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Beyond diversity initiatives: Building a community of care in scientific societies

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Over the past decade, diversity, equity, inclusion, and justice (DEIJ) initiatives have helped to bring historical and current exclusionary practices in science, technology, engineering, and mathematics (STEM) to light, especially across North American institutions. DEIJ initiatives encompass a wide range of activities, from small adjustments to individual-scale interactions (e.g., listed pronouns) to guiding principles for group dynamics (e.g., codes of conduct) through to structural and systemic changes (e.g., a review of evaluation criteria for election or hiring, the establishment of mentoring networks). Many of these DEIJ initiatives often specify ultimate goals that include large-scale cultural shifts that will fundamentally transform value systems within scientific communities and therefore shape how scientific fields operate. Indeed, there has been a proliferation of research on DEIJ issues, but the application of research findings has been difficult, often because of a lack of communication between STEM researchers and other disciplines. In response to or in line with these efforts, many funding agencies (e.g., the Howard Hughes Medical Institute, the National Science Foundation) have moved over the past 5-10 years to increasingly recognize and direct support towards DEIJ-oriented research and implementation, including introducing requirements that these be core components of the proposed research (Davis and Laas 2014). STEM professional societies have also become prominent areas in which DEIJ-oriented initiatives are being directed. These professional societies have promising potential for enacting cultural changes because they serve as primary gathering places for academic discourse and because they can act as catalysts for field-wide cultural changes in practices, priorities, and the science itself (Catalini et al. 2020, Tanner et al. 2021). However, the specific cultural values that are problematic and need changing are rarely made explicit among top-down efforts, including in key spaces such as professional societies.

Blatant exclusion aside (e.g., racism, sexism), there remain cultural challenges within academia that make even DEIJ-progressive institutions or environments, including professional scientific societies, exclusive to some communities. Uncovering and articulating the cultural norms acted on by organizational leadership that reinforce these patterns therefore remains a major challenge that is particularly pressing to address in light of the growing focus on DEIJ-related initiatives by federal and private funding groups. In concert, new frameworks that can help structure discovery and reorient DEIJ initiatives to address these cultural challenges are also needed, especially as the burgeoning political climate seeks to dismantle the protections and programs associated with the DEIJ designation.

In this Professional Biologist article, we present one such reframing that centers individualized care through structural changes. We argue that psychological and sociological motivations of belonging and social capital in the academy are fundamental challenges contributing to the cultural problems within STEM fields and are particularly present within professional scientific societies. In support of this argument, we present survey-based data alongside significant literature from the humanities. In this reframing supported by existing organizational culture literature and our survey results, we suggest that scientific societies are uniquely positioned to promote significant cultural change within STEM by focusing on building communities of care alongside their established communities of practice. We further make specific suggestions about how to build these communities of care in ways that will increase buy-in from the historical majority to support and promote the historically excluded without relying on DEIJ initiatives that can often harm more than help (e.g., Leslie 2019, Burnett and Aguinis 2024, Robb and Rana 2024).

Professional societies uphold a community of practice

In 2021, we distributed a survey to STEM professionals in the United States (n = 429) that was designed as a first step in identifying aspects of scientific meetings that were valuable in professional and personal aspects for our community (building on Burnett et al. 2020). Quantifying the reasons why people choose to spend their limited time and resources on attending a conference can help us understand how they feel connected to and engaged with their broader STEM community, both as an individual and through structural and institutional supports (i.e., for access to networking and more resources). We received responses from people at all career stages (undergraduate student to emeritus faculty, including nonacademic positions of similar rank), with 51% identifying as belonging to a training-focused career stage (e.g., postdoctoral fellow or more junior). 76% of the respondents identified as White, and 67% of respondents identified as women. Although this survey was distributed via American Association for the Advancement of Science (AAAS)

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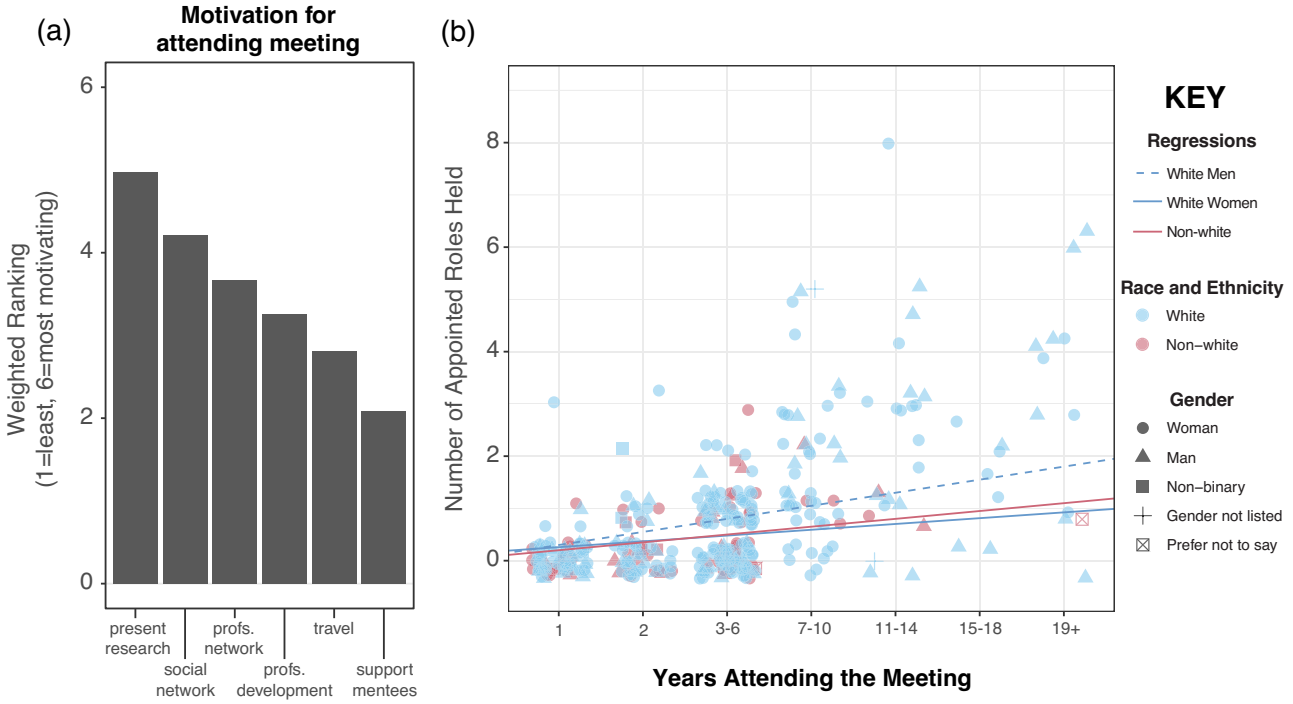

Figure 1. (a) Individuals across all career stages and demographics indicate that presenting research is the primary reason they attended a meeting, whereas supporting mentees ranked the lowest. (b) Nonvolunteer roles held by society members (n = 429) increase by one role, on average, for a career-long meeting attendance for White women (the blue solid line) and people of color (the red solid line) but by two roles for White men (the blue dashed line). The points are jittered to increase the legibility of the data. Race and ethnicity categories are aggregated into White and non-White for plotting and analysis. See the supplemental material for further breakdown of the race and ethnicity categories. An ANOVA was performed to confirm these trends ($p < .05$). The lines shown are applied for visualization purposes only. Note that these data were collected as part of a single survey distribution and do not represent repeated measures of individuals through time.

societies previously engaged in Burnett and colleagues (2020, 2022) and social media (not through academic institutions), employees and students of doctorate-granting universities (DGUs) were the most represented (67% of responses). The respondents included the breadth of AAAS-defined STEM fields, including but not limited to anthropology, chemistry, biology, geosciences, engineering, physics, and neuroscience. The most populous STEM field identified by our respondents was general biology (118 responses).

We had predicted that social interactions and network connections would be primary reasons that individuals valued specific conferences or society meetings. However, in our survey results, STEM professionals largely indicated that the number one reason that they value conferences is to present research (i.e., disseminate scientific knowledge; figure 1a). In interpreting these surprising results, we considered whether these responses could reflect the reality that many funding mechanisms require presentation of research products as part of travel support. However, when we pared our responses down to include only those from individuals that indicated that they would attend the meeting regardless of external funds (61% of the respondents), the presentation of research remained the top reason for conference attendance. Furthermore, we found that supporting mentees was ranked lowest among the survey options as a reason for attending a scientific meeting across either group; supporting mentees was ranked even below traveling to the conference destination (figure 1a). This pattern was also similar across career stages and remained even when the data set was constrained to individuals who were most likely to be in a mentoring role (any professor rank from a masters-granting university or a DGU).

Nonetheless, we know from informal social media and other peer-reviewed research (Ebner and Reinhardt 2009, Lopes et al. 2010) that social opportunities at conferences are highly valued by scientists. Indeed, the respondents to our survey did rank social networking as the second-highest reason to attend a conference (figure 1a), demonstrating that personal relationships (as defined in the survey) are top motivators for meeting attendance. However, this was still consistently ranked below presenting research in the survey and did not appear to include or connect to supporting mentees. Therefore, we argue that our survey results are consistent with an underlying and pervasive culture that centers on a community of practice, in which the organization's priorities and cultural values are structured on and explicitly value scientific knowledge and discourse (i.e., a Eurocentric meritocracy), to the exclusion or demotion of building strong, inclusive, and accessible scientific communities.

The origins of our scientific communities of practice

A community of practice describes a group that shares a particular passion or interest in some domain or area (Wenger 2000) and therefore broadly aligns with how many scientific organizations are structured. Not all communities of practice are organized outside of a sociocultural framework that prioritizes bringing one's whole self (Fisher et al. 1990); however, our survey results indicate that scientific communities prioritize the products of practice over the people. In general, scientific societies and their conferences are indeed convened with an emphasis on scientific discovery, innovation, and dissemination (Tanner et al. 2021)

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to serve the purpose of advancing knowledge. Although this has likely been impactful for scientific innovation at large, it also means that the community is generated as a byproduct of scientific discourse, which continues to be driven by established networks or individuals. Moreover, members of these communities must therefore explicitly identify with or participate in the value system (i.e., the highest value placed on scientific discovery and dissemination) promoted by these organizations to effectively belong to the community itself through recognition of their works (Merton 1968, Turner 2019; see Gaukroger 2008 for a discussion of the development of scientific culture). As such, the survey responses we received that were focused on scientific discourse and dissemination are a predictable outcome of professional societies' explicit focus on scientific practice, as they are specified in their goals and priorities.

Social patterns and the communities that they shape extend well beyond the values we communicate. Our survey data are largely in line with this principle in that historical communities of scientific practice have shaped and continue to shape leadership and control in scientific organizations. Specifically, as part of our survey, we asked STEM professionals about their additional engagement with these societies—for example, as volunteers during meetings or as appointed leaders of the meeting or journal. Because leaders or organizers within scientific societies are generally determined through votes or direct appointments, participating in such activities often indicates higher social capital and stronger networks within the society. These types of social capital and networks can also affect the professional success of an individual and can reflect how much support (including mentorship) they have received from their professional society. Finally, individuals participating in service leadership roles often do so at the cost to other types of highly rewarded productivity (e.g., research, less so teaching), so leaders are often either compensated by their employer or their professional society or free from other service obligations. In this way, appointed leadership reflects an integrative outcome of multiple potential barriers to participation. Among our survey respondents, executive roles were held exclusively by White members, and White male members were the only demographic group that gained more than one leadership opportunity by the end of their career (figure 1b, the dashed blue line). In addition, any role beyond attendee was more likely to be held by individuals who are White or employed at a DGU (executive roles, 100% White, 67.8% DGU; appointed roles, 82.5% White, 60.6% DGU; volunteer roles, 69.8% White, 66% DGU). Taken together, our data paint a picture of few, powerful, White individuals upholding an a relatively insular community of practice rooted in high-ranking universities with predominantly White faculties and in their professional societies.

Defining the community of care

Complementary to communities of practice, a community of care focuses on the human dimensions of doing science. In defining communities of care for STEM fields, we draw inspiration and tools from feminist approaches to care and mutual aid and Indigenous communities of practice (Fisher et al. 1990, Johnson 2013, Spade 2020). In our work, *care* is defined as an explicit focus on people, their social and emotional needs, their sense of self and belonging, and their connections to others. Care is executed on the individual level but is codified in a community that trusts one another to provide mentorship and support. Essential to this work is centering social and emotional support, continued learning about the social constructs under which we practice science, and sharing lived experiences.

A future where communities of care are the dominant cultural value in professional STEM societies must be one that is postcapitalist and postcolonialist. Capitalism and colonialism have only existed for decades, not millennia, but we uphold them as core to our existence as a society. Professional societies are arguably well positioned to be more independent from capitalist and colonialist institutional structures because of their existence outside of any brick-and-mortar institution (Tanner et al. 2021). Conferences and journals can take any form, can be instituted by any process, and most importantly can involve any people with an interest and passion for the society's topical focus. As such, professional societies have an important opportunity and obligation to be leaders in imagining a future of inclusion, not oppression, especially when people are not supported by their home institutions.

Constructing a community of care

In recognizing that we need to promote and build communities of care, we also recognize that scientific conferences will always provide a space for science dissemination—focusing on communities of care does not detract from or lessen our communities of practice. Furthermore, dismantling existing communities of practice to build new communities of care is not only infeasible but exclusionary to those who have some of their needs already served by their professional societies. Therefore, we must pursue a pathway of constructive resilience (Lear 2006, Kazemzadeh 2019), building an inclusive future community that does not share all its values with which its leaders operate within. We must consider the ability of existing communities of practice to generate ideas that dismantle the systems that put their leaders into power: Do executive committees and editorial boards have sufficient external accountability to make these changes? Furthermore, does society governance have the support and resources not only to implement change but also to retain institutional knowledge for future leaders? Through these challenges we must consider some social theories that drive decision-making and community building and be proactive in addressing their applications during leadership training.

Rotter's locus of control theory is a social learning theory used to explain and understand behavior and motivation (Rotter 1966). Rotter's locus of control posits that people have a stronger motivation to achieve when they perceive that their outcomes are internally rather than externally directed by the actions of others. Redistributing power in the cultivation of cultural norms is necessary for individuals to feel ownership of the outcomes (Anderson et al. 2007, Plastrik et al. 2014). Therefore, to center a community of care alongside a community of practice in scientific societies and their external faces, we must reallocate control and power by adopting listening sessions and collaborative workshops as key tools in reimagining how our scientific societies and conferences operate.

In prioritizing these efforts, professional societies should formally adopt the principles of communities of care into professional societies' constitutional documents and bylaws, where the foundational mission of the organization is set and enforced. Importantly, we are not advocating for an adoption of DEIJ language and identifiers in formal documents, given the social and political barriers to its enforcement. Instead, we are advocating for an integration of the principles of care, because they support diverse, inclusive, and equitable practices as key products and procedures of

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a professional society to open space for member-driven priorities that fall under this category to be supported by society resources.

Alongside top-down changes in power redistribution, we also must consider the responsibilities of STEM professionals to serve as mentors and to seek out mentorship. Our findings that supporting mentees was ranked lowest across career stages and demographics is particularly concerning because mentors often provide critical social capital to early career scientists that allows them to engage in and become active members within professional communities. Moreover, the high ranking of social networking in our survey reflect that reality that scientific conferences (and therefore scientific societies) construct and reinforce social networks that are highly connected to the professional practice. We expect that the prominent representation of DGUs in our data set further amplifies this signal: maintaining social connections through conferences is much easier than developing new connections, especially with access to the high social capital afforded by prestigious university affiliations or large research groups with legacy members. Social opportunities at conferences for all members (especially those without existing networks) are unlikely to be evenly distributed, and therefore, when collaborations and resources depend on these personal relationships, equity gaps are likely to widen.

Mentorship also needs more attention and potentially guidance as part of developing communities of care in the context of professional societies. Creating formalized structures and spaces that prioritize mentorship is an invaluable top-down agent of change, but the benefits may be reduced if there are not clear expectations or learning opportunities for effective mentorship. Some mentees expect both professional and personal (i.e., identity-affirming) mentorship from their societies, which may not align with the traditional professional mentorship expectations and preparedness of more senior attendees. Fostering an environment that values and promotes effective mentorship to enact cultural change will include training opportunities for mentors, expectation setting procedures, and clear pathways to receiving or giving mentorship in an opt-out format. Formalizing mentorship as a product of professional societies should therefore be viewed as an important aspect of leading cultural change in scientific societies.

As such, primary importance should be placed on scaffolding spaces or times in which social and emotional conversations and learning opportunities are similarly accessible for all participants. Such scaffolding could therefore take the form of mentoring programs that provide structure for low stakes informal interactions among members of diverse backgrounds and career stages, society-wide symposia focused on novel networking through the conduit of a scientific topic of interest or giving prime time slots to events that promote inclusion to signal high importance to membership (see Burnett et al. 2020). We also must work toward diversifying the representation of all perspectives in leadership roles and provide leaders with training and support so that the culture of care is institutionalized.

Cultural changes such as those proposed in the present article are often difficult to implement because they directly challenge the standards and structures put in place by the majority group, who perceive the status quo as a positive experience. If it is framed improperly, implementing new standards and structures can paint the old system as negative, thereby activating a social identity threat in majority groups and alienating them in the ongoing sociocultural change progress. For example, the use of DEIJ initiative language framing has so far alienated individuals with existing high social capital that do not see this as their space or their problem. Reframing this approach as community building or as membership initiatives opens cognitive space for individuals to consider their place in this type of learning (Roy 1995, Simmons and Wahl 2016), which is an important component of broadening participation in systems of care within the society to include all members willing and able.

The construction of our communities of care must be iterative and must have pathways to entry and feedback. Ongoing primary research will continue to provide valuable tests of and input for how we build and maintain communities of care alongside our communities of practice. We must continuously ask ourselves how prevailing social norms are shaping the way we imagine our future and whether leadership and membership have the tools and resources to envision a radically new community. These tools and resources must be supported by funding—internal to the organization or externally generated—to value and retain the hard work of individuals leading the change. Together, we can move past the struggles of working within a system that is rooted in colonialism, which can never produce a future that is centered on peoples' needs and social opportunity.

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Supplemental data

Supplemental data is available at *BIOSCI* online.

Author Contributions

Richelle Tanner (Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Visualization, Writing – original draft, Writing – review & editing), Kathryn Wilsterman (Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Visualization, Writing – original draft, Writing – review & editing).

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