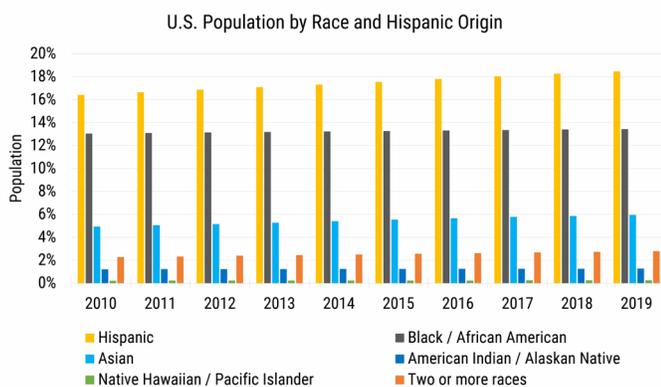


Diversity in the Geosciences

Whole population diversity

The U.S. Census Bureau publishes annual demographic data for the United States that can be used to establish whole population trends for women and minorities. We analyzed this dataset to understand whole population trends for gender, race, and ethnicity for individuals between the ages of 18 and 64 years old, as these individuals comprise most of the working population.

Between 2010 and 2019, women comprised 50% of those between 18 and 64 years old. Hispanics comprised the largest percentage of minorities in 2019 at 18.5%, and had the largest growth for all cohorts, with a 2.7% increase from 2010. Black and African Americans comprised 13.9% of those between the ages of 18 and 64 years old in 2019, followed by Asians (6.5%). Furthermore, American Indians and Alaskan Natives, and Native Hawaiians and Pacific Islanders comprised 1.3% and 0.3% of those between 18 and 64 years old, while those of two or more races comprised 2.3%. Between 2010 and 2019, the percentage of Whites in this age cohort declined from 78.4% to 75.8%.



Credit: AGI, data derived from the U.S. Census Bureau

Workforce diversity

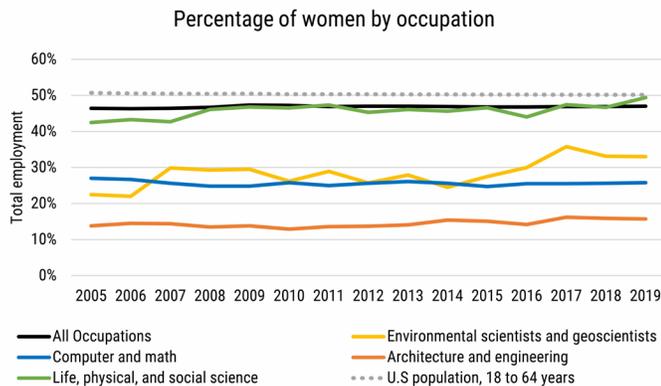
The Current Population Survey (CPS) dataset from the U.S. Bureau of Labor Statistics tracks race, ethnicity and gender by occupation and industry. This dataset only provides these demographic data if the occupation or industry has over 50,000 employed persons. Although the geoscience workforce in aggregate accounts for more than 400,000 employed persons, the profession spans many occupational categories that on their own do not meet threshold requirements for reporting of these demographic data. Of all geoscience-related occupational categories, the *environmental scientists and geoscientists* occupational category, which is the largest category representing one-fifth of employed geoscientists, does meet CPS demographic reporting thresholds.

We compared the *environmental scientists and geoscientists* occupational category to other broad science and engineering occupational categories and to U.S. whole population demographics to compare geoscience to other science and engineering occupations as well as to whole population demographics. By 2019, one third of those employed as *environmental scientists and geoscientists* were women, up from 22.5% in 2005. While the representation of women in this occupation lags *life, physical, and social science* as a whole, the rate of increase in participation within *environmental scientists and geoscientists* has outpaced other broad science and engineering occupational categories, with the majority of the increase occurring between 2014 and 2017.

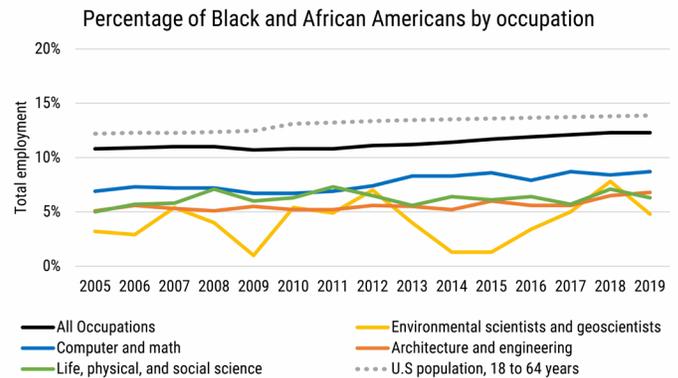
Participation of underrepresented minorities has long been an issue for science and engineering occupations, with participation rates well below that of whole population demographics as well as all occupational categories. Since 2007, the percentage of underrepresented minorities working in science and engineering occupations has ranged between 15% to 25% below that of whole population demographic trends with *environmental science and geoscience* occupations having the lowest participation rates.

It is important to note that underrepresented minority participation levels are measured as that of the non-White/Asian participation. Summation of the various individual race/ethnicity groups yields an overestimate as the ethnicity is independent of race. So a proportion of the Hispanic reporting individuals are reporting with a separate race, such as Black or African American or White.

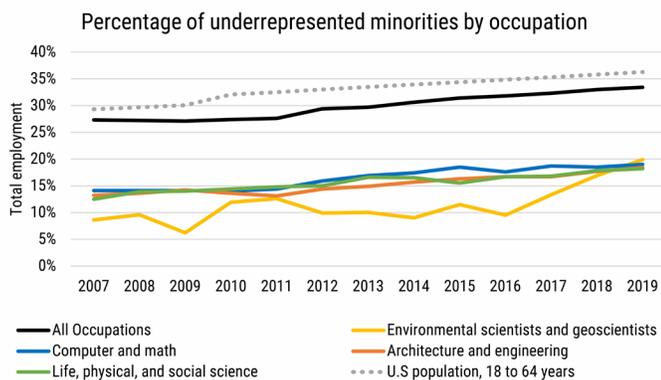
science and engineering occupations. This is primarily due to the increases seen between 2012 and 2015 and between 2017 and 2019.



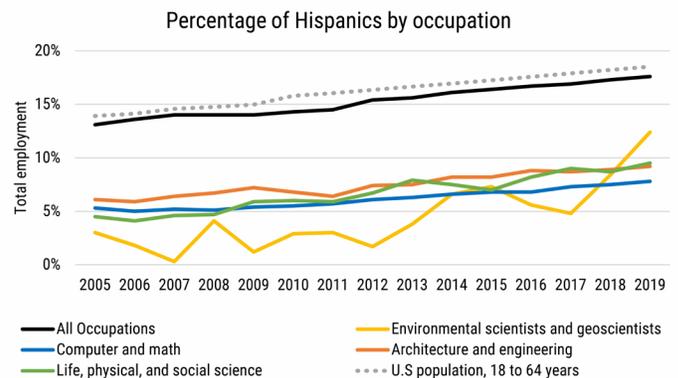
Credit: AGI, data derived from the U.S. Census Bureau and U.S. Bureau of Labor Statistics



Credit: AGI, data derived from the U.S. Census Bureau and U.S. Bureau of Labor Statistics



Credit: AGI, data derived from the U.S. Census Bureau and U.S. Bureau of Labor Statistics



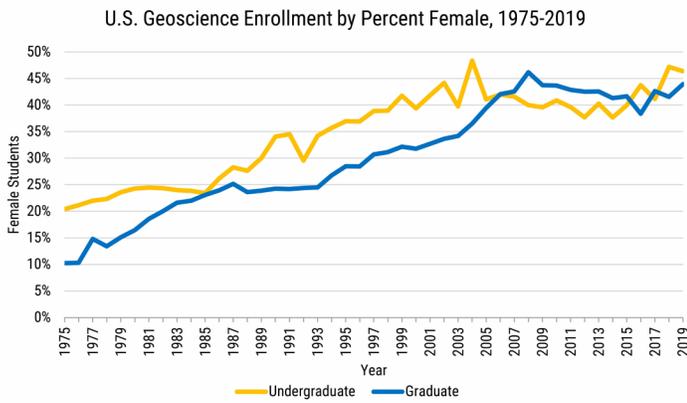
Credit: AGI, data derived from the U.S. Census Bureau and U.S. Bureau of Labor Statistics

The percentage of Black and African Americans working as environmental scientists and geoscientists fluctuated between 1% and 7.8% between 2005 and 2019, with the lowest participation rates occurring in 2009, 2014 and 2015, and the highest participation rates occurring in 2012 and 2018.

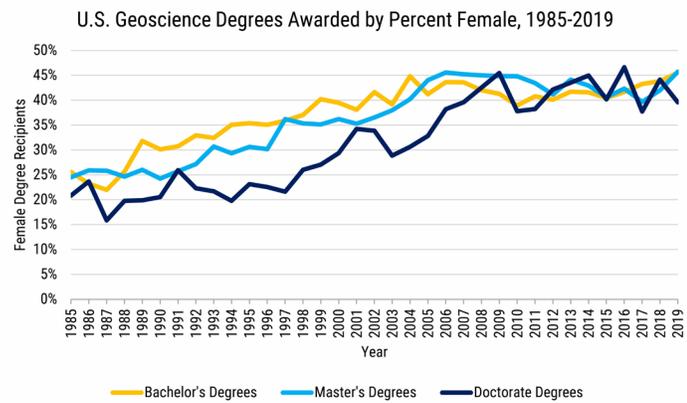
Diversity of geoscience graduates

To better understand occupational demographic trends, we first must examine the demographic trends in graduates of geoscience programs as well as their occupational pathways. AGI's Department of Geoscience Directories has provided a consistent source of data on degrees and enrollments by gender from the mid-1970's (enrollments) and mid-1980's (degrees). The participation of women in geoscience academic programs has steadily increased over this period, albeit with some fluctuations over time. In 2019, 44% of undergraduate geoscience students and 46% of graduate geoscience students were women. Furthermore, in 2019, 46% of geoscience bachelor and master's degrees and 40% of geoscience doctorates were conferred to women.

Participation rates of Hispanics in *environmental science and geoscience* occupations were consistently lower than other science and engineering occupations until 2019. The growth in participation in *environmental science and geoscience* occupations however has far outpaced other



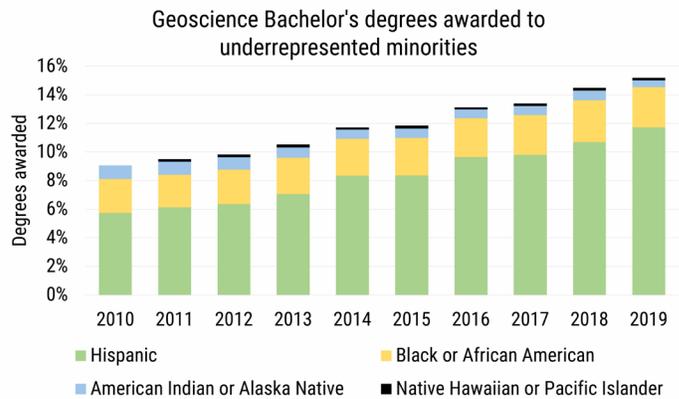
Credit: AGI, data from AGI's Directory of Geoscience Departments



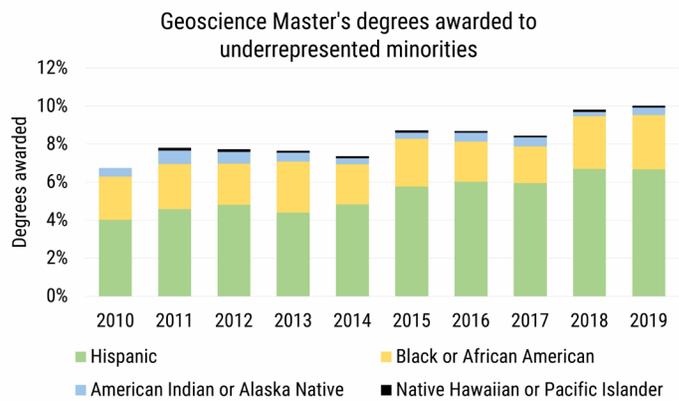
Credit: AGI, data from AGI's Directory of Geoscience Departments

To examine trends in minority participation in academic programs, we use data from the Department of Education IPEDS database which provides annual degree completion data by race and ethnicity. In 2019, underrepresented minorities earned 15.7% of geoscience bachelor's degrees, 10% of geoscience master's degrees, and 6.7% of geoscience doctorates.

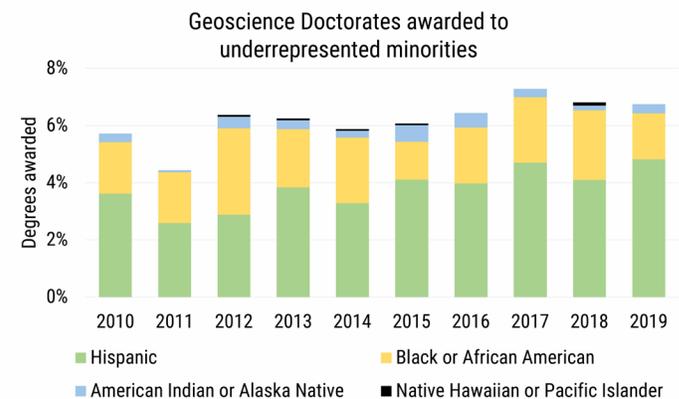
Between 2010 and 2019, the increase in the percentage of degrees conferred to underrepresented minorities was primarily due to the increased participation of Hispanics. From 2010 to 2019, the percentage of geoscience bachelor's degrees conferred to Hispanics increased from 5.7% to 11.7%, while the percentage of degrees conferred to other minorities remained relatively steady. Hispanics earned an increasing percentage of graduate degrees over this same period, but at a slower pace. The percentage of graduate degrees conferred to Hispanics between 2010 and 2019 increased from 4% to 6.7% for geoscience master's degrees and from 3.6% to 4.8% for geoscience doctorates.



Credit: AGI, data derived from IPEDS



Credit: AGI, data derived from IPEDS



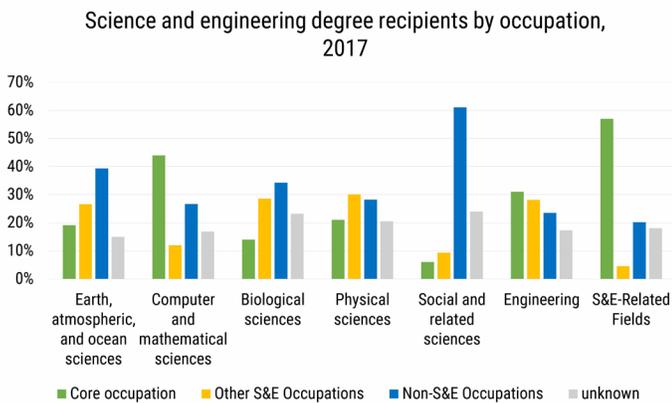
Credit: AGI, data derived from IPEDS

Graduation to occupation retention

In addition to recruitment and retention efforts at the university level to increase the participation of women and minorities in geoscience academic programs, there is also

the question of retention of geoscience graduates as they transition into the workforce. What percentage of graduates end up working within the profession? With data from the National Science Foundation's 2017 National Survey of College Graduates, we examined the occupations of science and engineering graduates and those of geoscience graduates to understand workforce retention rates.

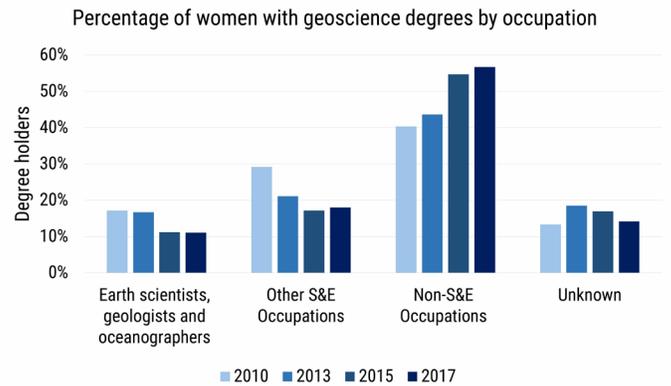
Within science and engineering disciplines, science and engineering related degrees and computer science and mathematics had the highest percentages of graduates working in core occupations (57% and 44%, respectively), while the social sciences had the highest percentage of graduates working in non-science and engineering occupations. The physical sciences had 21% of graduates working in core occupations (down from 25% in 2010), 30% working in other science and engineering fields, and 28% working in non-science and engineering occupations. In 2017, 19% of geoscience graduates worked in core occupations (down from 23% in 2010), 27% in other science and engineering occupations (down from 32% in 2010), and 39% in non-science and engineering disciplines (up from 31% in 2010).



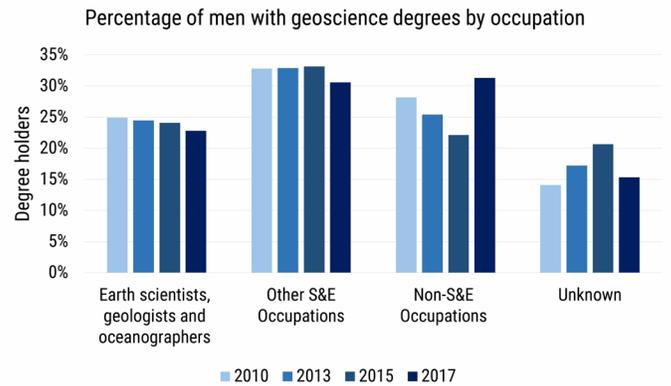
Credit: AGI, data derived from NSF National Survey of College Graduates

Since 2010, the percentage of women with geoscience degrees working as geoscientists declined from 17% to 11%, and those working within other science and engineering occupations declined from 29% to 18%. Over the same period, there was a slight decline in the percentage of men with geoscience degrees working in the profession and in other science and engineering occupations (25% to 23% and 33% to 31% respectively). Furthermore, since 2010, the percentage of women with geoscience degrees working in non-science and engineering occupations increased from 40% to 57%. This increase was driven by the increases in women with geoscience degrees working in sales and

marketing occupations in 2015 and 2017, and those working as non-science and engineering managers in 2017.



Credit: AGI, data derived from NSF National Survey of College Graduates



Credit: AGI, data derived from NSF National Survey of College Graduates

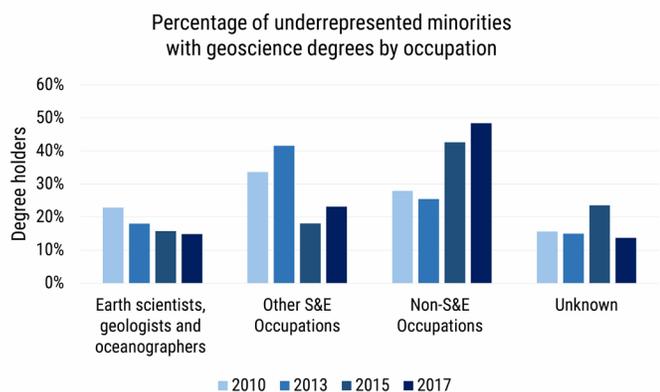
Since 2010, there has been a decrease in the percentage of minorities with geoscience degrees working as geoscientists (23% to 15%) as well as those working within other science and engineering occupations (34% to 23%). Over the same period, there has been a slight decrease in the percentage of non-minorities with geoscience degrees working in the profession and in other science and engineering occupations (23% to 19% and 32% to 27% respectively).

There has been a corresponding increase in the percentage of minorities with geoscience degrees working in non-science and engineering occupations, from 28% in 2010 to 48% in 2017. In 2017, 8% of minorities with geoscience degrees worked in arts and humanities occupations, 7% in sales and marketing, 7% in management and related occupations, and 23% in other non-science and engineering occupations. For non-minorities with geoscience degrees, the percentage of

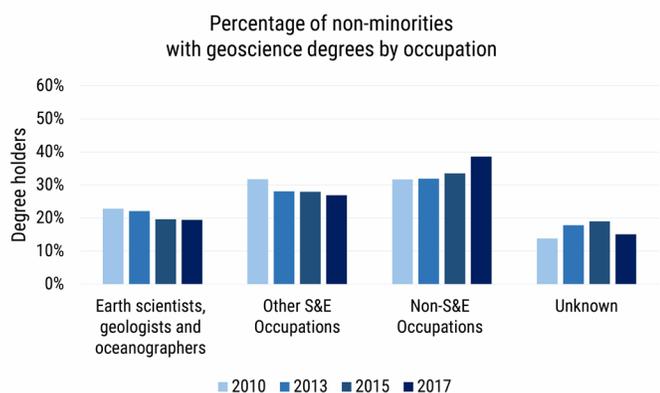
those working in non-science and engineering occupations increased from 32% to 39% over the same period.

Within the physical sciences, the percentage of minorities working in the same occupational field as their degree is on par for the geosciences. In chemistry, 15% of minorities with chemistry degrees worked as chemists in 2017, and 8% of minorities with physics degrees worked as physicists. However, the percentage of minorities working in non-science and engineering occupations was much lower than in the geosciences (29% for chemistry and 22% for physics).

This suggests retention issues within the academic to work-force pathway which is not only an issue for the geosciences itself, but also more broadly for all science and engineering professions. This may also signal the versatility of a geoscience degree in skillset transference to non-science and engineering occupations.



Credit: AGI, data derived from NSF National Survey of College Graduates



Credit: AGI, data derived from NSF National Survey of College Graduates