleviated by funding for just and equitable efforts to increase diversity and broaden participation. Finally, one of the most important takeaways for this committee is that the surveyed community broadly feels there is an important role for professional societies in addressing issues of justice, equity, diversity, and inclusion in ocean sciences. Professional societies should be communicating with each other and with their memberships about efforts and initiatives that are working, as well as those that are not.

The survey results and the description of the Town Hall discussion provided here are not meant to constitute a holistic or representative sample of the views of TOS members but rather are an initial effort by the TOS JEDI committee to solicit input on the ongoing work of the committee and the Society. Our survey response sample size was small (n = 38), as was the participation in the Town Hall discussion (n = 85). Demographic data were not collected, and participant demographics may not be representative of the broader attendance at the 2022 Ocean Sciences Meeting or of the ocean science field. Survey questions were not validated, and qualitative responses by the participants may be processed subjectively, both in how questions were perceived by the participants and how responses were evaluated by the authors. A more rigorous assessment of the challenges, initiatives, and opportunities for JEDI work in the ocean sciences could include more participants and better recruitment for balanced demographics among participants. Efforts to ensure anonymity within the discussion are important for providing participants with the opportunity to speak freely and without fear of retribution.

Because professional societies cut across career stages, institutions, and nations, they can bridge disparate groups and exemplify best practices for JEDI. Although the challenges and past failures to create a welcoming culture in the ocean sciences are apparent, feedback from the community has also highlighted recent successes and feasible solutions for supporting JEDI in this community. The TOS JEDI Committee is committed to implementing many of the suggestions provided during the 2022 Ocean Sciences Meeting and to seeking new ways to support the ocean sciences community as we confront biases and structural challenges that prevent broad participation and a universal sense of belonging. JEDI work is never finished, but the data and discussions presented here may inform and support new efforts to transform the ocean sciences into a more just, equitable, diverse, and inclusive community. The TOS JEDI Committee greatly appreciates the efforts put forth by the TOS and ocean sciences community for this important work and always welcomes feedback to improve the process and achieve the goals. Those who wish to be more involved in the process at TOS should reach out to committee membership to discuss ongoing opportunities and new initiatives.

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