



## SYMPOSIUM

# IDEA+ and OBFS: Using Transdisciplinary Strategies to Create More Inclusive Spaces

Victoria McDermott \*<sup>1</sup>, Lara D. Roketenetz †, Phoebe Jekielek ‡ and Rhonda Struminger §

\*Department of Communication, University of Alaska Fairbanks, Fairbanks, 99709, USA; † Martin Center for Field Studies and Environmental Education, University of Akron, Akron, 44333, USA; ‡ Hurricane Island Center for Science and Leadership, Rockland, ME 04841, USA; §Visiting Researcher, Communications and Marketing Division: Outreach Associate, University of Padova, Padova, 35122, Italy

From the symposium “Envisioning a Diverse, Inclusive & Safe Future for Field Biology” presented at the annual meeting of the Society for Integrative and Comparative Biology virtual annual meeting, January 16–March 31, 2023.

<sup>1</sup>Email: [vmmcdermott@alaska.edu](mailto:vmmcdermott@alaska.edu)

**Synopsis** Professional societies play a unique role in our personal and professional lives as spaces for connection and as regulatory entities. Often composed of volunteers from a variety of backgrounds, professional societies can guide the cultural norms and expectations of an industry by acting as critical leaders for supporting diversity, equity, and inclusion initiatives. The present manuscript explains how professional societies, like the Organization of Biological Field Stations (OBFS), can embrace transdisciplinary approaches to create more inclusive (in)tangible spaces to address serious problems facing industries today. Climate change, sexism, and racism, are examples of “wicked” problems that cannot be solved using existing modes of inquiry and decision making because of their complex and interrelated nature. As members of OBFS, a professional society dedicated to the advancement of field-based research, we explain how transdisciplinarity can and has been used to begin addressing serious issues like racism and sexism in field-based research and provide steps for future professional societies to engage in transdisciplinary thinking. We close with examples of our own transdisciplinary work developed through our membership within OBFS.

## Introduction

Professional societies play a unique role in people’s professional and personal lives by providing industry guidance, opportunities for growth, and spaces of connection outside individual workplaces (Feingold and Estes 2016). Specifically, previous research has demonstrated that professional societies can provide important career development for people at all career levels by acting as information hubs and sites for advice, support, and mentorship (Madzima and MacIntosh 2021). As succinctly explained by Madzima and MacIntosh (2021), “[professional] societies are the long-term professional homes of their members” (p. 3191).

In addition to providing spaces for connection, professional societies can play a significant role in advancing policies and best practices, such as promoting integrity in research within a discipline or industry

(Steneck 2003). Moreover, these organizations often set the cultural norms and expectations within an industry and can have a significant influence on governmental, societal, and global issues (Feingold and Estes 2016). By bridging the gap between our social lives and professional lives, professional societies occupy a unique space that can act as “critical levers for systems change” (Leibnitz et al. 2022, 1). Providing both peer influence and best practice guidance, professional societies can foster community-building in which positive work is rewarded and negative or unacceptable behavior is adequately addressed (e.g., acknowledgment of the issue or having a membership revoked) based on the policies of the society.

Based on the crucial role professional societies play in members’ lives and the setting of industry norms, this manuscript explores how professional societies

can play a significant role in creating more inclusive and equitable industry spaces through the adoption of transdisciplinary approaches. Ultimately, because of their position as regulatory and awareness building entities, as well as their ability to bring together individuals from different backgrounds and disciplines in pursuit of the same goals, professional societies can help to address inequities experienced by historically marginalized communities. Through the adoption of a transdisciplinary approach, professional societies are uniquely positioned to address “wicked problems” impacting industries and society at large (Brown et al. 2010; Bernstein 2015). To explicate this argument, we begin by providing background information on the Organization of Biological Field Stations (OBFS) as a professional society dedicated to the advancement of field-based research and outreach at field stations and marine labora-

tories. We then explain transdisciplinarity and explore how professional societies might implement transdisciplinarity to create more inclusive (in)tangible spaces, providing example projects completed by OBFS. We close with directions for future growth as a professional society and paths for academic inquiry.

### What is the OBFS?

As defined by [Struminger et al. \(2018\)](#), a field station or field-based institution is any establishment that “calls itself such and supports scientists conducting research on or near its premises” (p. 971). Sometimes termed “FSMLs” (field stations and marine laboratories), these sites provide researchers with infrastructure and accommodations to conduct research in often remote ecosystems. The OBFS is an international professional society dedicated specifically to supporting field-based institutions across the globe. Founded in 1968, OBFS is a nonprofit organization run solely by volunteers that seeks “to serve the member stations in ways that increase their effectiveness in research, education, and outreach. The organization pursues its mission in a manner that maximizes diversity, inclusiveness, sustainability, and transparency” (OBFS n.d., para. 1), providing field station staff, leaders, users, and community members with a space to communicate about FSML-specific issues and challenges. OBFS seeks to fulfill its mission through the cultivation of important resources and best practices on its website, engagement with members through meetings (virtual and in-person) and newsletters, and by building awareness for FSMLs through advocacy efforts at state, federal, and international levels. More recently, as an organization, OBFS has sought to become a leader of diversity, equity, inclusion, and accessibility among the fieldwork community through the implementation of a new strategic plan. The strategic plan, entitled *Adapting to a Changing Climate: Supporting Resilient Stations for Today and for Tomorrow*, was developed during 2020 and 2021, and was approved by the board to be implemented from 2021 through 2026. Developed based on member survey data, this guiding document identified the following areas related to the function, role, and value of OBFS: collaborations (e.g., among domestic and international stations as well as with other like-minded organizations and professional societies like Society of Integrative and Comparative Biology), human diversity, equity, and inclusion (DEI; e.g., support of awards to recognize extraordinary member initiatives, training for our members), membership support and services (e.g., website redesign, member survey, international station inclusion), advocacy (e.g., Congressional Visit Days, internal and external awareness campaigns), and gover-

nance and sustainability (e.g., policies and procedures to ensure long-term viability of the organization; OBFS 2021).

### Challenges of FSMLs

The creation, adoption, and implementation of this strategic plan was an important step for OBFS since FSMLs' unique and storied histories with remoteness, exclusion, and colonialism tend to affect their functioning and ultimately the integration of DEI initiatives in FSMLs today (Flowers et al. 2021; see McDermott et al. 2022 for a more in-depth explanation of these DEI-related challenges). Related to remoteness, FSMLs tend to be located in isolated, confined, and extreme environments (ICE), which are often inhospitable as well as difficult to access (McDermott et al. 2022). This can result in limited availability of resources, as well as require staff and users to live onsite. Living onsite at FSMLs for days to months on end can blur the lines between work and personal time, resulting in negative experiences ranging from interpersonal communication conflicts (McDermott et al. 2023) to burnout and turnover (McDermott 2019).

In addition to the effects of ICE, and in line with much of today's science (National Academies of Sciences, Engineering, and Medicine [NASEM] 2023), the cultural norms and values of FSMLs tend to be built around and continue to perpetuate hegemonically masculine ideology, making it difficult for historically marginalized groups such as women, People of Color, gender-diverse people, and those with intersecting identities to progress, succeed, and thrive (McDermott et al. 2022). Because of the focus on the hegemonic masculinity (i.e., the adherence, performance, and expectation of traditional gender roles, man-masculine-leader, and woman-feminine-caretaker; Jewkes et al. 2015), people may feel unwelcome or unsafe because of their preferred gender identity and expression (Flowers et al. 2021; Simon et al. 2017). For example, STEM has been deemed a "chilly climate" for women who often face ostracism and incivility, as well as the femininity penalty (i.e., the inequalities women face in the workplace for being a woman such as lower pay, limited access to peer networks, etc.; Miner et al. 2019; Simon et al. 2016). Within FSMLs, research has demonstrated that women and gender-diverse people may experience higher rates of sexual violence and harassment than men as blurry boundaries are pushed in ICE locations (Clancy et al. 2014; McDermott et al. 2022).

Compounding the effects of a hegemonically masculine culture, FSMLs are also often sites of colonialism in which Native and Indigenous lands and resources have been taken in the name of western scientific advancement without proper compensation to or collaboration

with local communities (McDermott et al. 2022). Today, the history of colonialism globally has resulted in Native and Indigenous displacement, resource exploitation, and distrust across cultures, as well as the creation of "parachute science" (de Vos 2022). Parachute science is when researchers from wealthy places come to poorer places to collect data and leave without investing in or even crediting the local communities that supported their research endeavors (Roldan-Hernandez et al. 2020; de Vos 2022). Parachute science is detrimental to local communities as it ignores the value of local knowledge and context, both of which are critical for long-term research and sustainable solutions to environmental problems, as well as reinforces economic inequity (Roldan-Hernandez et al. 2020). When researchers do not engage with local communities, they reinforce colonialism by taking resources (e.g., tangible specimens and intangible Elder knowledge) without reciprocating adequate compensation, thereby reinforcing colonialist trauma and poverty.

Ultimately, with organizational histories and cultures steeped in hegemonic masculinity and colonialism, historically marginalized people may face seemingly insurmountable barriers to accessing FSMLs. Further feelings and experiences of bias, discrimination, and harassment may be exacerbated when FSMLs are located in remote spaces with limited access to outside support systems and require extensive funding to visit (McDermott 2019; Becker et al. 2022; NASEM 2023). However, for many students, experiences at a FSMLs conducting hands-on science can be transformative and assist in the recruitment and retention of students in STEM careers (National Research Council 2014; Becker et al. 2022). Thus, racism, sexism, and colonialism present wicked problems, i.e., problems that cannot be solved using existing modes of inquiry because of their complex and interrelated nature (Berstein 2015), for field-based institutions to overcome. As we look to create more inclusive and accessible spaces in STEM and field-based institutions, applying new approaches to research and inquiry such as transdisciplinarity may help to identify ways to combat and solve issues related to DEI experienced at FSMLs.

### The role of professional societies and transdisciplinarity

One space that may provide invaluable opportunities for overcoming and mitigating some of the challenges to inclusion and access in field-based institutions is professional societies. Although professional societies may vary in terms of their specific mission and vision, they primarily seek to educate and inform, defining and setting standards for professional fields to promote high

quality research and awards, and increase public awareness (NASEM 2023). Important to this work, professional societies can be foundational organizations and provide structures for making people feel less isolated physically, emotionally, and mentally, especially when in niche industries that may differ greatly from the traditional corporate 9-to-5 workplace structure. Because of their roles in both setting industry-specific cultural norms and acting as gatekeepers in the accreditation process, Leibnitz et al. (2022) argued that STEM professional societies are “uniquely positioned to foster national-level diversity, equity, and inclusion (DEI) reform” (p. 1). For example, professional societies often represent community concerns and can therefore support advocacy efforts through actions such as communicating an emphasis on inclusion through policies and best practices shared among community members (Hulede 2018; Morris and Washington 2018). As argued in the most recent National Academies of Sciences, Engineering, and Medicine (2023) report on *Advancing Antiracism, Diversity, Equity, and Inclusion in STEMM Organizations*, professional societies have an important role in shaping the collective conversations and priorities in STEM.

We agree with this assertion and seek to take this argument a step further. We argue that professional societies can play a significant role in creating more inclusive and equitable spaces through the adoption of transdisciplinary approaches. Because of their unique positionality to bring together individuals from different backgrounds and disciplines, as well as their role as regulatory and awareness building entities, professional societies can shift the culture of industries to make DEI a top priority and focus. As members of OBFS, President of OBFS (Lara), Co-Chairs of the IDEA+ Committee (Victoria and Phoebe), and Co-Chair of the International Committee (Rhonda), we seek to try to take innovative transdisciplinary approaches to build better, more supportive, and inclusive field-based institutions.

### Adopting transdisciplinarity

Transdisciplinarity is not a new approach. Started in the 1970s, it has been used extensively in the humanities and seems to be getting renewed attention in the physical science fields as we seek to identify creative solutions for increasingly complex issues (Berstein 2015; Chuenpagdee and Jentoft 2019; Scholz 2020; Zscheischler and Rogga 2015). Transdisciplinarity involves work that creatively reimagines disciplines and the possibilities for combining them (for a full history of transdisciplinarity see Bernstein 2015). Unlike multidisciplinarity (i.e., collected inputs from differ-

ent disciplines without synthesis), and interdisciplinarity (i.e., collaboration between researchers from different disciplines aimed at a synthesis and integration of knowledge), transdisciplinarity generally rejects the separation of topics and scholarly approaches into disciplinary “silos” (Berstein 2015). Instead, transdisciplinary approaches seek to challenge the framework of disciplinary thinking to instead generate fundamentally new conceptual frameworks, hypotheses, and theories that transcend their disciplinary origins (Borrego and Newswander 2010; Hall et al. 2012; NASEM 2023). Moreover, transdisciplinarity also includes non-academic stakeholders to participate in the meaning making process (Rigolot 2020).

Thus, transdisciplinarity seeks to move beyond discipline-specific approaches to address “wicked” problems (Berstein 2015; Choi & Pak, 2007; Rigolot 2020). Wicked problems are defined as those that “defy complete definition and cannot be solved using existing modes of inquiry and decision making” (Brown et al. 2010, 1–2). In other words, wicked problems are complex, ill-defined, and often interrelated with other issues, systems, and organizations that make them difficult to address. Wicked problems include issues like climate change, international health pandemics, and racism. As wicked problems, these complex, ill-defined, multi-layered, societal challenges transcend domains and require resources outside of a specific discipline to fix (Knapp et al. 2019). Because of the complexity surrounding wicked problems, transdisciplinarity has been identified as a valuable framework for taking a holistic approach to knowledge production and decision making.

It is important to note that transdisciplinary thinking does not exclude the existence of disciplinary thinking. As argued by Burnard et al. (2021), “transdisciplinarity seeks to de-couple the specific language of a discipline from its original context, in order to open up new possibilities for viewing and experiencing the same phenomenon” (p. 114). As such, transdisciplinarity has been used to approach wicked problems such as complex sustainability problems (Knapp et al. 2019), fisheries governance (Chuenpagdee and Jentoft 2019), and incurable biomedical diseases (e.g., Parkinson’s and cystic fibrosis) (Flinterman et al. 2001). Through a transdisciplinary lens, scholars have demonstrated that innovative knowledge production, the integration and acknowledgement of different ways of knowing, and considerations of the impacts of power help us to face local and global issues from a perspective of “science for and with society” (Scholz 2020, 1042).

Although transdisciplinarity seems to be a viable pathway for identifying innovative solutions, it has and

continues to receive criticism and pushback from the scholarly community. Specifically, for those interested in promotion and tenure within academic institutions, research has demonstrated that transdisciplinary scholarship is not always viewed as “real” research or adequately funded (Zcheischler and Rogga 2015). Moreover, these approaches may take additional time to execute ethically and effectively as scholars must extensively consider how transdisciplinary collaborations will be approached (e.g., methods of data collection, goals of the project), as well as cultivate strong interpersonal relationships (Knapp et al. 2019). Ultimately, the time intensive nature of transdisciplinary research and the different types of deliverables (e.g., policy guidance, information for the public) that may be the goal of the project can result in lower traditional academic publishing rates (Knapp et al. 2019). Differences in ontological approaches, differences in outcome expectations, and general communication conflicts (e.g., interpersonal communication conflicts, power struggles) can make it challenging to engage in transdisciplinary research (Zcheischler and Rogga 2015). However, as we experience more frequent and severe wicked problems in society, professional societies may provide important spaces for engaging in transdisciplinary conversations and collaborations. From our experiences engaging in transdisciplinary collaboration within a professional society, we provide examples of how professional societies may act as integral entities for supporting, funding, and cultivating transdisciplinary work.

### How do we implement transdisciplinarity

As explained above, FSMLs are crucial locations for “tackl[ing] critical environment issues” (OBFS n.d., para. 3). As we continue to encounter wicked problems related to climate change and discrimination in FSMLs, “Twenty first century problem solving requires a cadre of disciplines working together to analyze, synthesize, and evaluate today’s global conversations” (Soublis 2017, 71). Thus, as scholars and practitioners affiliated with FSMLs, we have sought to use transdisciplinary approaches through OBFS to engage in problem-solving related to issues and challenges facing FSMLs. From our experiences, we offer some steps for engaging in transdisciplinarity in professional societies (develop a transdisciplinary foundation, ask questions from different lenses and paradigmatic assumptions, foster collaboration, and engage in problem solving), as well as examples of outcomes of our collaborations for each step. These steps are modified from the four stage model for transdisciplinarity argued by Hall et al. (2012; e.g., development, conceptualization, implementation, and translation).

### Develop a transdisciplinary foundation

The first step to engaging in transdisciplinarity is to identify and define your conceptualization of transdisciplinarity. Before engaging in transdisciplinarity, we urge those interested in this approach to explore additional scholarship, like the [OECD \(2020\)](#) report for *Addressing societal challenges using transdisciplinary research* and systematic review such as those conducted by [Knapp et al. \(2019\)](#), Zcheischler and Rogga (2015), and [Flinterman et al. \(2001\)](#), which may provide similarly important insights into implementing transdisciplinary approaches into culture and practices. Once you have determined an operationalized definition of transdisciplinarity, it is important to identify disciplinary thinking relevant to your topic and consider how this disciplinary thinking may hinder transdisciplinarity. As you identify disciplinary thinking, seek to decouple the specific language of a discipline from its original context (Burnard et al. 2021). For example, [Burnard et al. \(2021\)](#) explain how the word “cell” may have different meanings within different disciplines. As [Burnard et al. \(2021\)](#) argue:

In physics, a cell or “battery” is defined as an energy source providing an electrical potential difference between its two terminals. Whereas, in biology, a cell represents the smallest structural and functional unit of an organism with a set of identifiable features, such as organelles and membranes. Talking about “cells” is hardly a point of dialogue between the two realms of knowledge. That said, by shifting attention from its descriptive features and focusing on the physical exchanges of particles and dynamic processes taking place in the cell an important commonality can be found: the transfer of materials and energy through the “cell” (p. 114).

In other words, if we remain within one disciplines’ understanding of a “cell” then the discipline-specific history of the word “cell” could limit the ways in which we talk about and conceptualize what a cell is or could be. However, shifting the definition allows for the reconceptualization of a cell to make sense across discipline languages.

In taking a transdisciplinary approach to FSMLs, we considered how communication and FSMLs may intersect. Beginning with the disciplinary elements of communication, we can consider how communication elements such as conflict management and group communication theories like groupthink (Janis 2008) could manifest in FSMLs during a field season (McDermott et al. 2023). Using the patterns identified from field experiences, [McDermott et al. \(2023\)](#) determined critical points within a field season that may exacerbate interpersonal communication tensions. From these critical points, interventions such as surveys and workshops can be used to gather feedback on individuals’ mental and emotional states to try to mitigate the potential for interpersonal conflict. Reciprocally, communication

best practices such as dialogue agreements, i.e., communication norms set and agreed upon by a group, can be used at FSMLs to encourage quality communication interactions. The [First Alaskans Institute Dialogue Agreements \(2014\)](#) or a Communication Action Statement (CAS) are useful examples for setting communication norms expectations for members during interactions. A CAS seeks to set shared norms and expectations regarding communication, as well as acknowledge the effects that exclusionary communication norms may have on historically marginalized individuals. Moreover, CAS recognize and affirm the importance of place and cultural diversity in communication norms, as well as seek to signal mutual respect and affirmation ([McDermott and May, in press](#)). For example:

We recognize and make space for the communication norms and values of the Indigenous People and their ancestors, who care for these lands. We acknowledge the communication norms we know and practice are based in colonialist western knowledge systems. We invite attendees to share with us their language, Elder wisdom, and communication practices so that we may grow together as a community. ([McDermott and May, in press](#))

Setting explicit communication norms and expectations can be important to avoid ambiguity in communication interactions. For example, people may have different communication expectations related to gender, culture, or age that can result in unintended harms to others. Thus, explicitly setting communication norms helps to avoid these potentially negative interactions. In this first step, identifying discipline-specific language, as well as conceptualizations of transdisciplinary, we can start to see opportunities for cross discipline collaboration.

#### Ask questions from different lenses and paradigmatic assumptions

Second, be open to asking questions from different lenses and paradigmatic assumptions. Paradigmatic assumptions are how we conceptualize ontology (e.g., nature of truth), epistemology (e.g., nature of knowledge production), axiology (e.g., values placed in research), and methodology (e.g., approach to conducting research; [Tracy 2019](#)). Oftentimes, as scholars we are taught to become experts in one field from a singular perspective. While our paradigmatic assumptions may slightly shift over time, we encourage you to engage in a complete reflection of your current paradigmatic assumptions and consider how you might ask questions from different perspectives. Taking on new paradigmatic approaches may help you to see issues in a new light. To do this, you may also seek out other scholars whose work and training comes from different paradigmatic perspectives to talk to and learn from.

Ultimately, engaging in cross-discipline collaboration requires integrating a variety of perspectives and validating ideas that may conflict with our own steadfast assumptions. By challenging our own paradigmatic assumptions, we can practice valuing, respecting, and viewing issues from others' perspectives before engaging in the collaboration process.

When reflecting on paradigmatic assumptions, especially in relation to FSMLs and STEM, we must consider the role and placement of power. Specifically, who has power and who does not. In a review of transdisciplinary research, [Knapp et al. \(2019\)](#) identified that the acknowledgement of power was a gap in much of the currently published research on transdisciplinarity. However, power must be considered so that outcomes are equitable and sustainable for all those involved in the collaboration, as well as all those the outcomes may affect (i.e., local community members). Power differentials can occur on many levels in a transdisciplinary project and must be acknowledged and addressed by “highlight[ing] how certain ways of knowing are privileged over others, who gets to make the decisions embedded in the modern scientific process, and what types of questions are pursued within modern science and scholarship” ([Knapp et al. 2019](#), 15).

In the specific contexts of communication and FSMLs, for example, an Indigenous scholar may provide important insights into the impacts of colonialism in the surrounding community and how it impacts trust and relationship development. A mathematician may explain how topology impacts the flow of communication in a FSML. An architect may provide insight on how physical structures impact communication and reinforce divisions between groups. From these different perspectives, you may be able to create a tangible outcome such as a comprehensive code of conduct. Integrating important contextual information into a code of conduct such as information about Indigenous communities and the desecration of land, as well as taking into account topology and physical structures that may create barriers to reporting conduct violations can help to create a comprehensive code of conduct that acknowledges the voices of all FSML community members and considers how power may negatively impact their FSML experiences. Comprehensive codes of conduct created through transdisciplinary collaboration and with a high level of care can then be used to penalize unwanted behavior from community members to begin shifting the overall culture of an industry. An example of transdisciplinary collaboration would be the development of an annual meeting code of conduct by OBFS based on the guidance from [ADVANCEGeo \(2022\)](#), a diverse team of scholars, practitioners, and institutions working to ad-

dress problems of harassment in science research environments.

### Foster collaboration

The third step, which may be done in tandem with step two, is to identify collaborations. In this stage, you should identify potential collaborators and the wicked problems you wish to tackle as a team. During this stage, all collaborators are brought together to develop research questions or hypotheses, research design, and potential outcomes in the specific contexts of communication and FSMLs. When engaging in the collaboration process, Flinterman et al. (2001) provide an important overview of the social conditions required for transdisciplinary research success (e.g., commitment to a common vision, mutual respect, mutual learning, openness). When picking collaborators and identifying wicked problems, these conditions must be considered to avoid potentially negative interactions and project outcomes.

The value of professional societies is that they may attract many individuals who meet the conditions for transdisciplinary research since they provide a meeting space for those from any discipline to come together in pursuit of the same goals. Professional societies which are often run by volunteers, may cultivate a community of experts who are interested and eager to engage in the transdisciplinary collaboration process. Because professional societies are open to those from a variety of disciplines, as well as affiliations (e.g., community members, employees, alternative stakeholders), members may feel welcome to participate in this community environment, unlike in solely academic spaces that may require specific criteria (e.g., experience in a certain discipline) for access and participation.

One example of a transdisciplinary collaboration that emerged from our work with OBFS is the edited volume *Women of the Wild: Challenging Gender Disparities in Field Stations and Marine Laboratories* (McDermott et al. 2022). *Women of the Wild* is an edited volume spearheaded by McDermott, Gee, and May, and was created through collaborations with other members of OBFS. After sending out the call on the OBFS email listserv, this edited volume challenged ecologists, biologists, and other physical science trained scholars to engage in qualitative communication inquiry. Through a collaborative research process from initial research question generation to final chapter write-up, social scientists McDermott and May worked with volume editor and physical scientist Jennifer Gee, as well as chapter contributors, to conduct rigorous qualitative research to share their FSML stories with gender discrimination and harassment. Contributors' chapter methodologies ranged from questionnaires to

autoethnographies, documenting and giving voice to gender-specific challenges encountered in FSMLs. For most of the chapter contributors, this was their first time engaging in qualitative research. The result was a comprehensive edited volume that transcended social and physical science spaces to illustrate the gender-specific challenges experienced in field-based institutions, as well as provide tangible recommendations for combating systemic sexism in FSMLs. This edited volume was possible because all those who participated in this project were committed to the common vision of highlighting gender discrimination in FSMLs and open to learning new frameworks for inquiry.

### Engage in problem solving

The final step is to engage in problem solving as a collaborative team. Once collaborators have been found and the conditions for collaboration have been set, such as setting aside power differences and challenging ontological assumptions, the team can start to execute the project. During this execution phase, problem solving should be assessed in relevant ways to assure the process and outcomes of the project are functioning as intended. For example, OBFS took a transdisciplinary approach to developing the most recent member survey. First, the organization identified funding to support the initiative. Second, they brought in a social science consultant to collaborate with committee members and the larger OBFS community over a series of months through individual and group meetings to develop and test the survey. While the social science consultant provided guidance for developing a rigorous and useful methodological design, the inclusion of committee members during the creation process allowed all members of the organization the space to talk about issues important to them. Thus, the survey sought to capture the experiences of topics ranging from FSML infrastructure to DEI. A range of question formats (e.g., Likert, open-ended) allowed participants a variety of options for sharing their perspectives. Further, those who were not currently members or had never been members were also encouraged to participate to see how the organization could better support FSMLs overall. Feedback gleaned from this survey is the first step for addressing some of the wicked problems facing FSMLs to see how OBFS can act as a leader, guide, and support for field-based institutions in the future. Finally, anonymized and aggregated survey results are available to any OBFS member to use in future research and funding proposals.

Important in this step is that we need to recognize transdisciplinary work as valuable, fundable, and labor-intensive in ways that are different but equally impor-

tant as single or siloed discipline research inquiries. Because of traditional structures in academia that privilege specific types of publications and research, some transdisciplinary work may not be viewed as rigorous (Knapp et al. 2019). Depending on the outcome of the project relative to the output that is traditionally counted for tenure and promotion, people may be hesitant to engage in transdisciplinary work. This is where professional societies may provide some additional assistance. First, professional societies may be able to provide funding to members to conduct transdisciplinary projects that may not qualify for other sources of funding. Funding and additional resources provided by professional societies may allow for innovative, transdisciplinary projects to be executed to meet the needs of both the organization and the industry at large. Second, because of the service component related to professional societies, we may be able to increase the value of transdisciplinary work. For example, transdisciplinary work may be counted as important service to a discipline or field and professional societies can create awards and programs that recognize and validate the significance of this work. For example, as OBFS works to challenge issues related to racism and sexism in the field, the *Advancing Equity Award* provides both an award and monetary compensation in recognition of unique activities, programs, or approaches (funded or unfunded) that increases the involvement, engagement, and sustainability of underrepresented groups in field science. This award and monetary compensation can be used to assist people in tenure and promotion, as well as to illustrate to donors the value of their donations for supporting FSMLs' DEI initiatives. Although we present these steps in a sequential manner, these steps are recursive, iterative, and sometimes simultaneous throughout the life cycle of a project or team (Hall et al. 2012). Importantly, challenging your paradigmatic assumptions as a form of researcher reflexivity (Tracy 2019) should be implemented at every stage of a project to continuously consider how power and research may affect intended and unintended audiences.

## Going forward

We hope this paper serves as a starting point for other professional societies and disciplines to consider how transdisciplinarity can be applied in unique spaces to push inclusion and equity policies and regulation forward and address some of the wicked problems facing society today. To that end, OBFS will be continuing to work on our own strategic initiatives through this transdisciplinary methodology when appropriate to improve our community for current and future members and to report on these endeavors externally to the

broader STEM community so that we can be accountable for our actions. Some of the initiatives we hope to tackle over the next few years include working on the practicalities of a Code of Conduct for members; updating our bylaws to provide guidance for reporting violations and how to manage violation investigation and consequences; supporting training on Field Safety (see Kelly and Yarincik 2021); and continuing collaboration with other professional organizations and individuals doing the hard work of social and environmental justice. We also plan to continue supporting our strategic plan goals, specifically those related to the IDEA+ and the collaborations, international, and advocacy/outreach/communications committees through investment of funds for professional development/workshops/training to increase member engagement and opportunities for improvement at individual FSMLs. Ultimately, taking a transdisciplinary lens, through the unique location of professional societies as open-access regulatory and awareness building entities, we can work to bring together individuals from different backgrounds and disciplines in pursuit of shared goals to face wicked problems posed by today's society.

## Conflict of interest

We do not have any conflict of interest to declare.

## Data availability statement

There is no data associated with this project.

## References

ADVANCEGeo. 2022. Codes of conduct. [https://serc.carleton.edu/advancegeo/resources/codes\\_conduct.html](https://serc.carleton.edu/advancegeo/resources/codes_conduct.html)

Becker DM, Griffin JE, Miller CML. 2022. Identifying factors that contribute to positive and negative student experiences at field-based institutions. In: McDermott V, Gee J, May A, editors. *Women of the wild: challenging gender disparities in field stations and marine laboratories*. Lexington Books, Lanham, MD.356.

Bernstein JH. 2015. Transdisciplinarity: a review of its origins, development, and current issues. *J Res Pract* 11: 1–20. <http://jrp.picaap.org/index.php/jrp/article/view/510/412> [Last accessed April 18, 2023].

Borrego M, Newswander LK. 2010. Definitions of interdisciplinary research: toward graduate-level interdisciplinary learning outcomes. *Rev High Educ* 34:61–84. <https://doi.org/10.1353/rhe.2010.0006>

Brown VA, Harris JA, Russell JY, (eds.). 2010. *Tackling wicked problems: through the transdisciplinary imagination*. Earthscan, New York, NY.

Burnard P, Colucci-Gray L, Sinha P. 2021. Transdisciplinarity: letting arts and science teach together. *Curric Perspect* 41:113–8.<https://doi.org/10.1007/s41297-020-00128-y>

Choi BC, Pak AW. 2007. Multidisciplinarity, interdisciplinarity, and transdisciplinarity in health research, services, education and policy: 2. Promotors, barriers, and strategies of enhancement. *CIM* 30:351–64. <https://doi.org/10.25011/cim.v30i6.2950>

Chuenpagdee R, Jentoft S, (eds.). 2019. *Transdisciplinarity for small-scale fisheries governance*. Springer, New York, NY.

Clancy KB, Nelson RG, Rutherford JN, Hinde K. 2014. Survey of academic field experiences (SAFE): trainees report harassment and assault. *PLoS One* 9:e102172. <https://doi.org/10.1371/journal.pone.0102172>

de Vos A. 2022. Stowing parachutes, strengthening science. *Conservat Sci Prac* 4:1–3. <https://doi.org/10.1111/csp2.12709>

Feingold RS, Estes SG. 2016. The politics, roles, and future of professional societies. *Quest* 68:284–91. <http://dx.doi.org/10.1080/00336297.2016.1175952>

First Alaskans Institute. 2014. First Alaskans Institute Dialogue Agreements. <https://firstalaskans.org/wp-content/uploads/2014/03/Dialogue-Agreements-FINAL.pdf> [Last accessed: April 18, 2023]

Flinterman JF, Teclemariam-Mesbah R, Broerse JE, Bunders JF. 2001. Transdisciplinarity: the new challenge for biomedical research. *Bull Sci Technol Soc* 21:253–66.

Flowers SK, O'Connell K, McDermott VM. 2021. Crafting field station and marine lab communities for undergraduate diversity, equity, and inclusion. *Bull Ecol Soc Am* 102:e01908. <https://doi.org/10.1002/bes2.1908>

Hall KL, Vogel AL, Stipelman BA, Stokols D, Morgan G, Gehlert S. 2012. A four-phase model of transdisciplinary team-based research: goals, team processes, and strategies. *Transl Behav Med* 2:415–30. <https://doi.org/10.1007/s13142-012-0167-y>

Hulede IV. 2018. Preparing students for success in STEM: role of professional societies. *LSE* 17:es14. <https://doi.org/10.1187/cbe.17-11-0243>

Janis IL. 2008. Groupthink. *IEEE Eng Manag Rev* 36:36.

Jewkes R, Morrell R, Hearn J, Lundqvist E, Blackbeard D, Lindeger G, Quayle M, Sikweiyia Y, Gottzen L. 2015. Hegemonic masculinity: combining theory and practice in gender interventions. *Cult Health Sex* 17:112–27. <https://doi.org/10.1080/13691058.2015.1085094>

Kelly A, Yarincik K. 2021. Report of the workshop to promote safety in field sciences. Workshop to promote safety in field sciences (SIFS), Virtual. Zenodo. <https://doi.org/10.5281/zenodo.5604956>

Knapp CN, Reid RS, Fernández-Giménez ME, Klein JA, Galvin KA. 2019. Placing transdisciplinarity in context: a review of approaches to connect scholars, society and action. *Sustainability* 11:4899. <http://dx.doi.org/10.3390/su11184899>

Leibnitz GM, Gillian-Daniel DL, Greener RMCC, Campbell-Montalvo R, Metcalf H, Segarra VA, Peters JW, Patton S, Lucy-Putwen A, Sims EL. 2022. The inclusive professional framework for societies: changing mental models to promote diverse, equitable, and inclusive STEM systems change. *Front Sociol* 6:784399. <https://doi.org/10.3389/fsoc.2021.784399>

McDermott V. 2019. “It’s a magnifying glass”: the communication of power in a remote field station (13856666)[dissertation]. University of Alaska Fairbanks. ProQuest Dissertations & Theses Global.

McDermott V, Gee J, May A. 2022. *Women of the wild: challenging gender disparities in field stations and marine laboratories*. Lanham, MD . Lexington Books.

McDermott V, Kauten R, Gee J, May A. 2023. Understanding and mitigating interpersonal communication conflict in field based institutions. *Bull Ecol Soc Am* 104:e02037. <https://doi.org/10.1002/bes2.2037>

McDermott V, May A. Challenging the positionality of western mainstream English through the implementation of communication action statements. In press.

Madzima TF, MacIntosh GC. 2021. Equity, diversity, and inclusion efforts in professional societies: intention versus reaction. *Plant Cell* 33:3189–93.

Miner KN, January SC, Dray KK, Carter-Sowell AR. 2019. Is it always this cold? Chilly interpersonal climates as a barrier to the well-being of early-career women faculty in STEM. *EDI* 38:226–45. <https://doi.org/10.1108/EDI-07-2018-0127>

Morris V, Washington T. 2018. The role of professional societies in STEM diversity. *Not Am Math Soc* 65:149–55. <https://doi.org/10.1090/noti1642>

National Academies of Sciences, Engineering, and Medicine. 2023. *Advancing antiracism, diversity, equity, and inclusion in STEMM organizations: beyond broadening participation*. Washington, DC. The National Academies Press. <https://doi.org/10.17226/26803>

National Research Council. 2014. *Enhancing the value and sustainability of field stations and marine laboratories in the 21st century*. Washington (DC): The National Academies Press. <https://nap.nationalacademies.org/catalog/18806/enhancing-the-value-and-sustainability-of-field-stations-and-marine-laboratories-in-the-21st-century> [Last accessed: April 18, 2023].

OECD. 2020. Addressing societal challenges using transdisciplinary research. <https://www.oecd.org/science/addressing-societal-challenges-using-transdisciplinary-research-0ca0ca45-en.htm> [Last accessed: April 18, 2023].

Organization of Biological Field Stations. n.d. Home. <https://www.obfs.org/>

Organization of Biological Field Stations. 2021. Strategic plan (2021–2026) adapting to a changing climate: supporting resilient stations for today and for tomorrow. <https://obfst.memberclicks.net/assets/docs/OBFS%20Strategic%20Plan%202021-2026%20%28Sept%202021%29.pdf> [Last accessed: April 18, 2023].

Rigolot C. 2020. Transdisciplinarity as a discipline and a way of being: complementarities and creative tensions. *Humanit Soc Sci Commun* 7:1–5. <https://doi.org/10.1057/s41599-020-00598-5>

Roldan-Hernandez L, Boehm AB, Mihelcic JR. 2020. Parachute environmental science and engineering. *Environ Sci Technol* 54:14773–4. <https://doi.org/10.1021/acs.est.0c07462>

Scholz RW. 2020. Transdisciplinarity: science for and with society in light of the university’s roles and functions. *Sustain Sci* 15:1033–49. <https://doi.org/10.1007/s11625-020-00794-x>

Simon RM, Wagner A, Killion B. 2017. Gender and choosing a STEM major in college: femininity, masculinity, chilly climate, and occupational values. *J Res Sci Teach* 54:299–323. <https://doi.org/10.1002/tea.21345>

Soublis T. 2017. Transdisciplinary pedagogy: a competency based approach for teachers and students to promote global sustainability. *J Interdiscip Stud Educ* 5:64–72.

Steneck NH. 2003. The role of professional societies in promoting integrity in research. *Am J Health Behav* 27:S239–47.

Struminger R, Zarestky J, Short RA, Lawing AM. 2018. A framework for STEM educational outreach at field stations. *Bio-science* 68:969–78. <https://doi.org/10.1093/biosci/biy108>

Tracy SJ. 2019. Qualitative research methods: collecting evidence, crafting analysis, communicating impact. John Wiley & Sons, Hoboken, NJ.

Zscheischler J, Rogga S. 2015. Transdisciplinarity in land use science—a review of concepts, empirical findings and current practices. *Futures* 65:28–44. <http://dx.doi.org/10.1016/j.futures.2014.11.005>