

“Enriching Lives within Sedimentary Geology”: Actionable Recommendations for Making SEPM a Diverse, Equitable and Inclusive Society for All Sedimentary Geologists

Anjali M. Fernandes¹, Antoinette Abeyta², Robert C. Mahon³, Rowan Martindale⁴, Kristin D. Bergmann⁵, Christopher Jackson⁶, Theodore M. Present⁷, Darryl Reano⁸, Travis Swanson⁹, Kristina Butler⁴, Sarah Brisson¹⁰, Cari Johnson¹¹, David Mohrig⁴, Michael D. Blum¹²

¹ Department of Geosciences, Denison University, 100 West College Street, Granville, Ohio 43023, U.S.A.

² Math and Science Division, University of New Mexico-Gallup, 705 Gurley Ave, Gallup, NM, 87301, U.S.A.

³ Department of Earth and Environmental Sciences, University of New Orleans, 2000 Lakeshore Dr., New Orleans, LA 70148, U.S.A.

⁴ Department of Geological Sciences, Jackson School of Geosciences, University of Texas at Austin, 2305 Speedway, Stop C1160, Austin, TX 78712, U.S.A.

⁵ Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA 02139, U.S.A.

⁶ Imperial College London, Department of Earth Science and Engineering, South Kensington Campus London SW7 2AZ, U.K.

⁷ California Institute of Technology, Division of Geological & Planetary Science, Pasadena, CA 91125, U.S.A.

⁸ Florida International University, STEM Transformation Institute, 11200 SW 8th Street, VH 183, Miami, FL 33199, U.S.A.

⁹ Georgia Southern University, Department of Geology and Geography, Statesboro, GA, P.O. Box 8149

¹⁰ University of Connecticut, Department of Geosciences, 354 Mansfield Road - Unit 1045, Storrs, CT 06269, U.S.A.

¹¹ Department of Geology and Geophysics, University of Utah, Salt Lake City, UT 84112, U.S.A.

¹² Department of Geology, University of Kansas, Lawrence, Kansas 66045, U.S.A.

Corresponding author: Dr. Anjali M. Fernandes (fernandesa@denison.edu)

ABSTRACT

Innovative science benefits from diversity of thought and influence at all waypoints along the scientific journey, from early education to career-length contributions in research and mentorship. Scientific societies, like the Society for Sedimentary Geology (SEPM), steward their innovators and the direction of the science, thereby defining the societal impact and evolution of a discipline. They are uniquely positioned to promote the representation and success of all scientists, including those from minoritized populations, through proactive advocacy, and inclusive mentorship, awards, and leadership. We introspectively review available records of SEPM membership, leadership, awardees, and editorial boards to identify areas for growth and begin a dialogue about how the society and its members can work together to better reflect our community. In the last decade, SEPM has seen a decline in membership, while representation and recognition of scientists from minoritized groups has remained low. Awards and honors have overwhelmingly gone to men, even in the last ten years, and very few women or people of color are in leadership roles. SEPM has recently taken positive steps towards becoming more inclusive (e.g., the Code of Professional Conduct); however, much more work is needed. We provide recommendations for swift actions that SEPM and its members should undertake for the society to become a diverse, inclusive, and equitable environment where all scientists thrive. The systemic changes needed will take continuous effort, which *must be shared by all of us*, to build an enduring legacy that we can be proud of.

INTRODUCTION

The mission of the Society for Sedimentary Geology (SEPM) is to “enrich the lives of professionals and students within sedimentary geology.” Amidst the swell of voices speaking out against discrimination in Science, Technology, Engineering and Mathematics (STEM), and the resultant loss of valuable, diverse talent at all career stages (Bernard & Cooperdock, 2018; Calma, 2020; Dutt, 2019; Goldberg, 2019; Marín-Spiotta et al., 2020; Nature Editorial, 2020; Nature Ecology and Evolution Editorial, 2020; Subbaraman, 2020), it is time for SEPM to assess whose lives the society is truly enriching. What is SEPM doing to increase diversity, equity and inclusion (DEI) in sedimentary geology? Do all scientists who share a love for the sedimentary record feel an *equal* sense of belonging within our scientific society? Are the achievements and contributions of all scientists, irrespective of their socio-economic class, disability status, sexual orientation, race, ethnicity, or gender (for example), being fairly recognized?

Scientists’ contributions are customarily measured by their record of publications, service, mentorship, and awards; likewise, a measure of a scientific society’s professional relevance lies in its record of scientists represented in publications, leadership, membership, and award history. We introspectively review a few key SEPM records to assess how current and past practices impact the scientists within sedimentary geoscience, and we identify areas for improvement. We appeal to our readers

to reflect upon the content of this work with open minds, to consider its implications for the careers of generations of scientists, past, present and future, and to think deeply and strategically about the future that we want for SEPM. It is essential for us to take a careful look at the records of our society; this introspection, while uncomfortable, reinforces the need for immediate and sustained action. We acknowledge the efforts of scientists who invested years or decades of service to SEPM in the past and emphasize that the content of this work is not intended as an indictment of particular individuals or groups. Instead, with this work, the authors call attention to the scientists whose careers have been harmed and are currently being harmed by inequity, and a lack of decisive action against it. To that end, we identify areas where growth or change is urgently needed. We call on SEPM and our colleagues to take on the burden required to change the status quo, as individuals and as a society.

We would ideally synthesize these records to include self-reported gender, racial, ethnic, LGBTQ+, disability, and other legally protected statuses; however, as is the case with a number of other scientific societies, this demographic data has never been collected (Rasmussen et al., 2019). Results reported below, assembled through personal knowledge, website information and personal pronouns used, are the authors' best approximation of demographic trends in SEPM. This approach is fundamentally flawed, as each person that is a part of this synthesis has been categorized according to the authors' perception, rather than their own self-reported identity (Rasmussen et al. 2019); **this risks the further disenfranchisement of individuals who are already marginalized.** For example, this

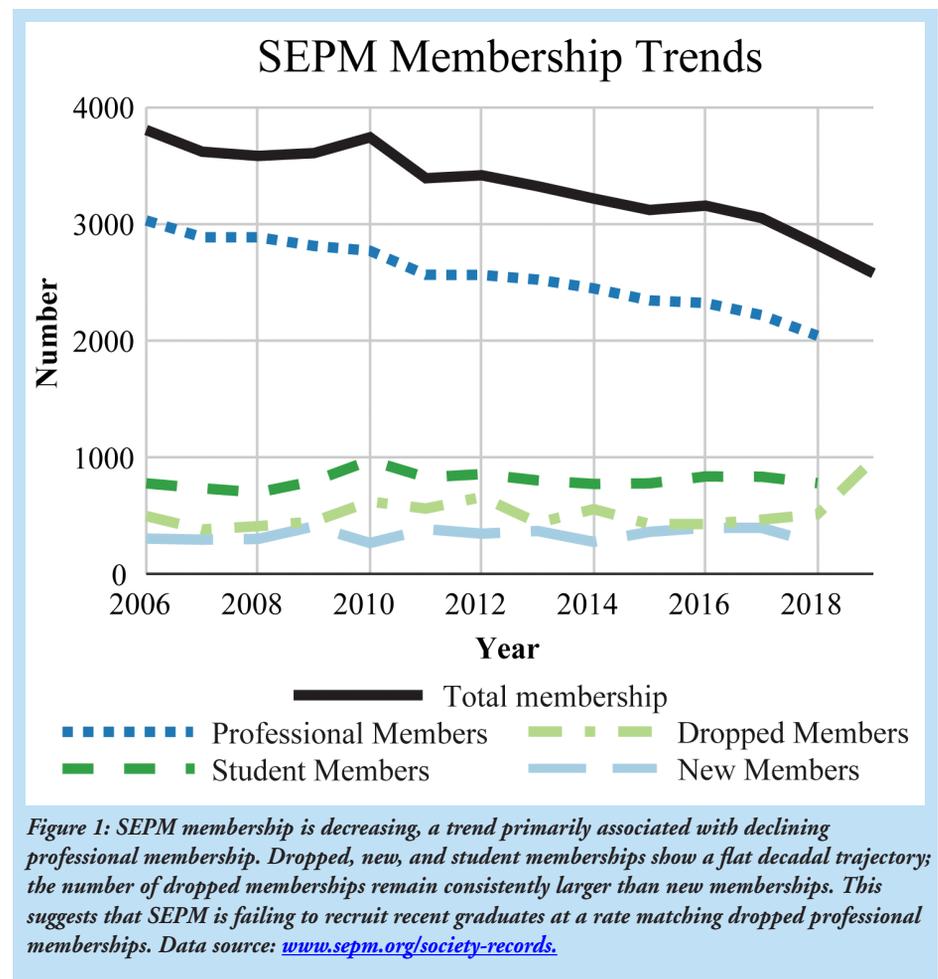
approach does not include persons with non-binary gender, biracial, ethnic, and intersectional identities (Blevins and Mullen 2015; Harris 2013; Quihuiz 2011; Rasmussen et al. 2019). The existing data used in this study serves only as a starting point to begin a dialogue, and to identify areas where change is needed. The data treatment herein **should not** be used as a template for further demographic research within the society (see detailed critiques in Rasmussen et al. 2019). We emphasize that SEPM and its members **must** prioritize the collection and tracking of anonymous, **self-reported** demographic information that encompasses the diversity of our community and of human society as a whole.

MEMBERSHIP

SEPM is experiencing decreasing membership (Fig. 1). It is unclear

what drives membership attrition, and additional data are needed to uncover the impetus behind the decline in SEPM professional memberships. Collected data are currently limited to gender (only binary options) and age, whereas data on race, ethnicity, LGBTQ+, and disability status has never been collected. Anonymous collection and transparent reporting of demographic information of the SEPM membership must be prioritized. The number of scientists from under-represented minoritized groups in STEM who are joining, remaining with, or leaving SEPM are currently unconstrained. Career stages of professional members, not currently reported through society records, could provide insight into membership trends.

Per the [membership registration portal](#) and the [society bylaws](#), to acquire voting membership, an

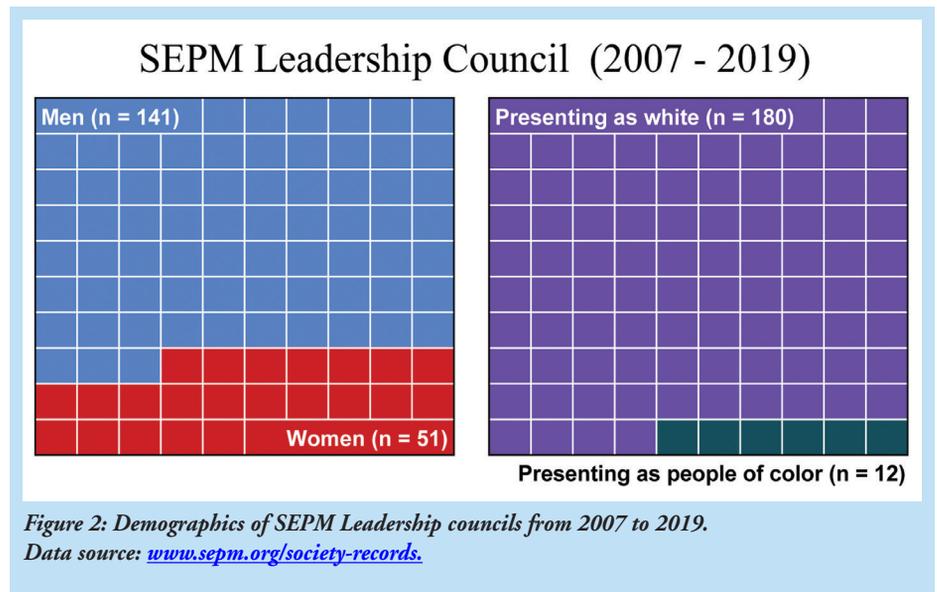


The **Sedimentary** Record

applicant must (1) provide two professional references, and (2) have 3 years of experience beyond their bachelors' degree. Dues for voting and non-voting members are the same; the difference lies in applicants' professional networks. To first-generation scholars, scientists from developing nations, scientists not affiliated with top-tier research schools and anyone without a large network of colleagues, the practice of requiring references can be a barrier to participation (Dutt et al., 2016; Madera et al., 2009; Ward et al., 2018). Scientists will be unlikely to invest in a society where they cannot influence decisions. By contrast, the American Geophysical Union, a thriving scientific society, opens voting to *all* members. Furthermore, membership dues for recent graduates and scientists at under-funded institutions could be substantially reduced from current rates or subsidized by donors. Proactive recruitment of students belonging to minoritized groups at SEPM booths at minority-focused conferences (e.g., the Society for Advancement of Chicanos/Hispanics and Native Americans in Science, or SACNAS) and partnerships with organizations like the Geoscience Alliance would help diversify membership.

LEADERSHIP

"Representation matters" across the sciences but especially in positions where decisions may impact communities (Powell, 2018). Per society records, 141 (73%) of 192 seats on the SEPM leadership council from 2007 to 2019 were occupied by men and 51 (27%) were occupied by women (Fig. 2); the ratio of men to women in different years ranged from 1.5 to 6. Councilors who presented as white held 180 (94%) of the council seats and 12 (6%) seats were held by members presenting as people of color;



to our knowledge, a seat on the council has rarely been held by LGBTQ+ or Latinx scientists and has never been held by an Indigenous or Black scientist. We recommend that scientists with diverse identities are proactively recruited into SEPM leadership positions and that leadership opportunities for both students and professionals are expanded. Ensuring that all leadership positions (e.g., councils, committees, editorial boards) are framed in the context of diversity, equity, and inclusion is essential for the future of this society. All leadership teams *must* be educated about issues that limit equity and demonstrate a commitment to removing bias from decision-making that affects SEPM, its members and the larger community of sedimentary geologists (Bumpus, 2020). All humans have biases; the only way to eliminate the effects of these biases is to ensure that people with a range of perspectives are involved in all decision-making processes (Miriti et al., 2020).

SOCIETY PUBLICATIONS

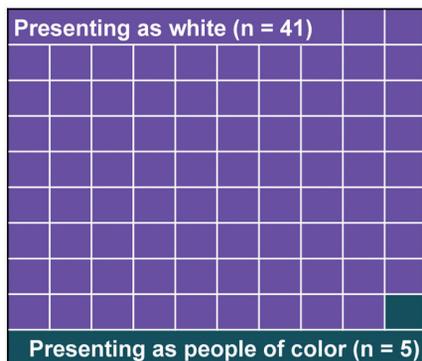
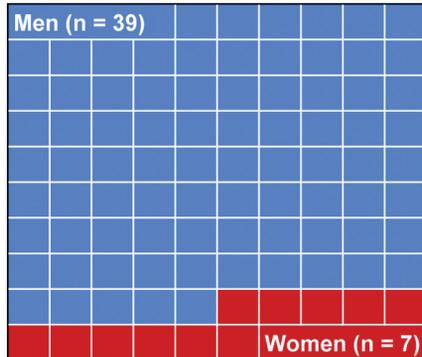
Diversity promotes innovation from hypothesis through peer review and final publication (Hofstra et al., 2020; Powell, 2018). Personal identity impacts how we engage with our

science (Apple et al., 2014; Semken, 2005; Smythe et al., 2020; Unsworth et al., 2012); it impacts how we approach a problem, and what we value, study, and write (Núñez et al., 2020; Ward et al., 2018). It influences how we select reviewers (Ross, 2017), how we review (Kaatz et al., 2014; Sordi & Meireles, 2019), and ultimately what makes its way through to publication (Chawla, 2019; Pico et al., 2020). Diversity in the peer review and publishing process can help to eliminate bias (Fox & Paine, 2019).

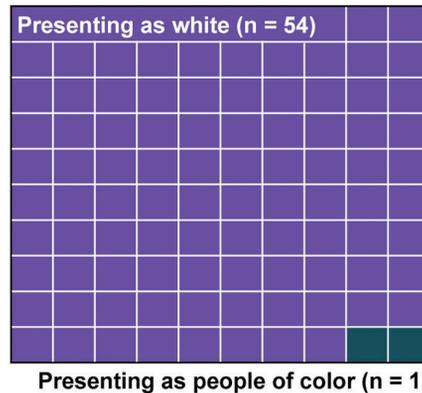
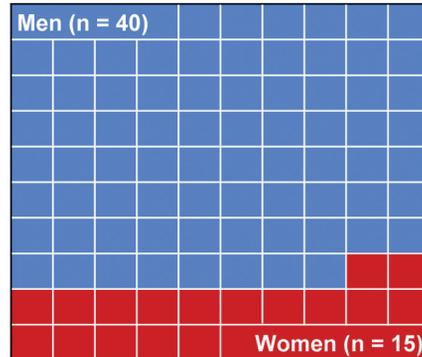
SEPM's editorial teams are not diverse (Fig. 3). The team of 46 associate editors for the Journal of Sedimentary Research currently includes 39 (85%) men and 7 (15%) women; of these, 41 (89%) associate editors present as white and 5 (11%) present as scientists of color. The PALAOIS team of 55 associate editors includes 40 (73%) men and 15 (27%) women; 54 (98%) of the team present as white and 1 (2%) presents as a scientist of color. Of the 58 editors of 20 SEPM special publications from 2009 - 2019, 48 (83%) were men and 10 (17%) were women; 53 (91%) editors present as white, 2 (3%) present as scientists of color. SEPM must take aggressive steps to include diverse identities in its editorial

SEPM Editorial Boards

Associate Editors of
the *Journal of
Sedimentary Research*
(2019 - 2020; n = 46)



Associate Editors of
PALAOIS
(2019 - 2020, n = 55)



Editors of 20 Special
Publications
(2009 - 2019, n = 58)

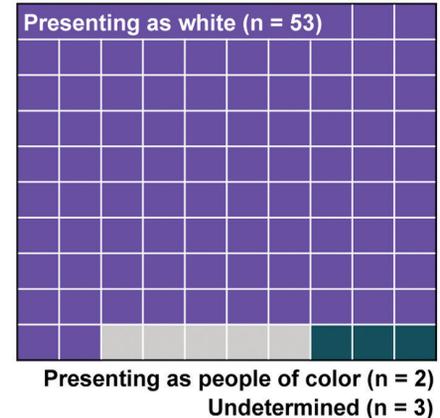
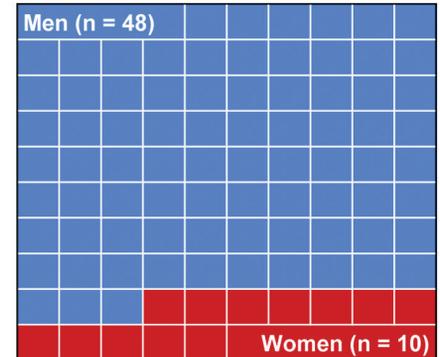


Figure 3: Recent demographics of editors on the two society journals, the *Journal of Sedimentary Research* (www.sepm.org/AE-Board) and *PALAOIS* (<https://www.sepm.org/PALAIOS-Information>) in 2020, and SEPM Special Publications published between 2009 and 2019.

process to ensure equitable publication standards. Existing leadership must stay informed of and vigilant to sources of potential bias in editorial processes (Bumpus, 2020).

Double blind peer-review is a mechanism for eliminating bias, by reducing opportunities for nepotism (Cox & Montgomerie, 2019; Sordi & Meireles, 2019) and increasing submissions from female first authors (Budden et al., 2008; Pico et al., 2020). Tomkins et al. (2017) showed that single-blind reviewing, which is what SEPM currently offers, significantly advantaged papers by well-established authors relative to the same papers when reviewed double-blind. Alternatively, open reviewing

can eliminate potential bias, as the reviews are published alongside the manuscript (e.g., *Earth Surface Dynamics*).

Negative and fundamentally unhelpful reviews, lengthy review timelines, and rejections can create barriers to publishing. They slow the trajectory of early-career scientists, damp innovation, and can ultimately drive scholars out of STEM. We urge SEPM journals to consider prioritizing a mentoring approach over negative and unconstructive critique for papers that are first authored by students and early career scientists. Minimizing barriers to publishing is particularly important now, given the unequal impacts of the COVID-19 pandemic

on submissions by men and women (Times Higher Education, 2020; Myers et al., 2020).

AWARDS

SEPM awards eight distinct honors annually; all named awards honor white, male scientists. Of 337 awards since 1930, 309 (92%) awards recognized men and 28 (8%) recognized women (Fig. 4A, C). Gender ratios of awards in the last decade (2011-2020) improved slightly (Fig. 4 B, D); of 65 awards, 51 (78%) went to men and 14 (22%) went to women. Half of all awards to women were in the last 10 years. The Moore Medal is the only award with equal gender representation in

The **Sedimentary** Record

the last decade; only 2 of 10 James Lee Wilson Awards to young scientists went to women, even though this is the demographic where female professional scientists are best represented (Bernard & Cooperdock, 2018). This review is not exhaustive; we encourage our readers to review the [list of past award-winners](#) to form their own assessment of diversity.

SEPM's future, and that of sedimentary geology, will be dictated by how and if we choose to remove explicit/implicit bias from our definition and recognition of outstanding contributions to our community. Inspecting the sources of bias in these award outcomes is an essential first step. Fully recognizing the talent and contributions of members who are not white, and male is essential, if SEPM is to avoid becoming professionally irrelevant. Scientists' contributions to our discipline are not limited to their research but include committed mentoring, community service, and outreach; the required content of nomination and supporting letters should be changed to reflect that. Our awards nomination criteria ought to recognize the positive impacts made by individuals or teams on the field of sedimentary geology, especially from marginalized groups or scientists outside of the U.S.

Requiring gender, racial, and ethnic representation on awards committees is a good start, and including students from minoritized groups in committees could help relieve the service load on early- and mid-career minoritized scientists (Gewin, 2020). It is critical that we work together to ensure that minoritized scientists are nominated for awards (Hofstra et al., 2020). To bear out the value of a scientist's contributions as scholar *and* mentor, diversity among letter writers in terms of gender, race, ethnicity, and career-level should be viewed just

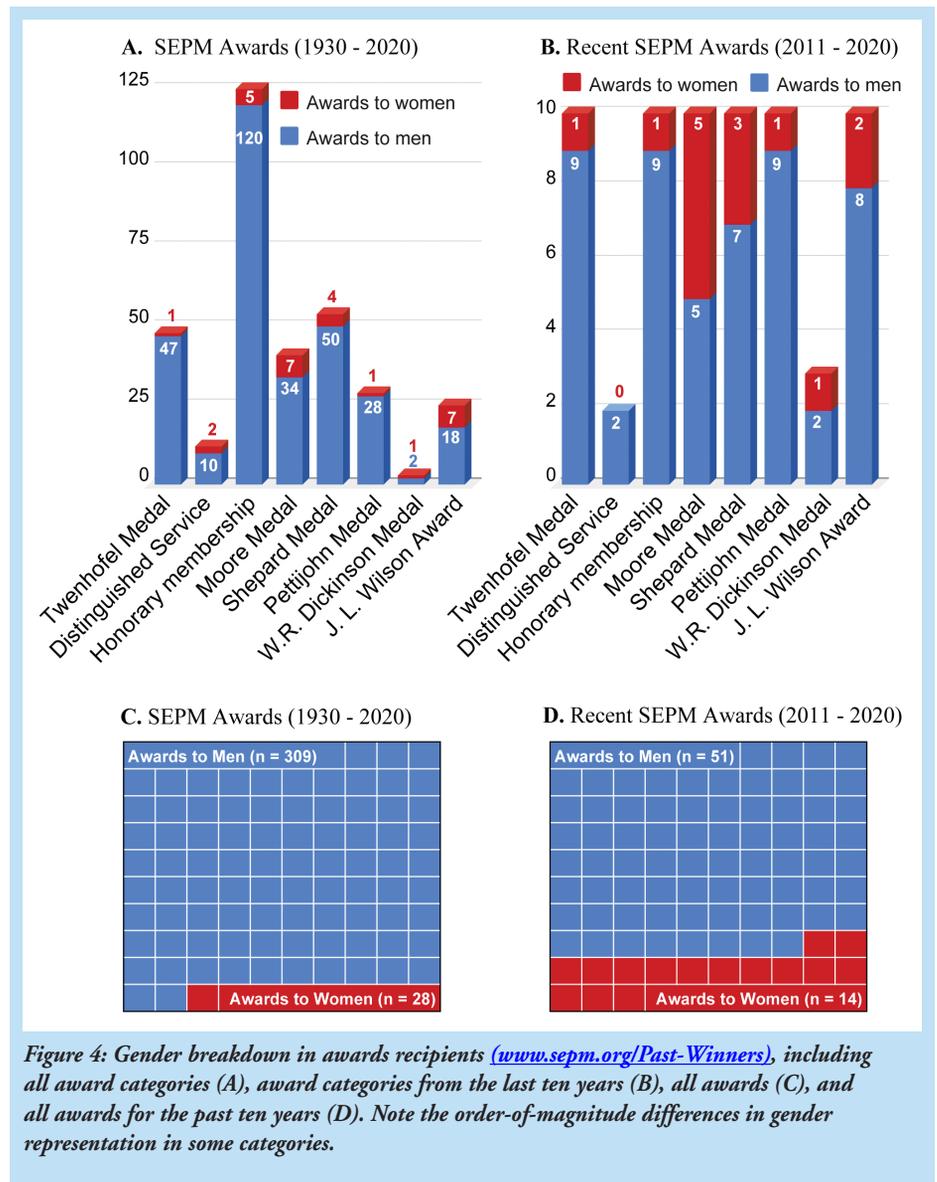


Figure 4: Gender breakdown in awards recipients (www.sepm.org/Past-Winners), including all award categories (A), award categories from the last ten years (B), all awards (C), and all awards for the past ten years (D). Note the order-of-magnitude differences in gender representation in some categories.

as significant as letter content, and nomination letters should include the demographics of nominees' mentees *and* mentees' post-graduate successes. SEPM has adopted the practice of requesting "Professional conduct self-disclosure forms" for all nominees, but more must be done to ensure the top candidates for awards have been above reproach in all aspects of their professional lives over their entire career. We recommend top nominees are vetted by cross-checking code of conduct reports with other societies, and by contacting Title IX offices of current and previous institutions or employers (Wadman, 2017; Bumpus, 2020).

Scientists at all career levels often treat junior colleagues with far less respect than they do their peers or senior scientists. Members of one or more marginalized group(s) (Charleston et al., 2014; Crenshaw, 1990; Doshi, 2020; Miriti et al., 2020; Muhs et al., 2012) are particularly vulnerable to bullying, harassment, discrimination, prejudice, and abuse (Geocognition, 2019). For example, the work-place experience of a female scientist of color might be drastically different from that of her white male or female colleagues (Abedalthagafi, 2018; Doshi 2020; Muhs et al., 2012; NASEM, 2018; Sharon & Cheney, 2020; Skachkova, 2007). It can

take scientists years to recover from bullying and to get their careers on track, if they do not choose to leave their field of study entirely (Goodboy et al., 2015; Martin et al., 2015; NASEM, 2018; Poole, 2016; Twale & De Luca, 2008). By implementing the measures outlined above, SEPM will set the highest standard of ethical professional conduct for its members and ensure that its most vulnerable members know their welfare and long-term success are valued as highly as the research contributions of senior colleagues.

CONFERENCES, WORKSHOPS, AND FIELD TRIPS

Positive conference experiences build community. Quality educational and social events for students are investments in the future of the discipline. Friendships forged, shared adventure, and trust developed at conferences or on field trips engenders a sense of belonging that can last for a lifetime, span disciplines, and nurture creativity. Conversely, exclusion, harassment and exposure to unsafe behavior or spaces can cause scientists and members of their networks to permanently disengage from the community. Emphasizing *inclusivity* at conferences, workshops, and field experiences will foster a culture in which future cohorts of diverse talent are encouraged to thrive; such events attract groups invested in supporting and retaining diverse talent. Invited and accepted speakers at conferences must include scientists with diverse identities (Ford et al., 2019). Need-based rebates on membership and conference registration for faculty and students at two year colleges, small graduate programs, and Minority Serving Institutions will ensure broader participation of students and scientists from minoritized backgrounds, and create a diverse recruitment pool for

institutions and companies present at these conferences.

Ensuring that diverse identities are represented at speaking engagements at all SEPM sponsored events must be a priority (King et al., 2017; Cannon et al., 2018; Ford et al., 2019; Hernandez et al., 2020). Normalizing remote presentations promotes participation of scientists who find travel challenging, including immigrants, parents of young children, people who do not feel safe at a conference venue, and anyone with cultural or religious obligations or special needs which prohibit travel. Even before COVID-19, international travel was colored by uncertainty for immigrant or overseas-based scientists (Reardon, 2017a, 2017b). Potential delays in acquiring a visa can result in scientists choosing not to attend a conference. Scientists on work visas routinely avoid leaving the United States for fear of being barred from re-entry (Reardon, 2017b). U.S. work visas are usually valid for one to three years; while able to work in the U.S. with renewed paperwork, scientists must budget time (six weeks or more) and expense (e.g., consulate fees, travel, room and board) to acquire a visa sticker at a U.S. consulate in order to re-enter the country after international travel. Faced with the possibility of endangering their current job by traveling internationally, most immigrant scientists choose not to travel. This can have measurable impacts on career trajectories (Kelsky, 2019; Morello & Reardon, 2017; Skachkova, 2007). In the wake of the COVID-19 pandemic, when most of us have adapted rapidly to remote conferencing technology, this is a manageable goal.

Similarly, field experiences are an integral part of sedimentary geology, yet access to and comfort/safety associated with participation in field opportunities is not equal (Carabajal et al., 2017; Carabajal and Atchison,

2020; Dzombak, 2020; Morales et al., 2011; Prickrell, 2020; Sychala, 2020). A fundamental part of including junior scientists with diverse identities in field-based educational programs is recognizing that LGBTQ+, Black, Latinx, Indigenous, Asian, and Middle Eastern colleagues are less safe in many environments (Clancy et al., 2014, 2017; Nelson et al., 2017). To guard against negative experiences, which can be particularly consequential for scientists from minoritized groups, we must raise awareness of differences in backgrounds and experiences, and *actively reject* hostile behavior, bias, and discrimination. We must develop guidelines for respectful behavior, and use the SEPM reporting and enforcement mechanisms laid down in the [Code of Conduct](#). Field trip protocols must be designed to ensure all participants' safety and the [Code of Conduct](#) must be clearly shared and agreed to before field trips begin (Gries, 2019; St. John et al., 2016; Williams et al., 2017). Furthermore, mitigating the financial burden of these experiences will demolish a fundamental barrier to participation of students with diverse identities and backgrounds.

A CALL TO ACTION

Scientists who belong to racial, ethnic, LGBTQ+, and gender minorities are more likely to encounter negative and traumatic experiences than their majority-identifying colleagues (Clancy et al., 2017). Scientists belonging to minoritized groups in STEM are disproportionately taking on the labor to enact meaningful change to the system, using time that could otherwise be directed towards innovation and career development (Di Roma Howley, 2020; Gewin, 2020; Jimenez et al., 2019). Often, scientists from minoritized groups do this knowing that their careers, the stability of their personal lives, and the contributions of those who come after,

hinge upon changing the system. *They are doing this because they have no choice.*

A pervasive myth, which promotes the idea that the lack of diversity is due to a self-selection process, suggests that this happens because there are relatively few qualified candidates. What is often overlooked by believers of this myth is that scientists from minoritized groups face significant barriers at all stages of their careers; these are barriers to professional advancement that their majority-identifying colleagues do not face. The culture and practices associated with a system of “meritocracy” has been shown to be the real reason for continued lack of diversity (Uhlmann and Cohen, 2005); a system in which the *perception* of merit is imbued with bias is one that efficiently self-selects by excluding marginalized identities (Hugo et al., 2013; Marín-Spiotta et al., 2020; Moss-Racusin et al., 2012; Smythe et al., 2010; Watts and Smythe, 2013). As a result, despite significant efforts to recruit and retain minoritized groups into STEM, these efforts have not translated into representation at faculty and leadership levels (Bernard & Cooperdock, 2018; Carter-Sowel et al., 2019; Dutt, 2019; Dutt et al., 2016; Ford et al., 2019; Hernandez et al., 2020; Mertz, 2011; Rissler et al., 2020; Smith, 2000; Turner et al., 2008).

If SEPM is less diverse than other societies (e.g., AGU), we must ask ourselves *why* this is the case. There is nothing about the *science* of sedimentary geology that makes it less inclusive. Like other sub-disciplines of geoscience, sedimentary geology incorporates fieldwork, data analysis, museum research, laboratory analysis, and numerical or physical experimentation. Scientists of all genders, ethnicities, races, and abilities can be and *are* sedimentary geologists. Therefore, we must acknowledge that *the lack of diversity in membership,*

leadership, editorial teams and awards within SEPM are a direct consequence of culture and practices that exclude scientists belonging to marginalized groups (Marín-Spiotta et al., 2020); we must recognize that, as current and/or prior members of SEPM, *we are all complicit* in this system of exclusion. A close examination of every individual’s role in that system is essential for eliminating harmful and exclusionary practices.

Given the data presented here, SEPM must take decisive action to remake this scientific society into one where every sediment- and fossil-loving scientist, regardless of personal identity, can thrive. We envision a society that reflects, supports, and increases the diversity of our field, and that recognizes that diverse identities are the scaffold of innovative science (Hofstra et al., 2020; Schell, 2020). Membership in this society should immediately mark every scientist, irrespective of career stage, as part of a forward-thinking group of individuals eager to use their skills and knowledge in service of Earth’s most urgent problems and invest in the foundational research and education initiatives that build capacity for future generations and the problems they must solve. We want educators to be eager to bring students from all backgrounds, especially those belonging to minoritized groups, to conferences and educational programs organized by SEPM, knowing their students are physically safe and protected from discrimination, harassment, and exclusion, and that their ideas and identities are valued in these spaces. We envision an SEPM where all scientists listen to and center historically silenced perspectives, and *share the workload* required for system-wide change.

Scientific societies can be transformative in creating equitable work environments and mitigating cultural injustices (NASEM, 2018).

SEPM has recently implemented a [Code of Professional Conduct](#) and created channels for investigation of code violations; these actions represent significant advances towards protecting the most vulnerable among us, but more work is needed. The list of recommendations below is not exhaustive, nor is it directed at specific committees or councils. Instead, we urge SEPM to consider the list below as starting points in a strategy for change that could be championed by specific committees; it is our hope that the implementation of these suggestions will be coordinated by SEPM and embraced by its membership.

Below are eleven evidence-based, actionable recommendations to improve recruitment, retention, and advancement of minoritized scientists/students within SEPM and sedimentary geology:

1. Establish a continuous, annual survey of self-reported SEPM member demographics, including new and dropped memberships. Understanding who has been recruited and retained must be prioritized in order to characterize SEPM’s status with respect to inclusion. Analyze and report these data to the society membership annually.
2. Ensure that all members, including students, have voting rights.
3. Ensure that the recently written [SEPM Professional Code of Conduct](#) is agreed to by members, and all persons attending SEPM sponsored events; ensure that violators of the code are expelled from the society and barred from future events, as is within the society’s purview.
4. Support victims of SEPM code of conduct violations (as they desire), by following up and offering to report code violations to the perpetrators’ employers and funding agencies.

5. Facilitate need-based rebates in society membership and conference registration.
 6. Ensure diverse identities are represented at speaking engagements at all SEPM sponsored events and facilitate broader participation through remote presentation options.
 7. Ensure all student-focused events are scaffolded upon a principle of proactive inclusion of diverse identities. Actively recruit students belonging to minoritized groups through partnerships with initiatives like the Geoscience Alliance, Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), GeoLatinas, National Association of Black Geoscientists (NABG), American Indian Science and Engineering Society (AISES), Society of Latinxs/Hispanics in Earth and Space Science (SOLESS), The International Association for Geoscience Diversity (IAGD), Association of Women Geoscientists, 500 Women Scientists, and 500 Queer Scientists.
 8. Ensure representation of diverse identities on award nomination lists, named awards, leadership councils, organization committees, awards committees, and editorial boards. To share the workload equitably, volunteers for different types of leadership roles could be identified via survey questions administered during membership renewal and/or meeting registration.
 9. Evaluate sources of bias within the awards nomination and selection process, formalize content requirements and rubrics for nominations, support letters, and selection. Ensure nominees are above reproach in all aspects of their professional lives. Track and continually review the self-reported, anonymous demographic information of nominees, awardees, and nominators to ensure society awards are representative of the demographics of the field.
 10. Appoint one or more DEI Councilor(s) and/or external consultants to hold the society accountable in DEI efforts **while also emphasizing that DEI labor is not solely their responsibility.** Moreover, ensure that all leadership and committee work is framed in the context of inclusion and equity. Expand leadership opportunities especially at the student level and proactively recruit scientists with diverse identities into leadership roles.
 11. Collect and continually review data for each society journal, including accepted and rejected manuscripts, and the demographics of associated authors (i.e. first author career stage, gender, LGBTQ+ status, ethnicity, race and disability status), reviewers, and editors. Promote mentorship during the peer-review process, especially for junior scientists. Ensure that all editors are educated and vigilant to implicit bias in the peer review process (e.g., through annual anti-bias training), and proactively work to eliminate it. Administer anonymous surveys after submission, review and publishing to collect author-demographics and feed-back on the review process.
- Implementation of these practices, accountability assessment, and further revision of policy should be a formal, iterative process (NASEM, 2020). ***SEPM must make a commitment to continuously set goals, track changes implemented, measure their success, and transparently report this data to its membership. These recommendations are only the first steps for improving equity, diversity***

and inclusion within SEPM.

There are many reasons to look back on our history and feel discouraged that so little has changed or be immobilized by the scale of systemic change needed. But we are geoscientists; we work every day to imagine abstract environments and ecosystems that do not exist today. In our imaginations we walk on the ocean floor or on the surface of planets and moons we will never visit. Who better to transcend the bounds of space and time, to imagine and build a different and kinder world in which our history does not dictate our future, and those who come after us do not have to resist inequity in order to practice their craft? We understand the relevance of long-term trends; more importantly, we know how profound an impact human intervention can have. Imagine how rapidly we could change the status quo, if we all committed to doing the work needed to make SEPM a society where all sedimentary geologists belong, are supported to innovate, and are respected and safe. We want this to be SEPM's central, guiding principle; it would be one we could all be proud of.

ACKNOWLEDGMENTS

The lead authors acknowledge NSF grants [EAR-2005439](#), [EAR-2029803](#) and [EAR-1855209](#) for providing the opportunity to do this work. The authors thank Howard Harper for offering historical perspectives on SEPM and for feedback on an early version of this work, Dr. Beck Strauss and Dr. Marissa Doshi for being generous with their time in offering feedback and guidance on different aspects of this work, Dr. Lauren Birgenheier as editor, and Dr. Jean Hsieh, Dr. Amy Weislogel and Dr. Margaret Fraiser for their constructive reviews which were delivered on a compressed timeline.

REFERENCES

- ABEDALTHAGAFI, M. (2018). As a Saudi woman scientist, I'm tired of negative stereotypes. *Nature* 554, 405. <https://doi.org/10.1038/d41586-018-02163-2>.
- APPLE, J., LEMUS, J., & SEMKEN, S. (2014). Teaching Geoscience in the Context of Culture and Place: Theme Issue Continued. *Journal of Geoscience Education*, Vol. 62, Issue 2, pp. 157–157. <https://doi.org/10.5408/1089-9995-62.2.157>
- BERNARD, R. E. & COOPERDOCK, E. H. G. (2018). No Progress on Diversity in 40 years. *Nature Geoscience*, 11(5), 292.
- BLEVINS, C. & MULLEN, L. (2015). Jane, John... Leslie? A Historical Method for Algorithmic Gender Prediction. *DHQ: Digital Humanities Quarterly*, 9(3).
- BUDDEN, A. E., TREGENZA, T., AARSSSEN, L. W., KORICHEVA, J., LEIMU, R., & LORTIE, C. J. (2008). Double-blind review favours increased representation of female authors. *Trends in Ecology & Evolution*, 23(1), 4–6.
- BUMPUS, N. (2020). Too Many Senior White Academics Still Resist Recognizing Racism. *Nature*, 583, 661. <https://doi.org/10.1038/d41586-020-02203-w>
- CALMA, J. (2020). Black Scientists Call Out Racism in their Institutions. *The Verge*. ([link](https://www.theverge.com/2020/10/10/21194740/black-scientists-call-out-racism-in-their-institutions))
- CANNON, S., REID, D. A., MCFARLANE, K., KING, L., MACKENZIE, L., TADAKI, M., & KOPPEL, M. (2018). Race and Gender Still an Issue at Academic Conferences. *The Conversation*. ([link](https://www.theconversation.com/race-and-gender-still-an-issue-at-academic-conferences/100000))
- CARABAJAL, I. G., MARSHALL, A. M., & ATCHISON, C. L. (2017). A Synthesis of Instructional Strategies in Geoscience Education Literature that Address Barriers to Inclusion for Students with Disabilities. *Journal of Geoscience Education*, 65(4), 531–541.
- CARABAJAL, I. G. & ATCHISON, C. L. (2020) An Investigation of Accessible and Inclusive Instructional Field Practices in US Geoscience Departments. *Advances in Geosciences*, 53, 53–63. <https://doi.org/10.5194/adgeo-53-53-2020>
- CARTER-SOWELL, A. R., VAID, J., STANLEY, C. A., PETTIT, B., & BATTLE, J. S. (2019). ADVANCE Scholar Program: Enhancing Minoritized Scholars' Professional Visibility. *Equality, Diversity and Inclusion: An International Journal*. ([link](https://www.emerald.com/insight/content/doi/10.1108/eqd-03-2019-0011))
- CHARLESTON, L. J., ADSERIAS, R. P., LANG, N. M., & JACKSON, J. F. L. (2014). Intersectionality and STEM: The Role of Race and Gender in the Academic Pursuits of African American Women in STEM. *Journal of Progressive Policy & Practice*, 2(3), 273–293.
- CHAWLA, D. S. (2019). Female Authors Listed on just 30% of Recent UK Academic Research. *The Guardian*. ([link](https://www.theguardian.com/science/2019/oct/10/female-authors-listed-on-just-30-of-recent-uk-academic-research))
- CLANCY, K. B. H., NELSON, R. G., RUTHERFORD, J. N., & HINDE, K. (2014). Survey of Academic Field Experiences (SAFE): Trainees Report Harassment and Assault. *PLoS One*, 9(7), e102172.
- CLANCY, K. B. H., LEE, K. M. N., RODGERS, E. M., & RICHEY, C. (2017). Double Jeopardy in Astronomy and Planetary Science: Women of Color Face Greater Risks of Gendered and Racial Harassment. *Journal of Geophysical Research: Planets*, 122(7), 1610–1623.
- COX, A. R., & MONTGOMERIE, R. (2019). The Cases For and Against Double-blind Reviews. *PeerJ*, 7, e6702.
- CRENSHAW, K. (1990). Mapping the margins: Intersectionality, identity politics, and violence against women of color. *Stanford Law Review*, 43, 1241.
- DI ROMA HOWLEY, K. (2020, June 3). Deep Biases Prevent Diverse Talent from Advancing. *Enr*. ([link](https://www.enr.com/story/2020/06/03/deep-biases-prevent-diverse-talent-from-advancing))
- DOSHI, M. J. (2020). Tales of Precarious Digital Empowerment. *International Review of Qualitative Research*. <https://doi.org/10.1177/1940844720939849>
- DUTT, K., PFAFF, D. L., BERNSTEIN, A. F., DILLARD, J. S., & BLOCK, C. J. (2016). Gender Differences in Recommendation Letters for Postdoctoral Fellowships in Geoscience. *Nature Geoscience*, 9(11), 805–808.
- DUTT, K. (2019). Race and Racism in the Geosciences. *Nature Geoscience*, 13(1), 2–3.
- DZOMBAK, R. (2020) It's Time to Change the Geosciences' Outdated, Exclusionary, and Ableist Field Requirements. ([link](https://www.earth.org/2020/09/24/its-time-to-change-the-geosciences-outdated-exclusionary-and-ableist-field-requirements/))
- FORD, H. L., BRICK, C., AZMITIA, M., BLAUFUSS, K., & DEKENS, P. (2019). Women from Some Under-represented Minorities are Given Too Few Talks at the World's Largest Earth-science Conference. *Nature*, 576(7785), 32–35.
- FOX, C. W., & PAINE, C. E. T. (2019). Gender Differences in Peer Review Outcomes and Manuscript Impact at Six Journals of Ecology and Evolution. *Ecology and Evolution*, 9(6), 3599–3619.
- GEOCOGNITION. (2019). Not a Fluke: That Case of Academic Sexual Harassment, Sexual Assault, Sexual Misconduct, Stalking, Violations of Dating Policies, Violations of Campus Pornography Policies, and Similar Violation is not an Isolated Incident! *Geocognition Research Laboratory*. ([link](https://www.geocognition.com/2019/09/10/not-a-fluke-that-case-of-academic-sexual-harassment-sexual-assault-sexual-misconduct-stalking-violations-of-dating-policies-violations-of-campus-pornography-policies-and-similar-violation-is-not-an-isolated-incident/))
- GEWIN, V. (2020). The Time Tax put on Scientists of Colour. *Nature*. <https://doi.org/10.1038/d41586-020-01920-6>
- GOLDBERG, E. (2019) "Earth Science has a Whiteness Problem." *New York Times* ([link](https://www.nytimes.com/2019/09/10/science/earth-science-whiteness-problem.html))
- GOODBOY, A., MARTIN, M., & JOHNSON, Z. (2015). The Relationships Between Workplace Bullying by Graduate Faculty with Graduate Students' Burnout and Organizational Citizenship Behaviors. *Communication Research Reports: CRR*, 32(3), 272–280.
- GRIES, R. (2019). 2018 GSA Presidential Address: Navigating "Me, too" in the Geosciences. *GSA Today: A Publication of the Geological Society of America*. ([link](https://pubs.geoscienceworld.org/gsa/gsatoday/2019/09/18/2018-gsa-presidential-address-navigating-me-too-in-the-geosciences))
- HARRIS, S. H. (2013). Impact of Colorism: Narratives of Black/White Biracial Women's Identity Negotiation at Predominantly White Institutions (*Ph. D. Thesis, University of Georgia*). ([link](https://search.proquest.com/docview/230844444))
- HERNANDEZ, P.R., ADAMS, A.S., BARNES, R.T., BLOODHART, B., BURT, M., CLINTON, S. M., DU, W., HENDERSON, H., POLLACK, I., & FISCHER, E. V. (2020). Inspiration, inoculation, and introductions are all critical to successful mentorship for undergraduate women pursuing geoscience careers. *Nature Communications Earth & Environment*, 1, 7 (2020). <https://doi.org/10.1038/s43247-020-0005-y>
- HOFSTRA, B., KULKARNI, V. V., MUNOZ-NAJAR GALVEZ, S., HE, B., JURAFSKY, D., & MCFARLAND, D. A. (2020). The Diversity-Innovation Paradox in Science. *Proceedings of the National Academy of Sciences of the United States of America*, 117(17), 9284–9291.
- HUGO, R. C., SMYTHE, W. F., MCALLISTER, S., YOUNG, B., MARING, B., & BAPTISTA, A. (2013). Lessons Learned from a Geoscience Education Program in an Alaska Native Community. *Journal of Sustainability Education*, 5.
- JIMENEZ, M. F., LAVERTY, T. M., BOMBACI, S. P., WILKINS, K., BENNETT, D. E., & PEJCHAR, L. (2019). Underrepresented Faculty Play a Disproportionate Role in Advancing Diversity and Inclusion. *Nature Ecology & Evolution*, 3(7), 1030–1033.
- KAATZ, A., GUTIERREZ, B., & CARNES, M. (2014). Threats to Objectivity in Peer Review: The Case of Gender. *Trends in Pharmacological Sciences*, 35(8), 371–373.
- KELSKY, K. (2019, October 10). On Being a Woman of Color and an Immigrant in Academia – Guest Post | *The Professor Is In*. ([link](https://www.theprofessorisin.com/2019/10/10/on-being-a-woman-of-color-and-an-immigrant-in-academia/))
- KING, L., MACKENZIE, L., TADAKI, M., CANNON, S., MCFARLANE, K., REID, D., & KOPPEL, M. (2017). Diversity in Geoscience: Participation, Behaviour, and the Division of Scientific Labour at a Canadian Geoscience Conference. *FACTS*. <https://doi.org/10.1139/facts-2017-0111>
- MADERA, J. M., HEBL, M. R., & MARTIN, R. C. (2009). Gender and Letters of Recommendation for Academia: Agentic and Communal Differences. *The Journal of Applied Psychology*, 94(6), 1591–1599.
- MARÍN-SPOTTA, E., BARNES, R. T., BERHE, A. A., HASTINGS, M. G., MATTHEIS, A., SCHNEIDER, B., & WILLIAMS, B. M. (2020). Hostile Climates are Barriers to Diversifying the Geosciences. *Advances in Geosciences*, 53, 17–127. <https://doi.org/10.5194/adgeo-53-17-2020>
- MARTIN, M. M., GOODBOY, A. K., & JOHNSON, Z. D. (2015). When Professors Bully Graduate Students: Effects on Student Interest, Instructional Dissent, and Intentions to Leave Graduate Education. In *Communication Education*, Vol. 64, Issue 4, pp. 438–454. <https://doi.org/10.1080/0363452.3.2015.1041995>
- MERTZ, N. T. (2011). Women of color faculty: Recruitment, Hiring, and Retention. *Women of color in higher education: Changing directions and new perspectives*, Emerald Group Publishing Limited.
- MIRITI, M.N., BAILEY, K., HALSEY, S.J., & HARRIS, C. (2020). Hidden figures in Ecology and Evolution. *Nature Ecology and Evolution*. <https://doi.org/10.1038/s41559-020-1270-y>
- MORALES, N., O'CONNELL, K. B., MCNUITY, S., BERKOWITZ, A., BOWSER, G., GIAMELLARO, M., & MIRITI, M. N. (2020). Promoting Inclusion in Ecological Field Experiences: Examining and Overcoming Barriers to a Professional Rite of Passage. *The Bulletin of the Ecological Society of America*, 474 (July): 11. <https://doi.org/10.1002/bes2.1742>
- MORELLO, L., & REARDON, S. (2017). Meet the Scientists Affected by Trump's Immigration Ban. *Nature News*, 542(7639), 13.
- MOSS-RACUSIN, C. A., DOVIDIO, J. F., BRESKOLL, V. L., GRAHAM, M. J., & HANDELSMAN, J. (2012). Science Faculty's Subtle Gender Biases Favor Male Students. *Proceedings of the National Academy of Sciences, U. S. A.* 109: 16474–16479.
- MUHS, G. G., NIEMANN, Y. F., GONZALEZ, C. G., & HARRIS, A. P. (2012). Promoting Incompetent: The Intersections of Race and Class for Women in Academia. ([link](https://www.earth.org/2012/09/10/promoting-incompetent-the-intersections-of-race-and-class-for-women-in-academia/))
- MYERS, K.R., THAM, W.Y., YIN, Y., COHODES, N., THURSBY, J. G., THURSBY, M. C., SCHIFFER, P., WALSH, J. T., LAKHANI, K. R., & WANG, D. (2020) Unequal Effects of the COVID-19 Pandemic on Scientists. *Nature Human Behaviour*. <https://doi.org/10.1038/s41562-020-0921-y>
- NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE REPORT (2018). Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine; *National Academies Press*.
- NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE REPORT (2020). Promising Practices for Addressing the Underrepresentation of Women in Science, Engineering, and Medicine: Opening Doors. *National Academies Press*.
- NATURE EDITORIAL. (June, 2020). Systemic Racism: Science Must Listen, Learn and Change. *Nature*, 582(7811), 147 ([link](https://www.nature.com/articles/5827811a))
- NATURE ECOLOGY AND EVOLUTION EDITORIAL. (June, 2020). Black Lives Matter in Ecology and Evolution. *Nature Ecology and Evolution*, 4, 893–894. <https://doi.org/10.1038/s41559-020-1250-2>
- NELSON, R. G., RUTHERFORD, J. N., HINDE, K., & CLANCY, K. B. H. (2017). Signaling Safety: Characterizing Fieldwork Experiences and Their Implications for Career Trajectories: Lived Experiences in the Field. *American Anthropologist*, 119(4), 710–722.
- NUÑEZ, A.M., RIVERA, J., & HALLMARK, T. (2020). Applying an intersectionality lens to expand equity in the geosciences. *Journal of Geoscience Education*, 68(2), 97–114.
- PICO, T., BIERMAN, P., DOYLE, K., & RICHARDSON, S. (2020). First Authorship Gender Gap in the Geosciences. *Earth and Space Sciences*. <https://doi.org/10.1029/2020EA001203>
- POOLE, R. (2016). Bullied out of research. *Science*, 354(6311), 514.
- POWELL, K. (2018). These Labs are Remarkably Diverse - Here's Why They're Winning at Science. *Nature*, 558(7708), 19–22.
- PRICKRELL, J. (2020) "Scientists Push Against Barriers to Diversity in the Field Sciences." *Science*. ([link](https://www.sciencemag.org/news/2020/09/10/scientists-push-against-barriers-to-diversity-in-the-field-sciences))
- QUIHUIZ, S. D. (2011). Brown on the Inside: Multiracial Individuals and White Privilege. (*M. S. Thesis, Univ. Oregon*). ([link](https://www.proquest.com/docview/230844444))
- RASMUSSEN, K. C., MAIER, E., STRAUSS, B. E., DURBIN, M., RIESBECK, L., WALLACH, A., ZAMLOOT, V. & ERENA, A. (2019) The Nonbinary Fraction: Looking Towards the Future of Gender Equity in Astronomy. <https://arxiv.org/abs/1907.04893v1>
- REARDON, S. (2017a). How the Fallout from Trump's Travel Ban is Reshaping Science. *Nature*, 543(7644), 157–158.
- REARDON, S. (2017b). What Trump's New Travel Ban means for Science. *Nature News*. <https://doi.org/10.1038/nature.2017.21588>
- RISSLER, L. J., HALE, K. L., JOFFE, N. R., & CARUSO, N. M. (2020) "Gender Differences in Grant Submissions across Science and Engineering Fields at the NSF." *Bioscience*, baa072. <https://doi.org/10.1093/biosci/baa072>
- ROSS, E. (2017). Gender Bias Distorts Peer Review across Fields. *Nature News*. ([link](https://www.nature.com/news/gender-bias-distorts-peer-review-across-fields-1.20170107))
- SHELL, C.J., GUY, C., SHELTON, D.S., CAMPBELL-STATION, S. C., SEALEY, B. A., LEE, D. N., & HARRIS, N. C. (2020) Recreating Wakanda by Promoting Black Excellence in Ecology and Evolution. *Nature Ecology and Evolution*. <https://doi.org/10.1038/s41559-020-1266-7>
- SEMKEN, S. (2005). Sense of Place and Place-Based Introductory Geoscience Teaching for American Indian and Alaska Native Undergraduates. *Journal of Geoscience Education*, 53(2), 149–157.
- SHARON, S., & CHENEY, I. (2020). *Picture a Scientist*. ([link](https://www.pictureascientist.com/))
- SKACHKOVA, P. (2007). Academic Careers of Immigrant Women Professors in the U.S. *Higher Education*, 53(6), 697–738.
- SMITH, D. G. (2000). How to Diversify the Faculty. *Academe*, 86(5), 48–52.
- SMYTHE, W. F., HUGO, R. C., & MCALLISTER, S. (2010). Incorporation of Traditional Knowledge into Geoscience Education: An Effective Method of Native American Instruction. *Journal of Sustainability Education*.
- SMYTHE, W. F., BROWN CLARKE, J., HAMMACK, J., & POITRA, C. (2020) Native Perspectives about Coupling Indigenous Traditional Knowledge with Western Science in Geoscience Education from a Focus Group Study. *Global Research in Higher Education*, Vol. 3, No. 2. ([link](https://www.grejournal.com/index.php/gre/article/view/1000))
- SORDI, J. O. D., & MEIRELES, M. A. (2019). Halo Effect in Peer Review: Exploring the Possibility of Bias Associated with the Feeling of Belonging to a Group. *Perspectivas Em Ciência Da Informação*, 24(5), 96–132.
- SPYCHALA, Y. T. (2020) About the (In)Value of Field Work. *Journal of Sedimentary Research*, 90 (1): 102–103. [doi: https://doi.org/10.2110/jsr.2020.5](https://doi.org/10.2110/jsr.2020.5)
- ST. JOHN, K., RIGGS, E., & MOGK, D. (2016). Sexual Harassment in the Sciences: A Call to Geoscience Faculty and Researchers to Respond. *Journal of Geoscience Education*, 64(4), 255–257.
- SUBBARAMAN, N. (2020). How #BlackInTheVul put a Spotlight on racism in Academia. *Nature*, 582(7812), 327.
- TIMES HIGHER EDUCATION, 2020, Pandemic Lockdown Holding Back Female Academics, Data Show ([link](https://www.timeshighereducation.com/news/2020/09/10/pandemic-lockdown-holding-back-female-academics-data-show))
- TOMKINS, A., ZHANG, M., & HEAVLIN, W. D. (2017). Reviewer Bias in Single- Versus Double-Blind Peer Review. *Proceedings of the National Academy of Sciences of the United States of America*, 114(48), 12708–12713.
- TURNER, C. S. V., GONZÁLEZ, J. C., & WOOD, J. L. (2008). Faculty of Color in Academia: What 20 Years of Literature Tells Us. *Journal of Diversity in Higher Education*, 13(3), 139.
- TWALE, D. J., & DE LUCA, B. M. (2008). Faculty Incivility: The Rise of the Academic Bully Culture and What to Do About It. John Wiley & Sons. ISBN: 978-0-470-19766-0.
- UHLMANN, E. L., & COHEN, G. L. (2005). Constructed Criteria: Redefining Merit to Justify Discrimination. *Psychological Science*, 16(6), 474–480.
- UNSWORTH, S., RIGGS, E. M., & CHAVEZ, M. (2012). Creating Pathways toward Geoscience Education for Native American Youth: The Importance of Cultural Relevance And Self-Concept. *Journal of Geoscience Education*, 60(4), 384–392.
- WADMAN, M. (2017) Disturbing Allegations of Sexual Harassment in Antarctica Levelled at Noted Scientist. *Science*, AAAS. ([link](https://www.sciencemag.org/news/2017/09/10/disturbing-allegations-of-sexual-harassment-in-antarctica-levelled-at-noted-scientist))
- WARD, E. G., DALBOTTEN, D., WATTS, N. B., & BERTHELOTE, A. (2018). Using Place-Based, Community-Inspired Research to Broaden Participation in the Geosciences. *GSA Today* (pp. 26–27). <https://doi.org/10.1130/gsatg366gw.1>
- WATTS, N. B., & SMYTHE, W. F. (2013) It Takes A Community to Raise a Scientist: A Case for Community-inspired Research and Science Education in an Alaskan Native Community. *The Journal of Marine Education*.
- WILLIAMS, B. M., MCENTEE, C., HANSON, B., & TOWNSEND, R. (2017). The Role for a Large Scientific Society in Addressing Harassment and Work Climate Issues. *Annals of Geophysics*, 60(0). <https://doi.org/10.4401/ag-7441>