

COMMUNITY

DIVERSITY AT AMS

Insights from the AMS Membership Survey

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The demographics of the United States are changing, but data from the most recent survey of American Meteorological Society (AMS) members suggest that the weather, water, and climate (WWC) professions are not keeping pace. These results—which indicate modest progress in the participation of women and even less growth in the racial and ethnic diversity of our membership—are a call to action for the WWC community. In the words of the AMS Diversity Statement, “The advancement of the AMS mission is dependent on its ability to have a professional membership that is fully representative of societal demographics.”

While the Society still has a long way to go toward that aspiration, the data from the recent survey do show some positive trends. Careful analysis of the data, including multivariate regression across groups of questions, provides guidance for strategic action. In fact, the survey analysis is currently being used in the preparation of a roadmap for an Inclusion and Diversity Report led by the AMS Board on Women and Minorities (BWM).

KEY FINDINGS.

- While the participation of women has doubled since 1999, it still lags behind participation of men as members of the AMS. The survey also shows that the accomplishments of women are undervalued, and women continue to be underrepresented in leadership positions.
- Only 2.1% of AMS members identify as Black or African-American and 3.5% as Hispanic or Latino, and extremely few are American Indians or Alaskan Natives. Disappointingly, these numbers have remained essentially constant between 2005 and 2014.
- While studies in other Science, Technology, Engineering, and Mathematics (STEM) fields point out negative experiences and outcomes for members of the Lesbian, Gay, Bisexual, Transgender, Intersex, Queer/Questioning, and Allied (LGBTIQA) community, AMS members do not report feeling unwelcome or unsupported.

- Qualitative data suggest that people with disabilities still experience significant lack of access to both resources and tools of the WWC profession.

ACTIONS. To address the current lack of inclusion and diversity in the WWC profession, the AMS BWM updated a diversity statement that is more active and aspirational¹ to create a more inclusive and diverse environment within the AMS—an environment that represents and welcomes the full fabric of the community. Survey analysis is being used in the preparation of an Inclusion and Diversity Report led by BWM. This report will set goals for AMS membership, develop dashboards to measure progress, and recommend specific actions and programs to comprehensively address inclusion, diversity, and equity in the WWC community. BWM welcomes the talents of anyone who wants to contribute to this report.

DETAILED ANALYSIS OF THE SURVEY.

In collaboration with American Institute of Physics (AIP), BWM led the development and administration of the AMS membership survey. Similar to previous surveys, the 2014 survey quizzed respondents about their personal demographics and diversity. Also, several questions were designed to determine ways in which AMS services could better accommodate members with disabilities. This paper focuses only on certain aspects of diversity, such as gender, ethnicity, race, sexual orientation, and ability. Follow-up articles will discuss additional AMS demographic trends, such as age, member status and residency, educational background, and employment characteristics. Results were analyzed for this report using two primary methods. In order to understand representation in AMS, raw numbers and percentages are discussed. Multivariate models were also used to examine differences among responses. For further information on the methods, please contact the au-

¹ www.ametsoc.org/ams/index.cfm/about-ams/ams-organization-and-administration/ams-diversity-statement/

thors. What follows is a detailed analysis of diversity-related data obtained from the 2014 AMS survey.

PARTICIPATION OF WOMEN.

The number of women members of the AMS has increased only marginally since the 2005 survey (Table 1). Compared to 20% in that survey (Murillo et al. 2008), 22% of the respondents indicated their gender as women in the newest survey. Trends related to participation of women in AMS from 1980 to 2005 are discussed in detail in Tucker et al. (2009) and Hartten and Lemone (2010).

The small change in the number of women members—perhaps even too small to be statistically significant—is consistent with some national science and engineering (S&E) training and employment trends. According to the National Science Foundation (NSF) Science and Engineering Indicators Report (NSB 2016), even though women accounted for half of the college-educated workforce overall, they constituted only 29% of workers in S&E occupations in 2013. Women represent 39% of employed individuals whose highest degree was in S&E.

For the first time, the AMS survey included a “transgender” category. Less than 1% respondents chose transgender or other. The rest of the survey respondents chose their gender as male, except for the 1% who said nothing about gender.

Forty-three percent of student members in the United States and 28% of student members abroad are women. While there is a growth in the number of women in WWC workforce, it should be noted that the proportion of women is still the lowest in engineering (15%), computer sciences (24%), and physics (31%) (NCSES 2017).

In essence, while AMS membership has grown overall since the last survey, the percentage of women members has not increased significantly. This is in spite of the fact that international and student membership—two areas where AMS membership has grown most rapidly—have a high percentage of women members. The promising surge in women membership from 1995 to 2005—mostly the changing demographics of student and early-career members—has not been sustained. As noted as far back as 2003, an increase in student participation in atmospheric sciences and other geoscience fields does not automatically translate into an increase in the number of women members (Holmes and O’Connel 2003). This highlights structural and social challenges that still

TABLE 1. Percentage of women respondents by survey year.

1975	1990	1993	1999	2005	2014
3	7	9	11	20	22

need to be overcome and is one of the factors prompting renewed action by AMS.

The survey results provide an opportunity to explore the reasons for some of the structural and social challenges that might inhibit the participation of women in atmospheric sciences and other geoscience fields. Gender does not appear to play a significant role in members’ participation in AMS conferences: men and women were equally likely to have attended at least one conference in the last three years. However, and more ominously, when people were asked if they individually felt welcome and included in AMS, women were more likely to respond negatively—even when the answers were controlled for other factors like field of degree and employment.

Qualitative data adds context to the finding that women feel less welcome. One survey participant stated that, “AMS could do a LOT better with including minorities and women in their activities. If you see pictures from AMS events, it is full of white men. The demographics of the AMS do not mirror modern U.S. demographics. It should not be expected that women and minorities do the heavy lifting to diversify the ranks of AMS. EVERYONE is responsible.” This sentiment was echoed by other members of the community. Many participants also took time to note that AMS makes meaningful attempts to include women; however, as stated by one women member, “AMS has made great efforts to help people feel included. However, the field still suffers from lack of diversity.”

PARTICIPATION OF UNDERREPRESENTED MINORITIES. Three racial and ethnic groups—namely, Blacks or African Americans, Hispanic or Latino, and American Indians or Alaska Natives—are considered to be underrepresented minorities in WWC fields. It is worth noting that Asians are generally considered to be overrepresented in the S&E (NCSES 2017), though there is concern that Asians are underrepresented in leadership positions in the sciences and beyond (Woo 2000). Also, this analysis of racial and ethnic groups, in keeping with the common practice, is limited to citizens and permanent residents of the United States.

Despite considerable progress over the past four decades, the Society still lags behind in inclusion and ethnic diversity of minorities (Table 2). Underrepresented minorities constituted only about 7% of the overall AMS membership in 2014. Though statistically nonsignificant, one surprising result from the survey is the decline, since 2005, in the percentage of Asian members. This topic will be investigated in a future paper. It is clear, as one member wrote, “AMS should strengthen inclusion of minorities and promote greater diversity.”

The aforementioned trends, in general, are similar to trends reported by the National Science Foundation. According to an NSF report (NCSES 2017), “underrepresented minorities are less likely than whites and Asians to graduate from high school, enroll in college, and earn a college degree.” The NSF report also suggests that Asians are more likely than whites and underrepresented minorities to earn a college degree in an S&E field.

A comprehensive multivariate analysis, however, suggests that race does not correlate with how welcome or included people feel, how they value AMS, their likelihood of having a Certified Broadcast Meteorologist (CBM) or Certified Consulting Meteorologist (CCM) seal, or their academic rank. Additionally, underrepresented minorities reported being more likely than white and Asian members to attend AMS conferences. All of this is encouraging and positive. It does reveal, however, that the Society needs to do more work to understand the reasons for its lack of progress in diversity.

PARTICIPATION OF LGBTIQA. National studies suggest that an estimated 3.5% of Americans identify as gay, lesbian, or bisexual. Of AMS survey respondents, 3.9% self-identified as gay or bisexual. Conversely, 86.5% identified as straight (0.5% identified as other and 8.9% declined to answer the question).

Sexual orientation was not found to play a significant role in any of the multivariate models

constructed for this study. Therefore, there was no difference found in the perception of values for dues, conference attendance, feelings of welcome and inclusion, academic rank, or personally holding AMS certifications, including CBM or CCM. The Society can feel encouraged by this finding.

PARTICIPATION OF MEMBERS WITH DISABILITY. In the general population, the Census Bureau estimates that nearly 56.7 million people—that is, nearly 19% of the overall population—have some form of disability (Brault 2012). Similar to the survey results in 1999, 3% of AMS members in the United States and abroad reported having a disability. This percentage is slightly greater compared to the 2005 survey (2%), but less than in the 1993 survey (4%). Similar to the 2005 survey, respondents were asked to provide information about specific kinds of disabilities that require accommodation (Table 3). Among individuals with a disability, more younger members (age 29 or younger) reported a learning disability, while more members age 70 or older reported a hearing or visual disability.

There are two factors that may be related to the changes in the members who report having a disability. One is the increased awareness of disability in general. A second reason may be the general aging of the U.S. workforce, including AMS membership. It is also worth pointing out that the notion of disability is not a static concept and is to a large extent socially constructed. For instance, it has been argued that disability is not a function of an individual, but a function of the affordances and accommodations that are generally available. If accommodations and acceptance grow, then self-reported disability may well decrease. For example, a person may prefer to think in terms of neurodiversity instead of learning disability, and widespread accommodations for restricted mobility may make someone less likely to consider their mobility impaired.

Several retired members of the AMS reported “health” and “age” as two factors that limit their par-

TABLE 2. Percentage of responses by ethnic background by survey year.						
	1975	1990	1993	1999	2005	2014
African American or Black	0.5	0.6	0.7	1.0	1.9	2.1
American Indian or Alaska Native	0.9	0.8	0.3	0.6	0.3	1.0
Hispanic or Latino	0.4	1.2	1.4	1.5	3.5	3.5
Asian	3.2	4.1	4.5	5.2	7.4	5.8
White	94.0	93.3	92.4	90.6	86.7	84.0
Other	1.8	0	0.6	1.0	0.2	1.9

ticipation in AMS meetings (both the Annual Meeting and others). As noted by one member, "I am almost 80 years old and have a bit of trouble getting around."

Members who reported having a disability were equally likely to attend AMS meetings (both the Annual and other AMS meetings) and felt included and welcome at AMS, although several suggestions were made on ways to make meetings more accessible, particularly for aging members. A retired member noted, "Last AMS conference I attended was when [I was] still working for AF (civilian) in Orlando, Florida. Couldn't believe they had no powered riders to rent. It tore me up. I'm much worse now. Difficult to travel or I would love to still go to January meetings even though I'm retired. Would love to be able to attend meeting online maybe?" Members who reported having a disability were more likely than others to indicate that they were satisfied with the value of services provided by AMS in exchange for annual dues.

SUMMARY. While AMS has made clear efforts to meet its commitment to broaden participation and increase diversity, there is still significant work to be done. One survey participant noted that, "AMS is still an older, white man's world. Big changes need to occur with diversity and catering to the younger generation to keep it viable." Another retired member of the AMS noted, "There is a certain 'sameness' about the Annual Meeting that makes it less desirable than it used to be. There is also a feeling of a 'good old boy' network that makes it hard to fit in if you're not part of it." A written testimony provided by the AMS to a National Research Council Report (2013) confirmed several barriers that may be shared by women or ethnic minorities. These include lack of role models, lack of support networks or community, challenges of work-life balance that seem to disproportionately affect women, tight budgets and declining grant opportunities, and the fact that "many minorities and particularly women are drawn into more educational, outreach, or service-related activities, which tend to provide less reward and advancement than traditional academic research." The ongoing underrepresentation of individuals from diverse groups in AMS represents the systematic biases

TABLE 3. Distribution of responses by disability by age.

	Hearing disability	Mobility Orthopedic Disability	Visual Disability	Learning Disability	No. of Respondents
	(per thousand)				
29 or younger	4	4	1	14	785
30–39	4	0	4	7	683
40–49	3	6	6	6	651
50–59	9	2	4	1	844
60–69	25	4	28	1	673
70 or older	74	5	50	0	379
Overall	15	3	12	5	4,015

and power differences in the broader society, many of which have probably crept into AMS.

AMS has a history of taking action on recommendations based on results of more than 40 years of data collection on its membership, including information on member demographics, education, and employment. The Society is taking a number of steps to create a more inclusive and diverse environment for the WWC professions. For example, based on recommendations made in a white paper by Behl and Durre (2015), the AMS has made great efforts to make AMS meetings more accessible. Through its boards and committees, the AMS Education and Human Resources Commission leads a number of initiatives to address inclusion and diversity in the WWC professions. These initiatives include several activities of the BWM, Board on Early Career Professionals, Charles Andersen Award Committee, and Louis J. Battan Awards Committee. Other opportunities for involvement include leading sessions, serving on committees, and organizing town halls and workshops at AMS meetings. The AMS Council recently approved the development of an ad-hoc task force to review inclusion and diversity across the AMS in a holistic manner and assess the integrated effectiveness of its broadening participation effort and define next steps. As one AMS survey participant stated, "Continued efforts and innovation are needed in understanding how to make our community more welcoming to persons of color, women, differently abled individuals, LGBTIQ, and diverse ages and income levels within AMS. I appreciate AMS's previous efforts but they must continue to push forward."

In that spirit of pushing forward, we encourage all AMS members to reflect on their experience in the

Society and on what AMS and its members can do to continue to accelerate the progress. An AMS that represents, reflects, and welcomes the full fabric of society is essential to its mission, vision, and ability to serve humanity with its science. Achieving this goal is a shared responsibility of all members, and everyone has contributions to make through individual actions and collective practices. Members or volunteers who would like to engage in various aspects of promoting inclusion, diversity, and equity in the WWC enterprise are encouraged to contact AMS BWM.

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FOR FURTHER READING

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AMS ABROAD

BENEFITS OF THE AMS–CMOS RELATIONSHIP

An Interview with CMOS President Martin L. Taillefer

As AMS approaches its centennial, one of the legacies of its first century and objectives of its second century is the cultivation of relationships with peer organizations around the globe. This can take several forms, including the formalization of Memoranda of Understanding (MoU) and greater collaboration on projects. For example, an MoU currently exists between AMS and the Canadian Meteorological and Oceanographic Society (CMOS), Australian Meteorological and Oceanographic Society (AMOS), Chinese Meteorological Society, and Indian Meteorological Society (IMS). In addition,

AMS and the European Meteorological Society (EMS) regularly send speakers and delegates to each other’s annual meetings. In the May issue of *BAMS*, AMS Abroad featured an interview of Tanja Cegnar, the head of media and communications at the EMS, with her impressions of the recent AMS Annual Meeting.

AMS members might wonder: what are the benefits of strengthened relationships with these peer organizations? To answer that question, the structure of each peer organization and details of each MoU need to be considered individually. Here, we will visit our neighbor to the north—CMOS.