INTRODUCTION
The geoscience community discussion on diversity, equity, and inclusion (DEI) most often focuses on increasing the participation of underrepresented groups based on race, ethnicity, and gender. Disability status is often overlooked, even though people with disabilities are underrepresented in the US STEM workforce by a factor of 3 compared to factors of 1.5 and 1.3 for women and underrepresented minorities, respectively (NCSES, 2023). The unemployment rate (the proportion of the workforce population that is unemployed but actively seeking work) is twice as high for people with disabilities as it is for those without a disability, according to the US Bureau of Labor Statistics (https://www.bls.gov/news.release/pdf/disabl.pdf).

Thus, there is an untapped pool of individuals who have unique perspectives and experiences to contribute to the STEM enterprise, including ocean science. Why? For many of the same reasons that individuals from other underrepresented groups have been, and continue to be, excluded: lack of supportive infrastructure and misperceptions. Here, we highlight some of the barriers to full inclusion for people with disabilities in ocean science. Although many of these barriers are not unique to ocean science, they are not often discussed within this community. We also provide some resources for students, educators, researchers, and employers to obtain further information. This is not meant to be a complete or exhaustive treatment of the subject—rather an opportunity to ensure that some of the challenges people with disabilities face as they navigate education and careers in ocean science are made more visible, while offering some solutions for breaking down these barriers.

EXAMPLES OF OBSTACLES FACED BY PEOPLE WITH DISABILITIES IN OCEAN SCIENCE
In this section, we summarize some of the challenges individuals with disabilities must overcome to pursue an education or career in ocean science. Some of them may seem minor in isolation, but as is often discussed in DEI, the accumulation of multiple micro-inequities leads to a feeling of exclusion. Most of the inequities are also experienced by people with disabilities in other STEM disciplines, although there are some issues related to fieldwork that are unique to oceanography.

PHYSICAL ACCESS
It's not just about getting in the building: in the United States, physical access to classrooms, laboratories, office spaces, and meeting rooms are essential and are required by law under the Americans with Disabilities Act (ADA). However, too often access is only possible through a back door or via a sketchy freight elevator, potentially leaving the people seeking access with feelings of second-class citizenship at their institutions. Sometimes there is reluctance to retrofit a building to provide access through the front entrance that everyone else uses, and where chance meetings can lead to information exchange and new collaborations. Institutions can demonstrate that they value their employees with disabilities by providing equitable access to buildings and other institutional spaces. Adjustable-height lab benches and computer desks represent good universal design and can benefit everyone, not just individuals with disabilities.

FIELDWORK
Many ocean scientists carry out their research at sea on vessels of varying size, age, and capability. Until fairly recently, it would be unheard of for people with disabilities to consider going to sea on a research cruise due to the challenges of mobility and safety on a moving platform. This is changing. In 2008, the US National Science Foundation (NSF) asked the University National Oceanographic Laboratory System (UNOLS) Fleet Improvement Committee to generate guidelines for design and retrofit of the academic fleet in order to make seagoing education and research more accessible to students and scientists with disabilities. ADA compliance is not strictly required because research ships are not classified as passenger vessels by the US Coast Guard; however, NSF recognized the importance of making the fleet as accessible as possible to individuals with disabilities to support full participation in ocean science. Many of the...
recommendations of the final report (fourth listing in Additional Resources) also follow good universal design practices. For example, recessed thresholds between compartments make passageways accessible to the mobility-challenged and make movement of heavy equipment through and between compartments easier. Better lighting and open line-of-sight improve visibility and communication for visually- and hearing-impaired cruise participants, and everyone else. Continuous handrails and well-marked steps on ladders improve safe movement between decks for all. The ocean sciences community can learn more about accessible field work from the geology community, which has had an active discussion on increasing participation of people with disabilities in fieldwork in recent years, including capitalizing on virtual participation and high-quality telepresence (e.g., Marshall and Thatcher, 2019).

PERCEPTIONS AND STIGMA

Individuals with disabilities in STEM face many of the same challenges related to misconceptions as other historically excluded groups. They may be considered as less intelligent and less capable than their peers based solely on their disability status (“ableism”). As super-minorities in STEM, with very few role models or visible examples of successful ocean scientists with disabilities, students with disabilities may internalize ableism and choose not to pursue a career in ocean science. Some disabilities are not obvious to the casual observer—individuals with disabilities may try to hide their disability for fear of being judged unfairly or rejected. This stigma can prevent people with disabilities from requesting accommodations that they are entitled to and that their employers are, in fact, required to provide, even though employers make accommodations for non-disabled employees all the time for multiple reasons (e.g., flexible work hours, extended tenure clock, parental leave). To overcome this reluctance, employers need to go beyond the standard anti-discrimination statements in job announcements and openly advertise their willingness to make accommodations for people with disabilities. Many employers perceive that accommodations for employees with disabilities will be cost-prohibitive, but this is rarely the case. Institution leaders, funding agencies, human resources departments, mentors, professors, and peers all need to demonstrate that they value people with disabilities in their workplaces by proactively providing support and encouragement that goes beyond compliance.

CONCLUSIONS

The barriers to real equity and inclusion for people with disabilities in ocean science are many, but tangible solutions are in fact available for most. In the mid-twentieth century, full participation of women in STEM was largely unimaginable, but over the ensuing decades, policies, and infrastructure (e.g., parental leave programs; affordable, high-quality childcare) and attitudinal and behavioral shifts (shared family responsibilities, greater recognition of accomplishments of women scientists) have moved the needle significantly toward greater meaningful participation of women in science. With a collective community commitment to openly supporting and encouraging people with disabilities in ocean science—moving from compliance to true inclusion—we can achieve the same success. An important first step is to document the level of underrepresentation in ocean science by people with disabilities. Additionally, people with disabilities must always be included in the development of new policies and practices, in the spirit of the well-known disabilities activism phrase “nothing about us without us.”

ADDITIONAL RESOURCES

INTERNATIONAL ASSOCIATION FOR GEOSCIENCE DIVERSITY
A 501c3 nonprofit dedicated to improving access and inclusion for people with disabilities in the geosciences (https://theiagd.org/)

JOB ACCOMMODATION NETWORK
The leading source of free, expert, and confidential guidance on workplace accommodations and disability employment issues (https://askjan.org/)

EMPLOYER ASSISTANCE AND RESOURCE NETWORK (EARN)
A source of information and resources to help employers recruit, hire, retain and advance people with disabilities; build inclusive workplace cultures; and meet diversity, equity, inclusion, and accessibility goals (https://askearn.org)

NSF FACILITATION AWARDS FOR SCIENTISTS AND ENGINEERS WITH DISABILITIES (FASED)
(https://new.nsf.gov/policies/pappg/23.1)

UNIVERSITY OF WASHINGTON DISABILITY, OPPORTUNITY, INTERNETWORKING, TECHNOLOGY (DO-IT) CENTER
A center that “promotes awareness and accessibility—in both the classroom and the workplace—to maximize the potential of individuals with disabilities and make our communities more vibrant, diverse, and inclusive” (https://www.washington.edu/doi)

US DEPARTMENT OF LABOR ON DIVERSITY AND INCLUSION
With respect to people with disabilities (https://www.dol.gov/agencies/odep/program-areas/employers/diversity-inclusion)

DISRUPTING ABLISM AND ADVANCING STEM
A National Leadership Summit that took place in June 2023 (National Academies of Sciences, Engineering and Medicine): “This virtual session focused on the important role of education in preparing students with disabilities as they enter the STEM ecosystem.” Videos and meeting materials are available on the summit web pages. (https://mailchi.mp/nas.edu/bhew-disrupting-ableism-and-advancing-stem-recordings?e=2fbee9f96)

ADA GUIDELINES FOR UNOLS RESEARCH VESSELS

REFERENCES

ACKNOWLEDGMENTS
David Fisichella (Woods Hole Oceanographic Institution) is gratefully acknowledged for helpful comments on a draft of this paper. Walter Berry is also gratefully acknowledged for comments. The authors all have lived experience as professionals with disabilities in STEM.

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ARTICLE DOI. https://doi.org/10.5670/oceanog.2024.106