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SYMPOSIUM INTRODUCTION

# Beyond A Vision for The Future: Tangible Steps To Engage Diverse Participants in Inclusive Field Experiences.

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**Synopsis** Recent strides toward improving diversity, equity, and inclusion (DEI) in field biology present a unique opportunity for transdisciplinary exploration of the impacts and state of a topic that has remained hereto largely underexplored and under-discussed in the academic setting. Within current literature, themes of racial and gender inequity, power imbalances, unsafe environments, and underdeveloped infrastructure and resources are widespread. Thus, we organized a symposium that addressed these compelling issues in field biology DEI through a multitude of experiential and academic lenses. This article will orient the reader to the special issue and offer summative goals and outcomes of the symposium that can provide tangible steps toward creating meaningful improvements in the state of DEI and safety in field settings.

## Background

Recent sexist and racist events in science and society have sparked renewed interest and new initiatives to increase representation and recognition of diverse voices in higher education and STEM disciplines. Yet metrics like earned PhDs and student and workforce surveys suggest that many disciplines, including the traditional "field" sciences of ecology, environmental sciences, and geosciences, remain ineffective at recruiting, training, and retaining diverse individuals (Bernard & Cooperdock, 2018; Gill 2018; Johnson *et al.*, 2019; Gonzalez and Keane, 2020; O'Brien *et al.*, 2020). For this symposium, we gathered an international group of scholars and scientists from diverse backgrounds and career stages to share research and perspectives on the state of diversity, equity, and inclusion (DEI) issues particular to field experiences. Below, we summarize common themes from their work and place it in the context of the existing literature on the subject. We also offer a list of future directions and objectives for field researchers and institutions to commit to, in order to improve the climate for diverse researchers and students working in field settings.

A landmark 2014 article by Clancy *et al.* detailed sexual abuse and harassment at field sites that is disproportionately targeted at trainee women. Their data show widespread harassment of trainees, lack of clear reporting mechanisms, and a lack of satisfactory outcomes when reporting occurred (Clancy *et al.*, 2014). Further, the National Academy of Science's 2018 Report on Sexual Harassment of Women found that legal and policy engagement with the issue has not resulted in a meaningful solution to the ongoing problem of harassment in academic settings. The report determines organizational climate to be the single most important factor in enabling harassment to perpetuate in an institution. Institutions with more reporting risk, fewer sanctions, and less likelihood of complaints being taken seriously will likely continue to create permissive environments where harassment and discrimination can

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perpetuate. The National Academy of Science recommends that the academy at large should work on implementing diverse, inclusive, and respectful environments; diffuse power structures and reduced isolation; support systems for those who experience harassment; improved transparency; accountable leadership; and effective training (National Academy of Science, 2018).

Despite efforts to create more socially responsible workplaces, discrimination and harassment continue to be widespread in academic settings (Aycock *et al.,* 2019; Didre, 2019; Aguilar and Baek, 2020; Karami *et al*., 2020) with over 10% of all female graduate students at major research universities reporting sexual harassment by a faculty member (Cantalupo and Kidder, 2018). Similarly, persons with disabilities, members of historically excluded racial/ethnic groups, LGBTQIA + women, and LGBTQIA + professionals of color report experiencing more frequent harassment than colleagues without disabilities or with white male identities (Dengate *et al.,* 2019; Cech and Waidzunas, 2021; Powell, 2021a, b). Across many STEM disciplines, similar patterns emerge: harassment of trainees and scholars with marginalized identities by supervisors and community members with disproportionately large power imbalances (e.g., Dovidio, *et al*., 2011; Aycock *et al*., 2019; Freedman-Weiss *et al*., 2020; Kisel *et al.,* 2020; Marin-Spiotta *et al*., 2020; Mahowald, 2021). The concept of power in a relationship informs the behaviors of the interacting parties. In mentor-mentee or trainer-trainee relationships, the mentor or trainer may hold a variety of power positions over the mentee or trainee (e.g., expert power, reward power, positional power; Fitzgerald and Ormerod, 1991). In situations when harassment or abuse occurs, exploitation of one or more of those power positions may be a contributing factor (Johnson *et al*., 2019). Trainee or mentee perception of authority may further enhance these power positions. Professional abuses of power are increasingly documented in academia, likely as a result of increased reporting and support for victims (Bolotnikova, 2018). Nonetheless, this harassment disrupts and has the potential to significantly alter career trajectories of women and others with marginalized identities (LGBTQIA+, disability, nonwhite racial/ethnic background; McLaughlin *et al*., 2017; Booksh and Madsen, 2018). In particular, students in life and physical sciences underreport incidents of sexual harassment, largely as a result of institutional barriers (Aguilar and Baek, 2020), which may be further compounded by intersectional barriers (Liu *et al*., 2019).

The "field" represents a landscape where academia intersects with social and domestic life and presents unique challenges for researchers navigating the risks, boundaries, and expectations present there. Recent publications on the topics of safety, inclusion, and diversity in field biology highlight the challenges and barriers that continue to impede progress toward equity in field biology (Hall *et al*., 2004; Clancy *et al*., 2014; O'Brien *et al.,* 2020). Field sites and/or field stations and marine laboratories (FSMLs) are often the primary data collection sites for STEM professionals (Wyman *et al*., 2009). Furthermore, they represent necessary components of research training for many early-career scientists, and place-based courses are important components of undergraduate curricula in many university STEM programs (Wilson, 1982; Haywood *et al*., 2015; Tanner *et al*., submitted for publication). However, despite the formative role that field work can play in STEM professional development, the field environment presents challenges to safety and accessibility for scientists with diverse identities. While in the field, scientists may have less clearly defined domestic and professional separation. In this setting, most researchers spend large amounts of time in close professional proximity to one another, interact more casually among academic ranks, develop domestic intimacy through the sharing of lodging, meals and household duties, and spend social time together. Such an environment presents tremendous opportunity for collaboration and collegiality; however, the potential for magnification and abuse of power dynamics and harassment also exist as a result of these conditions. Furthermore, field work often presents higher risks of racial or sexual harassment from residents and law enforcement in areas where field work is conducted, particularly for researchers with disabilities, LGBTQIA+, Black, and other historically excluded identities (Demery and Pipkin 2020).

The largest study of field-based sexual harassment to date (Clancey *et al*., 2014) did not differentiate between FSMLs and less formally defined "field camps" or "field sites." While this article generated a large amount of academic and social attention, intervention programs and tools designed to change the culture of field programs are still lacking, particularly on a systemic level. FSMLs vary widely in size, user days, and funding; however, nearly all of them incorporate academic research and place-based curricula into their mission and strategic plan as a top priority (Baker, 2015). Field stations represent unique university resources and can provide a microcosm of the larger academic system (Michener *et al*., 2009). They are often considered on-campus facilities, but due to their distance from campus and rural and/or remote locations, the strict oversight and formality of the main campus environment may appear to be absent or relaxed. While most field stations have formal codes of conduct and anti-discrimination and harassment policies, the way in which FSMLs formalize, announce, and enforce these policies re-

mains unexplored and likely varies considerably among stations.

For this symposium, we gathered an international group of scholars and scientists from diverse backgrounds and career stages to share research and perspectives on the state of DEI issues particular to field experiences. Below, we summarize common themes from their work and place it in the context of the existing literature on the subject. We also offer a list of future directions and objectives for field researchers and institutions to commit to in order to improve the climate for diverse researchers and students working in field settings.

## Emergent themes and future directions

### Field experiences are valuable for professional growth and retention

Field experiences are critical to growing a scientific career. Field courses are an important component of undergraduate STEM curricula, as they provide valuable opportunities for skill development, work experience, and professional networking for early career scientists (Wilson, 1982; Haywood *et al.*, 2015; Morales *et al.*, 2020). Although broadly beneficial, field experiences can have an especially large impact on academic performance and retention for individuals with marginalized identities. In particular, field experiences have been shown to narrow academic achievement gaps (Beltran *et al.*, 2020), build confidence in scientific ability (Jelks and Crain, 2020; Theobald *et al.*, 2020), and increase sense of belonging (Carlone and Johnson, 2007; Zavaleta *et al.*, 2020; Tanner *et al.*, submitted for publication). However, access to field experiences is often limited due to financial, accessibility, and systematic barriers to inclusion (Atchinson and Libarkin, 2016; Bowser and Cid, 2023). Tanner *et al.*, (submitted for publication) assess the impacts of hybrid and virtual research experiences on undergraduate student perceptions of belonging and scientific identity, and provide recommendations for building short-term research experiences into STEM curricula. In this issue, Morales and Reano (2023) and Bowser and Cid (2023) examine how primarily Black, Indigenous, and People of Color (BIPoC) field program leaders design and implement inclusive field experiences for undergraduate students. Their work highlights the risks and harm associated with "color/gender-blind" approaches and provides important suggestions/strategies for breaking down barriers to field participation, including advocating for sufficient financial support, student-centered design, mentor/supervisor training, incorporation of traditional ecological knowledge, the importance of building a field community, and the development of formal safety guidelines/protocols with marginalized identities in mind (Bowser and Cid, 2023; Morales and Reano, 2023).

### Disability needs to be included in DEI policies

Oftentimes, DEI work focuses on the need for gender and racial equity and inclusion. However, these conversations often overlook inclusion and access issues for individuals with disabilities and/or chronic illnesses (Rudzki and Kohl, 2023). The limited inclusion of disabled voices in STEM DEI efforts may be rooted in academic ableist cultures and assumptions about limitations caused by disabilities (Dovidio *et al.*, 2011; Devitz, 2023). Consequently, STEM careers in general, and field-based STEM professions in particular, often seem exclusive of individuals with disabilities. Thus, discussions of DEI must acknowledge barriers to inclusion for disabled persons, in addition to issues related to race/ethnicity, gender, and sexual orientation. In this issue, Rudzki and Kohl (2023) and Devitz (2023) emphasize the value of disabled experiences in field-based STEM disciplines (Daehn and Croxson, 2021), and provide actionable suggestions for assessing and improving field access for individuals with diverse disabilities. In addition, Devitz (2023) introduces the equipment repository for accessibility (ERA) model, which can help field stations, universities, and other institutions address and minimize barriers to disabled inclusion in the field.

### Clear policies, accessibility measures, and communication are essential

Development of clear and enforceable policies/codes of conduct to address barriers is crucial to safe and inclusive field experiences. Furthermore, the inclusion of diverse perspectives—in terms of both discipline and identity—in developing policies and codes of conduct is necessary to ensure that they are relevant to and meet the needs of individuals from a wide range of backgrounds (McDermott *et al.*, 2023; Yarincik *et al.*, 2023). Policies should be grounded in best practices for risk assessment and field safety for all participants, and should include clear expectations for respecting boundaries (Troutman, 2023) and establishing a welcoming, safe environment (Yarincik *et al.*, 2023). Furthermore, recognition of power dynamics among individuals from different backgrounds and/or in different career stages is essential to creating frameworks in which abuses of power can be mitigated. Power does not exist in an institution itself, but in the interactions of individuals within the institution (Doherty, 2018); thus, cultural changes are possible through alterations of interaction norms and individual training,

when conducted at appropriate scales. Oftentimes, cultural changes must be made through the training of the next generation, as those who currently occupy positions of power are less likely to view these issues with the gravity they warrant. In other words, a system that has promoted and advanced the career of a senior scientist may be perceived by that scientist as functional, despite it being exclusive or harmful to marginalized groups. Thus, appropriate training must be included as part of field preparation (McDermott *et al.*, 2023; Morales and Reano, 2023; Yarincik *et al.*, 2023). Such training should include basic field safety training, as well as distinct training sessions focused on microaggressions, interpersonal safety, bystander intervention, and reporting.

In addition to safety and field climate considerations, clear action plans and timelines for addressing barriers to access/inclusion are also necessary. As acknowledged below, sweeping programmatic overhauls to address widespread DEI issues may not be possible all at once. However, identifying barriers is an important first step in addressing access and inclusion. By recognizing accessible aspects of a program or facility, that information can be made widely available, and thus help marginalized individuals identify field programs and/or facilities that they can safely engage with. Furthermore, barriers assessment can help identify program/facility areas that need improvement, and leaders can make and communicate a plan for progress in addressing these barriers (Devitz, 2023; Rudzki and Kohl, 2023).

Finally, clear communication is essential for safe and welcoming field experiences. Communication should include information about what accessibility measures are in place as well as policies and procedures related to access, inclusion, and safety. For example, upfront information about accessibility infrastructure, such as door width and kitchen appliances, is necessary for persons with disabilities to assess whether they can safely work at a particular facility (Devitz, 2023; Rudzki and Kohl, 2023). Similarly, clear communication about information like timing of "bio breaks" (times to use the restroom and/or eat), lodging arrangements and bathroom/shower facilities, local healthcare services, and field safety plans are important for all field participants, and are especially valuable for disabled, LGBTQIA+, and/or BIPoC individuals (Kamran and Jennings, 2023; Matsuda, 2023; Yarincik *et al.*, 2023). Furthermore, processes for reporting incidents should be well communicated in advance, and pathways for reporting should be readily available, even in remote locations, should the need arise (Yarincik *et al.*, 2023).

## Removing barriers to improve DEI is accomplishable and must be ongoing

Given the size and complexity of the problems that exist, making programmatic changes to address them can feel overwhelming and/or financially prohibitive. However, DEI work is not something that can or should be started and finished in one fell swoop. Impactful DEI improvements may be incremental, especially for programs or institutions with limited financial resources or training support. Furthermore, DEI assessment and progress must be ongoing, and measures need continual evaluation and revision to meet the evolving needs of a diverse scientific community (Bowser and Cid, 2023; Kamran and Jennings, 2023).

It is easy to assume that a lack of participation by underrepresented and/or marginalized groups in the field sciences stems from a lack of interest in these particular topics or career paths. Yet until we begin to identify and break down the barriers that exist, we have no way of knowing how incorrect that assumption may be or where in the pipeline where the biggest problems lie (Kamran and Jennings, 2023; Matsuda, 2023; Rudzki and Kohl, 2023). Removing barriers to participation can often be uncomplicated and improvements can be made in the short-term. This can be as simple as making accessibility-related information (Rudzki and Kohl, 2023), or details about the availability of gender-neutral housing and restroom options (Matsuda, 2023) available on field station websites. Being thoughtful about power dynamics, and involving diverse voices, communities, and perspectives in the planning of field experiences or research projects are additional straightforward and manageable ways to improve DEI in field settings (Bowser and Cid, 2023; Morales and Reano, 2023; Yarincik *et al.*, 2023) to ensure the health and safety of all participants for both the natural and societal threats they may encounter (Kamran and Jennings, 2023; Matsuda, 2023; Troutman, 2023). It is important that we become aware of these barriers, so that we recognize and can begin to address them where and when they pop up. It is also important to acknowledge that although some solutions can be rapidly addressed, programs and facilities also need to make long-term and sustainable commitments to field safety, inclusion, and access. The papers in this issue provide numerous examples of barriers, both big and small, that can be addressed by individuals, lab groups, field stations, and even professional societies (McDermott, 2023) without the need for large investments of material or financial resources, as well as strategies that can be used to mitigate these barriers.

All DEI initiatives, whether short- or long-term, will require some degree of financial and personal invest-

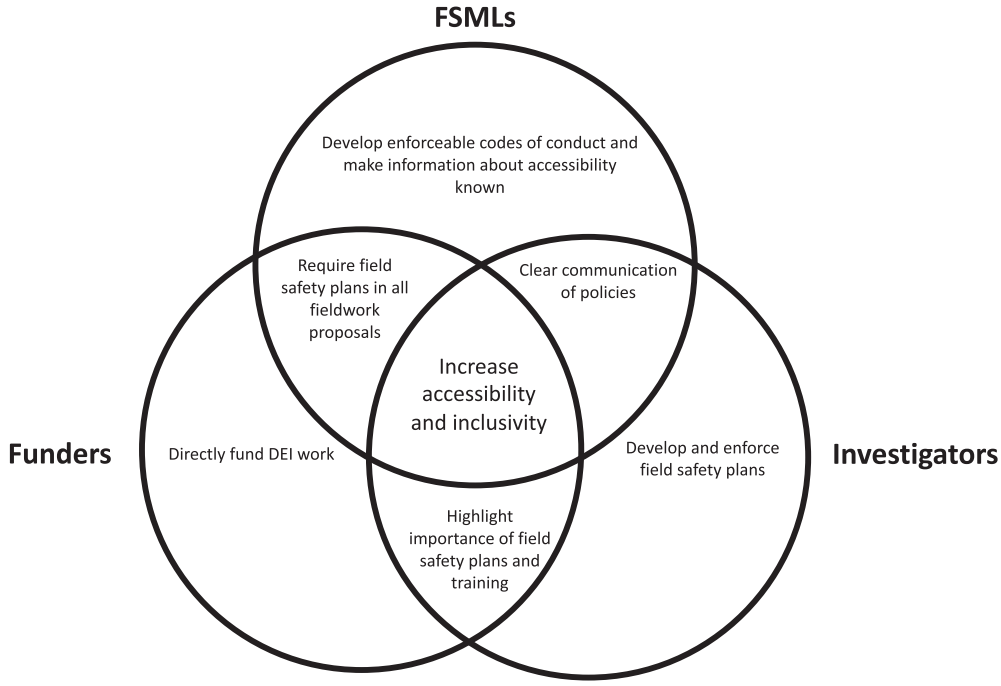


**Fig. 1** The overlapping roles of funders (e.g., National Science Foundation and other agencies), investigators (e.g., senior scientists, faculty), and FSMLs in establishing and maintaining diverse and safe field environments.

ment to be successful (Fig. 1). Yet, DEI work is typically unpaid, unrecognized labor that is primarily shouldered by members of underrepresented and historically excluded groups (e.g., women, LGBTQIA+, and members of nonwhite racial/ethnic groups; Kamceva *et al.*, 2022; Chugh, 2023). Therefore, institutional support, recognition, and funding are important elements in making DEI work sustainable. Some institutions and societies have already begun to invest in supporting DEI in academic and research settings, through the establishment of College/University offices of diversity and inclusion (e.g., University of Texas at Austin's Division of Diversity and Community Engagement) and awards to recognize individuals who have made meaningful contributions to advancing DEI initiatives (e.g., Society for Integrative and Comparative Biology's DEIJ Award; Organization for Biological Field Station's Advancing Equity Award). We believe that such efforts would be bolstered by widespread adoption of DEI statements and field safety and training plans as required elements in grant applications. Furthermore, field stations could require scientists and research groups to submit a field safety plan prior to their visit or project approval. NSF has already taken initial steps in this direction, by requiring a safe and inclusive work environments plan in a number of funding solicitations starting in January 2023, and we commend NSF on their efforts to advance field safety and inclusion in this manner.

## Conclusion

The evidence is clear that changes need to be made to make the field a safe, productive, and enjoyable place for researchers of all identities to work and learn. The ideas and perspectives in this issue help to enumerate the barriers that exist for researchers of different career stages and identities, but also provide tangible steps, both large and small, that we can make as individuals and as a community to break these down. We hope that they serve as a starting point for many conversations and actions that lead to positive changes for diversity, safety, equity, and inclusion in our field.

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## Conflict of Interest

The authors declare no conflict of interest.

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