The imperative for scientific societies to change the face of academia: Recommendations for immediate action

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Abstract
As organizations that facilitate collaboration and communication, scientific societies have an opportunity, and a responsibility, to drive inclusion, diversity, equity, and accessibility in science in academia. The American Association for Anatomy (AAA), with its expressed and practiced culture of engagement, can serve as a model of best practice for other professional associations working to become more inclusive of individuals from historically underrepresented groups. In this publication, we acknowledge anatomy’s exclusionary past, describe the present face of science in academia, and provide recommendations for societies, including the AAA, to accelerate change in academia. We are advocating for scientific societies to investigate inequities and revise practices for inclusivity; develop and empower underrepresented minority leadership; and commit resources in a sustained manner as an investment in underrepresented scientists who bring diverse perspectives and lived experiences to science in academia.

KEYWORDS
disability, diversity, gender, minority, underrepresented

Few would disagree with the urgency of action to improve representation and equity in academia, most recently concerning accountability and systemic change in race and ethnicity, gender parity, and accessibility. Unfortunately, efforts over the last decade have produced negligible increases in the numbers of scientists from historically underrepresented groups, and for the few in academia, inequities are experienced daily in support, opportunity, advancement, and recognition. The lack of diversity in academia directly impacts the collective progress of science (Bazner, Jyotsna, & Stanley, 2021; Campbell-Montalvo et al., 2020). Scientific or professional societies, as organizations, bring like-minded people together around a common goal or purpose. They also impact members’ careers, shaping the directions of scientific advances. Thus, scientific societies can and should take immediate, member-informed, and member-driven actions to address inclusion, diversity, equity, and accessibility in science in academia. Deriving data from the 2013 IRS Data Book, the American Society of Association Executives indicates that there are at least 66,985 trade and professional associations; thus, the impact on influencing change can be significant (ASAE, 2019).

For professional societies to drive meaningful change, they first need to assess current processes and structures that comprise their culture. Although there are many descriptions of culture, Tierney (1988) provides a helpful definition of culture in academia. “An organization’s culture is reflected in what is done, how it is done, and who is involved in doing it. It concerns decisions, actions, and communication both on an instrumental and a symbolic level.” As societies grow in membership and complexity,
an organizational structure is often imposed to manage communication, activities, decision-making, and accountability, and it can become increasingly difficult to engage members in the decisions of the whole. However, it is the members the professional society serves, and the onus is on the society to keep pace with the needs of their members. As others have (Hulede, 2018; Khan et al. 2019), we argue that professional societies have a unique opportunity and responsibility to intentionally engage and effectively serve members who bring diverse life experiences and perspectives to benefit all members and science.

Tierney’s definition of culture allows for thoughtful inquiry, and if considered with a growth mindset and a willingness to adapt and evolve, it will generate actionable steps to increase diversity in science in academia. A scientific society has the critical and influential role of shaping the profession by assuming responsibility for defining and promoting excellence in professional and ethical conduct. Knowledge is shared through society journals, and collective statements of opinion or action are generated to advocate for the profession and larger societal goals. Of equal importance to individual members, scientific societies support members in their roles, both within and external to the organization. Society-supported professional development, mentorship, peer relationships, and recognition systems directly impact members’ careers within their academic institutions. In keeping with members’ developing needs, professional societies may identify and acknowledge practices that are outdated, ineffective, or biased, or perpetuate discriminatory ideas such as ableism. Society members should be engaged in designing and implementing systemic changes to improve the culture for inclusion. In this publication, we describe examples of inclusivity from the American Association for Anatomy (AAA) and provide specific recommendations for all scientific societies, including the AAA, to achieve meaningful, measurable improvements in inclusion, diversity, equity, and accessibility in science in academia.

To change the face of science in academia to include perspectives and influence of individuals from historically underrepresented groups, we must (1) acknowledge our past; (2) understand our present; and (3) pledge to improve. The AAA’s broad definition of underrepresented minorities (URMs) includes individuals of differing race, ethnicity, religion, national origin, mental or physical ability, age, gender identity or expression, or sexual orientation. Over time, there have been varying degrees of misconduct, malfeasance and even atrocities against each URM group in anatomical and medical research, systemic delays and hindrances of equitable progress, and impossible hurdles to achieve the same success as those with greater representation. To provide context for necessary actions, we highlight below a few examples of discrimination within anatomy and medical science disciplines.

1 | ACKNOWLEDGING OUR PAST

Professional societies play a role in defining the critical milestones and discoveries in the discipline. However, the documented history of anatomy and medical science has frequently overlooked significant contributions from URM physicians, scientists, and educators (Lujan & DiCarlo, 2019). For example, James McCune Smith (1813–1865) was the first African American to earn a medical degree and publish in United States (US) medical journals, but he was prohibited from joining the American Medical Association (Morgan, 2003; Lujan & DiCarlo, 2019). McCune Smith studied the physiology of biological differences between races; he was a statistician and petitioned the US Senate to change views of racial bias (Morgan, 2003; Lujan & DiCarlo, 2019). William Montague Cobb (1904–1990), anatomist and physical anthropologist, published over 1,110 papers, several of which examined the proposed physical characteristics that differed between the races (Scarupa, 1988). Cobb (1976) once stated, in opposition to eugenics theories, that “every African who landed on these [US] shores had undergone a more rigid biological selection than any group in the history of mankind.” McCune Smith and Cobb are just two examples of highly successful African American social advocates in science and academia. McCune Smith was finally granted membership to the New York Academy of Medicine in 2018—171 years after he was denied (NYAM, 2018). Cobb was immeasurably involved in several professional societies, Chair of the Anatomy Department at Howard University, and awarded the Henry Gray Award from AAA in 1980 (Rankin-Hill & Blakey, 1994). Although the award was bestowed 7 years after Cobb’s retirement, AAA’s decision to award a social activist, potential agitator yet amplifier of African American physical anthropology and anatomy, validated and verified URMs’ contributions to the profession. Likewise, in 2019, the AAA Board of Directors unanimously voted to name its morphological sciences early-career investigator award the W.M. Cobb Award in Morphological Sciences to further acknowledge his contributions to anatomical sciences. It is the first and only award in the organization’s portfolio of awards named after an African American.

Historically, medical societies were racialized and highly gendered in both profession and member participation. Although the first medical text regarding
midwifery written by a female midwife was published in the 17th Century, the practice was male-dominated (Drife, 2002; Jex-Blake, 1886; Thomson, 2015). Dr James Miranda Barry (1795–1865), also known as Margaret Ann Bulkley, was the first woman to graduate from the University of Edinburgh in 1812, an occurrence only because she pretended to be a man (Drife, 2002). Modern analysis postulates that Dr Barry’s contributions to obstetrics and military medicine were the first made by a gender non-conforming individual (Duncker, 2016; Funke, 2012). It was not until 37 years after Dr Barry’s graduation that the first openly identified woman graduated from medical school in the United States in 1849 (Weiner, 2020). Although, it would be another 15 years until, Dr Rebecca Lee Crumpler became the first African American woman to graduate, in 1864, from the New England Female Medical College (Ferry, 2021; Weiner, 2020). Five years later, in 1869, the University of Edinburgh openly admitted seven women, but their graduation was prohibited (BBC, 2019; Jex-Blake, 1886). Meanwhile, scientific societies in the 19th Century also halted progress toward gender parity; in 1876, three members of the European Obstetrical Society board of examiners resigned at the thought of women being allowed to sit for the examination (Jex-Blake, 1886; Murray & Stark, 1985; Rivington, 1896). Opposition to women in science continued into the early 20th Century; one exemplar is Marian Diamond (1926–2017), who conducted groundbreaking studies on neural plasticity (Kentner, Lambert, Hannan, & Donaldson, 2019; Squire, 2009). When presenting her novel work to AAA in 1965, Diamond reported that a male scientist heckled her from the audience (Squire, 2009). Thankfully, since that time, the AAA annual meeting has improved in gender representation of participants, speakers, and session chairs, as well as in the respectful behavior of attendees.

Discrimination has also been present in visual depictions of anatomy. Anna Morandi Manzolini, the Chair of Anatomy at the University of Bologna, was instrumental in developing anatomical waxes for medical education that encompassed the beauty of the Italian Renaissance (Jex-Blake, 1886; Messbarger, 2010). However, in stark contrast to the elegant displays of the waxed Venus are the lurid representations of Sara “Saartjie” Baartman, a member of the Khoisan hunter-gatherers of South Africa whose steatopygia (large, fleshy thighs, and buttocks) was sexually exploited (Qureshi, 2004; Washington, 2006; Dunton, 2015). Different cultural customs, pathologies, and visual displays of URMs were presented in cabinets of curiosity, “freak shows,” menageries, and eventually medical museums in the 18th and 19th centuries. Pamphlets and advertisements for these displays have historically been a mix of voyeuristic entertainment and professional education—some used illustrations and language to attract the public and others were presented as scientific medical cases for society members only (Durbach, 2014; Qureshi, 2004). Baartman, in fact, was exhibited as a scientific curiosity for over 200 years, allowing for studies of ethnology and biological differences that propagated inappropriate assumptions of race and gender (Qureshi, 2004; Youé, 2007). Depictions of Baartman were hypersexualized due to her steatopygia and “apron of shame,” which were anatomically different from the European majority (Barrett, 2012; Gilman, 1985; Jewett & Jewett, 1897). Baartman is just one example of cultural misinterpretation perpetuated through widely disseminated illustrations in the 19th century. Unfortunately, misrepresentation in anatomical images and textbooks continues and may inadvertently contribute to racial and gender bias in training and education in the 21st century (Abu-Ghname et al., 2020; Deckman, Fulmer, Kirby, Hoover, & Mackall, 2020; Massie et al., 2021).

There is a paucity of visual images inclusive of genders, ethnicities, persons of varying ages, and persons with disabilities in medical and anatomical textbooks or atlases (Martin et al. 2016; Louie & Wilkes, 2018; Deckman et al., 2020). In the 18th century, Bernhard Siegfried Albinus (1697–1770) aimed to create the ideal, normative, and universal anatomical image through scientific measurements of what he deemed the “homo perfectus”—a young, fit, abled, eurocentric male (Albinus, 1754; Choulant & Streeter, 1920; Ghosh, 2015; Hildebrand, 2005). Several illustrators and artists perpetuated this “ideal” image of anatomy, avoiding displays of variation or diversity of gender, race, age, or disability that has continued into the 20th and 21st centuries. Some researchers have suggested that this underrepresentation leads to implicit bias and inequities in health care quality (Abu-Ghname et al., 2020; Massie et al., 2021). Diverse and representative images must also be considered for digitized anatomical illustrations, in which skin tones are heavily Eurocentric. Furthermore, programs such as Complete AnatomyTM (3D4Medical.com; Elsevier) depict primarily male anatomy. Although the program includes an independent, partial female pelvis, in general, applications and technology designed for anatomical education rarely feature visually diverse URMs beyond a stereotypical or pathological case study.

The advancement of both medical and anatomical sciences benefited significantly from the inequitable dissection of the enslaved and unclaimed bodies of URMs. (Washington, 2006; Halperin, 2007; Berry, 2017). The US domestic cadaver trade—wherein the southern states supplied northern medical schools with bodies for dissection—coincided with the development of
standardized academic medicine in the United States (Berry, 2017; Bride, 2020; Kenny, 2013). Southern medical schools also owned or employed resurrection men (enslaved porters) who would provide “fresh subjects” for dissection (see history of Grandison Harris Lovejoy, 2014 or Chris Baker Holmberg, 2012). It is an unfortunate truth that although enslaved bodies were clearly deemed profitable after death, they were discarded in unmarked graves once dissections were complete (Berry, 2017; Dunnavant, Justinvil, & Colwell, 2021). It goes without saying that “consent” or “ethical use” was uncommon. Scientific societies, including the AAA, should work collaboratively to increase public awareness and trust for body donation, in part by supporting repatriation efforts and policies, attempts to restore honor to the bodies that history and scientific advancement mistreated. Guidance for repatriation of Native American remains is available through the Native American Graves Protection and Repatriation Act (NAGPRA, 2021), and at least one university system is developing policies to meet recent revisions to the Act (UCOP, 2021). There has been advocacy for an African American Graves Protection and Repatriation Act modeled on the existing NAGPRA (Dunnavant et al., 2021). A recent study suggests that it may be possible in the future to use genomic methods to identify the source of remains for which provenance is unknown (Wright et al., 2018).

2 UNDERSTANDING OUR PRESENT

Science, technology, engineering, and mathematics (STEM) faculty are essential to advance scientific knowledge and serve as role models for the next generation of scientists and scholars (Clauset et al. 2015; Gibbs Jr et al., 2016). The National Science Foundation (NSF) reports that 8.89% of doctorate recipients and 8.1% of doctorally educated assistant professors in the biological sciences reported living with a disability (NCSES, 2021). These numbers may be underestimated, as 13.2% of the US population identifies as living with a disability (NCSES, 2021). It is possible that ableism, defined by the Center of Disability Rights as, “a set of beliefs or practices that devalue and discriminate against people with physical, intellectual, or psychiatric disabilities” (Smith, n.d.), causes individuals to pursue careers outside of academia or decline to inform others of their disability (Brown & Leigh, 2018; Yerbury & Yerbury, 2021). Scientific societies have a clear opportunity to fight ableism and advance inclusivity.

Recent censuses of the United States and Canada indicate that 36% of the US population belongs to a URM (NCSES, 2019) and 23% of Canadians are a member of a visible minority group (StanCan, 2019). However, the current AAA membership does not reflect the demographics of the United States and Canada, as less than 9% of members are URM, or members of a visible minority. The racial and ethnic disparity between the AAA membership and the general population of the United States and Canada mirrors the academic institutions to which 90% of the AAA membership belongs. It has long been noted that academic institutions’ student and faculty composition, including medical schools, does not represent the national racial or ethnic demographic (Gibbs Jr et al., 2016; Peter, Parsa, Hassanein, Rogers, & Chang, 2013; Whittaker, Montgomery, & Martinez Acosta, 2015). For example, in 2010 and 2019, 3% of US medical school faculty were Black or Hispanic, while less than 1% were American Indians, Native Hawaiians, or other Pacific Islanders (Roster, 2020). Hence, in the past 10 years, the percentage of URM holding faculty positions in US medical schools has not changed (AAMC, 2018), supporting a need for new approaches.

The lack of faculty diversity is partly due to lower recruitment and increased attrition rate among URMs (Jaffe, Yan, & Andriole, 2019; NCSES, 2019). Unfortunately, recruitment, retention, and advancement of underrepresented faculty, including Blacks or African Americans, Hispanics or Latinos (Latinx), American Indians or Alaska Natives, Native Hawaiians, and other Pacific Islanders, remain low across scientific fields (NCSES, 2019). This is often ascribed to fewer URMs in the “pipeline,” but recent studies suggest that this is no longer the case. For example, from 1980 to 2014, the number of non-URM candidates graduating with a PhD increased by 2.2%, and the number of non-URM new assistant professors increased by 1.7%, resulting in a significant positive correlation between the number of non-URM candidates and the number of non-URMs hired into assistant professor positions across the United States. During the same period, however, there was a 9.3-fold increase in the number of URM PhD graduates, but only a 2.6-fold increase in URMs hired into assistant professor positions, making the lack of racial and ethnic diversity at the faculty level in academia difficult to reconcile (Gibbs Jr et al., 2016). Thus, there is a significant problem in the recruitment of URMs into the academic ranks.

The absence of significant improvement in diversifying the academic workforce is compounded by low retention of URMs. With the exception of two studies examining URM retention in departments of surgery, few reports document the extent of this problem. In 2008, 10-year retention for URM assistant professors in surgery was 46%, and significantly less than for non-URMs (57%). Similarly, low retention was reported for Internal
Medicine at the assistant and associate professor level (Abelson et al., 2018). In fact, there was no increase in the percentage of URMs in the different academic ranks between 2005 and 2018, despite a number of initiatives aimed at diversifying academic staff in surgery (Valenzuela & Romero Arenas, 2020). A 17-year follow-up representative study showed a significant difference in retention between non-URMs and URMs: 86% for white versus 72% for URMs (Kaplan et al., 2018). Career dissatisfaction could not explain this difference, and other previously reported factors such as perceived discrimination, absence of a community, and a sense of isolation were postulated (Kaplan et al., 2018; Pololi et al., 2013). Additionally, the intersection of gender, race, and ethnicity leads to even poorer outcomes for URM women. Hence, although URM women make up 18% of the US population, they represent only 3.2% of full professors (Carr et al., 2019).

Over the past 40 years, academic institutions and associations have instituted several programs aimed at attracting URM trainees into academia. However, little attention has been paid to the fact that URM academic faculty in Canada and the United States have lower career satisfaction and often consider leaving their positions within 5 years (Palepu, Carr, Friedman, Ash, & Moskowitz, 2000). It is likely that the “feelings of isolation and lack of socialization” for URMs identified in many studies as a major issue contributes to the problem (Nivet, 2010). Though this issue is difficult to address, it must be done; the lack of success of URMs in academia is a deterrent for trainees who perceive a disproportionate burden on the few visible, successful URM academic faculty (Nivet, 2010). Inclusive professional societies like the AAA provide a stable environment for URMs across their training and career trajectories and are well-positioned to help increase their recruitment and retention in academia.

As stated by Estrada et al. (2016), change begins by recognizing the fields of influence in a situation and identifying the points at which there are “gatekeepers” that impede the flow of change in a system (Estrada et al., 2016). While one of the major gatekeepers is the transition of URM PhD fellows to URM faculty positions (Meyers, Brown, Moneta-Koehler, & Chalkley, 2018), a second gatekeeper is the lack of faculty member retention. Some of the barriers faced by URM faculty members early in their careers include (1) lack of awareness and inclusion in faculty development opportunities; (2) limited skills in developing research grant support; (3) limited or inadequate integration into academic communities and subsequent isolation; (4) real or perceived limitations in environmental support; (5) implicit bias and micro-aggressions; and (6) lack of will or cultural understanding on the part of institutional leadership. In order to overcome these barriers, formal retention strategies and mentoring plans must be established with clear goals for growth and success of URM scientists in Canada and the United States.

The few URM members who remain in academia are overburdened, undervalued, and face incredible hurdles at achieving promotion within their institutions resulting in a dearth of URMs in leadership positions (Peter et al., 2013; Whittaker et al., 2015). The term, “minority tax,” is used to describe this disparity in services, such as URM mentoring, diversity committee work and URM community engagement, that are often provided by URM faculty (Campbell & Rodriguez, 2019; Rodriguez, Campbell, & Pololi, 2015). However, as discussed by Rodriguez et al. (2015) the underlying causes of the minority tax are complex and are often the result of URM faculty feelings of obligation to their communities or gratitude to their institutions for being employed (Campbell & Rodriguez, 2019; Rodriguez et al., 2015). Obligation to future generations of URM students and faculty results in increased service in their communities and on diversity efforts at their institutions. Unfortunately, these commitments, which are often very time-consuming, contribute to less time for engagement in scholarly activities and for those services that are of value to the institution (Campbell & Rodriguez, 2019; Rodriguez et al., 2015). Reduced scholarly time explains the lower publication rate found when URMs are compared to their non-URM peers. This is especially concerning when one considers that publication is the currency with which funding and promotion are secured in academia. Gratitude to institutions for providing opportunity and help in securing a position can also stall careers of URMians, as they are hesitant to search for new career opportunities that give access to leadership positions (Ginther et al., 2018; Taffe & Gilpin, 2021). Together these disparate obligations and misguided feelings of gratitude contribute to the reduced number of URMs found in leadership positions within the academy. Increased value on diversity work by URM faculties along with funding that support diversity efforts is necessary to increase the promotion of URMs to leadership positions. Scientific societies can provide URM faculty opportunities for leadership positions that can later be leveraged at their home institutions. Finally, diversity on the editorial boards of society journals and intentional steps to increase funding for URMs will help to increase both retention and promotion of URMs in academia.

3 | PLEDGING TO IMPROVE

To date, change has been too slow to be impactful, and thus we must engage in new and systematic
approaches to address inequities. These are our specific recommendations:

3.1 | Vigilance: Investigate past and current inequities and revise practices

We recommend that organizations review all of their practices and documentation, including policies, procedures, bylaws, and communication materials on websites, newsletters, and social media, to identify content or practices that are outdated or unintentionally exclusionary. Like-minded people create scientific societies, and vigilance is required to adapt along with the needs of an evolving membership and an advancing discipline. Bylaws that are overly prescriptive can impede organizational development. Legacy policies and procedures may lack transparency to newer members and may inadvertently limit participation. Furthermore, outdated websites that are not digitally inclusive may be unwelcoming to persons with disabilities. To incorporate a wider variety of perspectives, reviews of practices and documentation should be conducted by both majority and minority participants beyond the established leadership and management teams. It is critical to conduct the reviews with a growth mindset, attending specifically to the myriad of things that can impede or block minority progress.

3.1.1 | AAA progress

When the “Association of American Anatomists” was established in 1888, Joseph Leidy’s like-minded peers were primarily male, and the organization was eurocentric. Over its 130-year history, AAA membership has broadened significantly, extending now across 57 countries (Anatomy.org). The AAA Diversity, Equity, and Inclusion (DEI) Committee established a membership goal to achieve parity with or exceed the published AAMC benchmarks for faculty demographics concerning race, ethnicity, religion, national origin, mental or physical ability, age, gender identity or expression, and sexual orientation (AAMC, 2018). In 2016, the AAA began collecting supplementary information to better understand its current membership. Each member profile includes an option to report gender preference, ethnicity, race, age, religion, national origin, and disability status. The rationale behind this reporting was to measure progress toward achieving parity and support efforts toward diversity and inclusion. The self-reported demographics are now communicated annually to the collective membership, and the aggregate data are used to inform AAA decisions for outreach, services, engagement, and inclusion of perspectives and experience in nominations and appointments.

The AAA identified several unintentionally exclusionary activities that required revision in its review of longstanding policies and procedures. In the first example, committee appointments had been made for many years through member nomination, limiting opportunities for those who did not “come to mind” at the time of need. To address this issue, the appointment process has been democratized through an annual open call for volunteers. Concurrently, the DEI Committee has a goal for all committee members to reflect the diversity of the current membership. Therefore, members from underrepresented groups are encouraged to answer the call through self-nomination, and each applicant is asked to describe their contributions to diversity and inclusion. Committee chairs, and often committee members, are engaged in the selection process. Having completed bias training and with awareness of DEI goals, individuals who will broaden perspectives and life experiences within working groups and committees are selected. Thus, AAA has made progress in the last 5 years. Committee demographics indicate that gender balance has been maintained, and URM participation has increased from 7% in 2015 to 19% in 2020 and 2021.

A second example of unintentional exclusion was identified in the selection for AAA Fellows, distinguished members who have demonstrated excellence in science and their overall contributions to the anatomical sciences. Interestingly, no more than 10% of current membership may comprise the Fellows community within AAA, rather limiting growth and inclusion. Prior to 2017, selection criteria included 15 years of AAA membership, and resulted in a Fellows group that was 79% male. Following extensive discussion, new selection criteria were adopted, focusing on outstanding scholarship in either research or teaching and 4 years of AAA membership. Although the Fellows selected since 2018 have been 51% female, the current Fellows group is 71% male, 29% female, and only 5% URM, indicating that efforts toward equity must continue.

Programming for the AAA annual meeting represents a third example of practices reviewed and updated for inclusivity. The AAA has revised its criteria to guide member-driven proposals for the annual meeting and has prioritized speakers who have not shared their work in recent years. Additionally, session chairs are required to include speakers who represent a balance of genders, career stages, and institutions, and are queried about inclusion of URMs among the speakers. Recent data suggest that there has been progress—in tracking “assumed gender,” there were equal numbers of male and female
speakers and session chairs in the 2018, 2019, and 2020 annual meetings.

In a final example, AAA staff and members recently conducted an audit of AAA awards, reviewing the types, selection criteria, and history of awardees. Award descriptions and selection criteria were adjusted to deepen the pool of nominees for each award, and selection activities were moved out of a single committee and distributed across multiple committees. Observing a paucity of achievement awards for mid-career investigators and awards to acknowledge outstanding mentors, new award categories were suggested to the Board. To address specifically AAA efforts toward diversity, a new award acknowledging excellence in diversity, equity, and inclusion was created to recognize a member who creates inclusive teams representing the rich diversity of communities served.

3.1.2 | Next steps

The current efforts alone are unlikely to achieve equity within AAA, let alone in the larger environment of academia. Vigilance will help identify processes that need further revision, adaptation, and modification. To continue to make progress, AAA needs to consistently review its practices, track the data and hold itself accountable for improvement. AAA members must be fully aware of how their profile information is protected and used while understanding the value of their profile data in making real change. In the examples above, detailed data on the representation of minority members are necessary to make continual progress in membership, engagement in committees and task forces, annual meeting programming, and equity in nominations and selection of Fellows and award recipients.

The AAA has an opportunity to lead the field in addressing ableism, by normalizing different abilities and valuing the contributions brought to the organization by members living with disabilities, chronic illness, or neurodiversity. Of the more than 8,000 doctoral recipients in the biological and biomedical sciences in 2019 who responded to queries about disability, 4.1% experience visual or hearing disabilities, 1.1% experience walking or lifting disabilities, and 5.3% experience cognitive disabilities (NCSES, 2021). Given society’s expanded understanding of disabilities, including chronic illness and neurodiversity, it may be necessary to update the AAA member profile request for personal information. With a growth mindset, the AAA could make the annual meeting more welcoming to all, possibly by following the example provided by the Ableism in Academia Conference (Brown, Thompson, & Leigh, 2018). Although the AAA annual meeting is generally physically accessible and service dogs have been accommodated, the organizers may also consider adding quiet spaces, live streaming, live captioning, and large print programs to increase accessibility.

Public and AAA member discourse has highlighted the skewed representation throughout the discipline of anatomy, from body procurement to donor-cadaver use, visual depictions of anatomy, and documentation of discoveries with an explicit acknowledgment of the scientists. As a follow-up to its recent analysis and revision of awards, AAA should now review the descriptions of awardees in its print and social media. It has been suggested that minoritizing language, such as “the first African American” or “the first woman,” should be removed, and text should instead focus on the awardee’s contributions to science, teaching, mentoring, or service, as fitting the award (Bazner et al., 2021). There is debate, however, as such language may serve to highlight inequities and exclusive practices of scientific societies and academia, and thus may be necessary until representation and influence is significantly diverse. The AAA must continue to investigate its past and promote change. This special edition of The Anatomical Record represents a good start, and a recently formed Presidential task force charged to review representation in the history of anatomy is likely to identify avenues for exploration. The AAA should ensure that findings, as well as more culturally inclusive, ethical, best practices for use of anatomical materials, are disseminated into the scientific and educational communities.

3.2 | Equity: Recruit, develop, and empower URM leadership throughout the organization

We recommend that organizations commit to transparent processes in recruitment, nomination, selection, and support of members from underrepresented groups, advancing them into leadership positions throughout the organization. A scientific society comprises members with various degrees of involvement, elected officers, and a volunteer governing Board of Directors who work closely with a salaried executive director, who oversees a professional staff team. This shared leadership approach ensures the organization follows its bylaws, and with member input, it sets the organization’s strategic direction. Importantly, committees, task forces, appointed liaisons, and other subgroups create tiers of leaders distributed throughout the organization. All engaged members, including those from underrepresented groups, should have equal opportunity to influence the organization and reap the career
development benefits of professional service. Of benefit to the organization, in addition to offering novel perspectives, members from underrepresented groups can often reach individuals through personal social networks who may be unfamiliar with or new to the organization.

To change the face of science in academia, institutions must have URMs in positions of leadership, however, individuals from minority groups may be less likely than their majority peers to apply for or be mentored into leadership positions (Campbell & Rodríguez, 2019; Whitfield-Harris & Lockhart, 2016). Scientific societies offer authentic leadership roles to help individuals gain confidence and professional skills to bring to the home institution. Experiences must be safe, well-supported, and enable valued contributions. With accompanying leadership training, mentoring, and peer support, societies can help combat experiences of Impostor Phenomenon (Clance, 1985; Parkman, 2016) and enable URM members to recognize similarities in themselves and colleagues. Additionally, there is a significant benefit to non-URMs experiencing collaboration with a diverse leadership team. With their URM colleagues, non-URMs can help drive change in their home institution.

### 3.2.1 | AAA progress

Cognizant that an organization’s culture is reflected in its actions, the AAA developed a DEI taskforce and in 2017 committed publicly to a culture of equity (AAA, 2017). An inclusive culture, along with a stated commitment, has been demonstrated to impact gender diversity of leadership in other scientific societies (Potvin, Burdfield-Steel, Potvin, & Heap, 2018). The maintenance of a culture, however, is dependent on effective leadership (Warrick, 2017); thus, the AAA has made deliberate investments in leadership development. In the first example, noting that there are few volunteer opportunities on standing committees and elected leadership, the AAA created micro-volunteer opportunities on short-term projects, award selection subcommittees, and social media communication. Importantly, the transparent application process enables self-nomination, and the micro-volunteer options increase flexibility, opening more opportunities for engagement and initial steps into leadership. This successful approach has increased member engagement over recent years, specifically from 2015 to 2018, there was a 25% increase in member engagement with the society.

A second example of leadership development is the proactive recruitment of Board-level leaders and the Presidential line. The membership elects board members, and thus nominees need to be well recognized and prepared for the leadership role. The Committee for Early-Career Anatomists (CECA) has proven to be an excellent training ground for emerging leaders. As CECA members work together to construct sessions for the annual meeting and judge early-career awards, they develop a long-lasting network of peers to tap for support and advice as they move up in their academic careers. Several former members of CECA have been elected to the Board, which has helped to expand the diversity of the AAA Presidents over recent years. Although the first female officer in the AAA, Florence R. Sabin, was elected to the Presidency in 1924, only 10 of the 88 AAA Presidents (11.4%) have been female. Six of the 10 (60%) of the elected female Presidents were in the last 17 years, demonstrating AAA’s recent progress in gender equity.

A final example of leadership development is in the effort put into training AAA leaders. Joint leadership includes the management team, and AAA has an Executive Director who engages with the American Society of Association Executives (ASAE) that supports professional development for the leadership team. The AAA President-Elect, President, and Executive Director participate in ASAE’s CEO Symposium program intended to provide insights into challenges facing contemporary association leaders to help them work better together. With a core value of inclusivity, the AAA provides training in unconscious bias for committee chairs and Board members and incorporates peer mentoring for members new to the Board. It is clear that the processes for recruitment, selection, and development of leaders within the AAA have become more transparent and deliberate in recent years. The tiers of leaders throughout the organization are slowly becoming more representative of the membership.

### 3.2.2 | Next steps

To continue to make progress, the AAA needs to better understand the impact that its leadership development activities are having within the academic environment. Academia, in general, has fewer leadership positions, and turnover is infrequent when compared to the 1–3-year terms of committee or Board positions in the AAA. Therefore, to assess the impact of leadership development AAA needs data on members’ retention and progression through their academic careers, and leadership roles they assume within their institution and other organizations. As change agents in anatomy, opportunities for AAA leaders will emerge beyond the member’s academic institution, for example, on journal editorial boards or as special issue editors, and in science advocacy activities. With continued effort on the part of scientific societies, we anticipate a more equitable representation of scientists.
from underrepresented groups in positions of influence and leadership within the academic community.

### 3.3 | Put your money where your mouth is: Commit to substantial, sustained investment in URM members

We recommend that scientific societies make thoughtful, strategic, long-term investments in the careers of members from underrepresented groups. Past treatment in academia, particularly for individuals from underrepresented groups, can result in skepticism about a scientific society’s motivation for reaching out. Inclusion, therefore, must be genuine and incorporated into all the society’s activities and should continue throughout the member’s engagement with the society. As stated by Morris and Washington (2017), “Organizations naturally do not diversify.” Therefore, there must be deliberate measures to ensure every voice is brought to the discussion. Furthermore, engagement opportunities must be meaningful, add value to the organization and the member, and not become a burden that derails the member’s career.

#### 3.3.1 | AAA progress

AAA leaders and professional staff support promote the broader vision of inclusion and are valued for their perspectives and contributions to the organization and its members. As such, the AAA has developed and acts upon statements and policies regarding inclusion, ethical conduct, and anti-harassment. Diversity goals and activities are embedded throughout the organization’s strategic plan and include both process and outcome metrics. There are several examples of AAA financial investment in diversity and inclusion. The first is seen in the Anatomy Scholars Program (ASP), designed to support and increase retention of URM members in STEM in academia in the United States and Canada. Cohorts of 10 Scholars will participate in a two-year, financed professional development program with sustained, formal mentoring and a peer-support network, concluding at the AAA annual meeting. Intended activities directly address some of the challenges experienced by URM members in academia. Anticipated outcomes of the ASP include increased satisfaction and reduced feelings of isolation of the URM Scholars, successful transition to academic positions, promotion within their home institution within 5 years, and publication progress.

A second example of AAA investment is the Innovations Program, which offers competitive funding for member-driven proposals supporting the AAA strategic plan. In 2019 and 2020, the Innovations Program supported The Summer Opportunities in Anatomy Research (SOAR) program, a 10-week, hands-on internship program in anatomical research and education for undergraduates who do not have these opportunities at their home institutions. Individualized mentorship focuses on the retention of budding anatomists from diverse and underrepresented groups. In 2019, the SOAR program supported the mentored research of three first-generation college students, one of whom identifies as American Indian or Native American. All three participants had research presentations accepted for the 2020 AAA annual meeting at Experimental Biology.

In a final example, the AAA has provided financial support for members to represent the AAA in meetings of historically underrepresented scientists, such as Out in Science, Technology, Engineering, and Mathematics (oSTEM). Additionally, the regular participation of DEI members in the Society for Advancement of Chicanos/Hispanics and Native Americans in Science and the Annual Biomedical Research Conference for Minority Students ensures that members of these organizations know of the activities and supportive culture of the AAA. Outreach activities such as these can facilitate entry of URM members into the AAA, and additional investment will help ensure their long-term engagement.

#### 3.3.2 | Next steps

To continue to make progress, the AAA needs to sustain and increase its investment in the development of URM members in academia and measure the impact of the investment. Furthermore, what is valued is measured. Thus, tracking the progress of valued inclusion, diversity, equity and accessibility will indicate whether AAA initiatives achieve the intended goals or if the approaches require change. AAA members may be surveyed to assess perceived progress and focus groups of members from underrepresented groups could be used to obtain detailed information on belongingness and career impact.

Additional investment may be made to support the costs of AAA membership for individuals with limited access to extramural or departmental funds. Given the medical expenses often incurred by individuals living with disabilities, the AAA may consider ways to subsidize or reduce the costs of meeting attendance. Many URM members find critical peer support in societies, conferences and social networks with a majority URM membership. Examples of existing societies and conferences include the Black Doctoral Network, the National Society of Black Engineers, STEMNoire, Cientifico Latino, the
Society of Hispanic Professional Engineers, the American Indian Science and Engineering Society, the Association of American Indian Physicians, Out to Innovate (previously the National Organization of Gay and Lesbian Scientists and Technical Professionals), the Coalition for Disability Access in Health Science Education, the Association on Higher Education and Disability, the National Action Council for Minorities in Engineering, and SciAccess. Some new social networks, such as Black in Anatomy and the Canadian Black Scientist Network, are in rapid development for nonprofit status. In line with its commitment to diversity, the AAA might consider joint membership models or packaged, reduced AAA membership dues for members of both societies. Given the inclusive culture of the AAA, some members may be supportive of a philanthropic campaign to financially sponsor the membership of early-career anatomists from underrepresented groups. With regard to the annual meeting and its associated costs, the AAA may consider enabling some level of participation in a virtual format and provide financial support for those with economic hardship. Regional meetings, which enable networking in a smaller group, may be held in regions with minority-serving institutions (John & Stage, 2014; US Department of Education, 2011).

Given that scholarship is the coin of academia and a method by which progress is made in science, AAA may consider ways to support diversity in authorship and research funding. As voices of anatomy, the three AAA journals may encourage the publisher, Wiley, to track and report the participation of scientists from underrepresented groups in submitted manuscripts, in line with peer publishers, such as Cell Press (Sweet, 2021). Ethnic diversity of publication co-authors has recently been demonstrated to be positively correlated with research impact, as measured by the number of citations within 5 years of publication (AlShebli, Rahwan, & Woon, 2018). Engagement of individuals with different life experiences, perspectives, and scientific contributions may bring together findings from seemingly disparate fields or even produce a novel discipline of science. AAA may consider innovative ways to support and reward this inclusivity in scholarship and publication.

To further support equity in science, the AAA may be encouraged to create or participate in actions of solidarity. Public statements of support, such as the AAA Statement on Racism (AAA, 2020), the AAA Statement on Ethical Use of Human Tissues, and the joining of AAA into the Societies Consortium on Sexual Harassment in STEMM (societiesconsortium.com), are recent examples of AAA leadership for equity. The AAA also has the opportunity to voice support for and act in solidarity with the NIH UNITE initiative to end structural racism and racial inequities in biomedical research (NIH, 2021).

With its welcoming, supportive culture, AAA has made progress in diversifying its membership and creating a participatory society. With its commitment to inclusion, diversity, equity, and accessibility, the AAA has begun to investigate its past, taken stock of some current practices, and initiated actions to broaden member engagement and leadership development throughout the organization. There is much more to address on the path toward equity, fairness, and justice, not least of which is ensuring that AAA efforts translate into improvements in representation and influence in the academic environment. A member's scientific identity, fostered in a professional society such as the AAA, can facilitate faculty retention in academia. We hope that the recommendations of vigilance, equity, and investment will be used as guideposts for the AAA and other scientific societies, accelerating transformational change in the face of science in academia.

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REFERENCES


