Pathways to Diversity and Inclusion in STEM: Challenges and Opportunities

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Diversity Data for the Geosciences

- Recent NSF statistics: Approximately 8% of graduate students are underrepresented (NSF 2018).

- Biological Sciences slightly higher percentage, 18%.

- Whole number comparison: 1303 total underrepresented Geoscience, 9520 in the Biological Sciences.
No progress on diversity in 40 years

Ethnic and racial diversity are extremely low among United States citizens and permanent residents who earned doctorates in earth, atmospheric and ocean sciences. Worse, there has been little to no improvement over the past four decades.

Rachel E. Bernard and Emily H. G. Cooperdock

Nature Geoscience

2018

Fig. 1 | PhDs earned by US citizens and permanent residents between 1973 and 2016. a, The total number of PhDs for all races, ethnicities and genders combined have fluctuated around 350 for the earth sciences, but have taken an upward turn from a stable base level in the last decade or so for ocean and atmospheric sciences. b, The largest race/ethnicity category by far is the White non-Hispanic PhD group. c, Focusing on what the NSF considers to be underrepresented minorities (that is, excluding White non-Hispanics and Asian non-Hispanics), and comparing with the increasing share of these groups in the US population (measured by decadal census and 2016 estimate), it becomes clear that gains in Hispanic or Latino PhDs largely reflect an increase in the relevant population in the US, and that there are no gains in PhDs earned among the other underrepresented groups. Data in a–c run from 1973 to 2016.
Low Student Diversity: Causes

- Lack of personal connection.

- Unclear understanding by students.

- Ineffective messaging and engagement, particularly at the early undergraduate stage.

- Historic overemphasis of certain fields (e.g., biomedical).
Opportunities for Improving DEI In Stem

- Messaging and Student Engagement
- Skill Development
- Diverse career options
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2020 SACNAS – The National Diversity in STEM Conference

*IS GOING VIRTUAL!*

New Dates: October 19 – 24
New Location: Online!

The largest multidisciplinary and multicultural STEM diversity event in the country, the SACNAS conference serves to equip, empower, and energize participants for their academic and professional paths in STEM.
SACNAS Geo-Futures

- Provides funding for students who have participated in Geoscience REUs or similar programs.
- Provides pre-conference preparation for students and mentors.
- Matches students up with Geoscience mentors at conference.
- Conference based sessions attached to Geo-Futures.
- Post-conference student support.
Monterey Bay Regional Ocean Science REU: Engaging Students in Diverse Research Activities

- Distributed REU Model
- California State University, Monterey Bay
- Elkhorn Slough National Estuarine Research Reserve
- Hopkins Marine Station of Stanford University
- Monterey Bay Aquarium Research Institute
- Moss Landing Marine Labs
- Naval Postgraduate School
- Focus on underrepresented students.
- Fall REU component.
Student Diversity

- 70 students in the program
- 3 Native American, 7 African American, 26 Hispanic/Chicano, 6 Pacific Islander, 25 Caucasian. (63% URM). 4 U.S. Veterans
- 38 students from research limited institutions (12 Community College Students).
- 13 Engineering, 16 Oceanography, 5 Geology, 36 Marine Biology/Ecology
- 3 NSF GRFP Awardees, 3 NOAA Hollings Scholars.
REU Student: Daniel DeLeon

- Worked with Dr. John Ryan and Danelle Cline of MBARI to engineer software to detect different species of whales.

- Used Google software as part of the process.

- Featured as part of a Google campaign to demonstrate how people use their software.

- Transferred to the Engineering program at Cal Poly San Luis Obispo after receiving Associates Degree from Cabrillo College.

- Graduate program in Fisheries at Oregon State University.
Funded by NOAA’s Educational Partnership Program (EPP).

Designed to increase the number and diversity of students who attend minority serving institutions and graduate with STEM degrees.

Four new centers established in 2016.

Each center awarded $15.5 million over five years.

Center for Earth Systems Science and Remote Sensing Technology

Center for Coastal and Marine Ecosystems*

Living Marine Systems Cooperative Science Center

Center for Atmospheric Sciences and Meteorology
NOAA Center for Coastal and Marine Ecosystems

- Train graduate and undergraduates in NOAA relevant science.
- Program designed to train a diverse future workforce for NOAA.
- Students and faculty engage in social science research as part of the program.
NOAA CCME Undergraduate Scholar: Olivia Boisen

- CSUMB Biology major.

- Researched the development of chemical sensors for ocean instrumentation.

- 2018 SACNAS student presentation award winner in Chemistry.

- First author publication as an undergraduate.

- Will enter graduate program in Fisheries Science at Oregon State University in Fall 2021.
NSF Geo-Bridge (Career Development)

- New NSF program to support gap year geoscience experiences.
- Targets recent undergraduates with no research or professional development experience.
- Students participate in our REU and NOAA CCME cohorts
- Fall participation in GeoFutures.
- Work with NOAA education to develop job apps for USA Jobs.
- Work with AGU Bridges to help students develop grad school applications.
DEI: Who to include?

- DEI can focus on more than just race, ethnicity and gender.

- Consider work with additional groups that are underrepresented in STEM.

- U.S. Veterans.

- Individuals with disabilities.

- LGBTQ+ groups.

- Consider broader societal impacts.

Ashaar Sanchez, USAF Veteran, CSUMB REU Alumna, M.Sc. Student Coastal Carolina University

Specializes in improving access to geoscience for those with disabilities.
Why DEI in STEM?

- Improves the diversity of those who engage in STEM.
- Helps bring new ideas and perspectives to our fields.
- Can result in new ways of conducting research.