NEXTGEN VOICES

Making science accessible

To mark the 30th anniversary of the Americans with Disabilities Act, we asked young scientists this question: **What one thing would you change about the training or careers in your field to improve accessibility for people with visible and/or invisible disabilities?** A selection of their responses is below. Follow NextGen Voices on Twitter with hashtag #NextGenSci. Read previous NextGen Voices survey results at https://science.sciencemag.org/collection/nextgen-voices.

Provide logistical support

Because I have dyslexia, I use read-out-loud software, but it is not well suited to journal articles with citations. Listening to citations makes keeping track of the paper difficult and can add hours of reading time. Some expensive software allows you to select what to read, but it can take days to mark the citations and is impractical when reading many journal articles. A tool that allows the listener to skip the citations would help.

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Movies have subtitles for a reason. People might be hearing impaired or easily distracted, have trouble deciphering accents, or understand written information better. Speech-to-text technology, which enables instructors to instantly provide written versions of their lecture materials, should be used in real time during classroom discussions. Alternatively, written summaries prepared beforehand should accompany visual and oral presentations. This would allow learners to read the material as explained by the professor, rather than a textbook, multiple times for stronger comprehension.

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Wet labs are designed for people with no physical challenges. Many of us who could contribute to science have difficulties not with the techniques or knowledge but rather with the need to spend hours sitting on a lab stool. Adjustable benches and equipment would improve accessibility and the wet lab experience for all scientists.

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Many fields of medicine require physicians to work on call for more than 24 hours. Although this serves as important experience, students with disabilities may find it prohibitively challenging to work so many consecutive hours. A reduction in required on-call hours would allow students with and without disabilities to thrive in their training. Students pursuing specialties with extended-call commitments could elect to gain this exposure.

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Despite being the most popular event at scientific conferences, poster sessions are probably the least accessible. As someone who struggles with low vision, I find poster sessions frustrating. Most posters have unreadable fonts, unclear images, and poor color contrast. Conference organizers should encourage poster presenters to make a 2-minute video summary of their work. The video and the presenter's contact information could then be accessed by scanning a QR code. These QR codes would help build camaraderie among researchers; unlike business cards, conference goers would have details of the presenters together with their presentations.

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In physical anthropology, the majority of assessments of ancestry, sex, and age of a skeleton are based on morphological features. However, only a limited number of models are provided to demonstrate the differences. The inclusion of 3D models with differing variations of features would be helpful to every student, not just the ones who are differently abled. I believe it would bridge the divide between recently graduated students and experienced practitioners, allowing for greater mentorship of other technical aspects of the work.

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Having a disability can be very expensive. In addition to costs such as out-of-pocket fees for therapy, people with mobility impairments may pay more for rent, as accessible apartments tend to be more expensive, or more for food because of specific dietary needs. These higher costs contribute to a higher risk of poverty for people with disabilities. Therefore, increasing pay for Ph.D. students would make it more likely that students with a disability—as well as students from

ILLUSTRATION: ROBERT NEUBECKER

disadvantaged backgrounds—could pursue a scientific career.

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Much of the scientific work in the field of chemistry depends on colors. For those who are color blind, the use of techniques such as acid-base titrations or spectroscopy presents a challenge. Technology could help. If an app could analyze a smartphone camera photo and correct different types of color blindness by converting the colors into decipherable patterns, it could be used not only in the lab but also to convert figures in textbooks and papers into more accessible images.

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Hearing impairment affects a sizeable minority of world inhabitants. To better welcome all scientists, we must incorporate sign-language translation and closed-captioning services in scientific meetings and conferences. Computer technologies are advancing, and machine translation services are now available at a fraction of their former cost. This simple modification could have a lasting impact on the progression of science through inclusion.

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Foster inclusive community

When onboarding a new member, the research group leader should affirm the entire group's commitment to accommodating anyone with a disability. Affirming this commitment to every new member ensures people with invisible disabilities are not unintentionally ignored, empowers people with a disability to disclose information and request accommodations, and sets clear expectations for those without disabilities to make accommodation requests a priority. Having this conversation during onboarding also helps form a community that is supportive of people with disabilities and in turn benefits from their unique perspectives.

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As a researcher with cerebral palsy, I know first-hand the fear that comes with applying for a job when you have a disability. Will department leaders be willing to make accommodations, and will they worry that hiring me will affect productivity? Academia needs to avoid direct comparison between researchers with and without disabilities. The academic paths of researchers with disabilities may differ, for example, because of prolonged stays in hospitals or numerous surgeries and rehabilitations. However, these "hardships" make us better researchers: They push us to develop excellent organizational skills, creativity, stress resilience, emotional intelligence, and grit. Students in STEM fields need role models in the form of lecturers or professors with disabilities. They need to see that it can be done and that universities and departments are inclusive in reality and not only on paper.

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In my field of astronaut training and operations, it is clear that humans sometimes need equipment to thrive in their environment. Just as an astronaut needs specialized technology to survive in space and a diver needs scuba gear to survive in water, people with disabilities benefit from access to the right tools. Technology, whether a brain-controlled exoskeleton, artificial limbs, or a computer-generated voice, allows us to overcome environmental challenges and transform into superhumans. If more people understood this concept, more individuals with disabilities would be involved in scientific fields.

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In graduate school, mental health is often put on the back burner. Encouraging more discussions about and providing more institutional support for mental health would foster a more welcoming and accepting environment. It would also allow all graduate students the opportunity to develop a better work-life balance and become more productive scientists.

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The shame and stigma of disabilities caused by depression and post-traumatic stress disorder prevent the people who have them from asking for help. Breaking this barrier would be easier if colleagues and especially principal investigators and group leaders were trained to identify the signs and reach out to ensure their support. Building the basic bridge of trust and safety is the most important first step in accessing people with hidden disabilities. Supervisors should be trained to create and communicate a safe, kind environment and to access further resources for help.

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Facilitating accessible learning spaces for students with invisible disabilities poses unique challenges, since neither student nor instructor is initially aware of the other's condition. Moreover, some invisible diagnoses, such as autism spectrum disorder (ASD), carry a degree of social stigma. If they feel comfortable doing so, I believe it would be valuable for course instructors and graduate mentors affected by ASD to acknowledge this fact to their students. This would make it easier for students to open up about their own invisible challenges and reduce both perceived and actual stigmatization.

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We need to change the narrative to value the experience of overcoming adversity rather than viewing those who have overcome challenges as inferior or damaged. I'd love to see a seminar series where established principal investigators could openly discuss the challenges they faced and how they overcame those challenges. This would increase representation and a sense of belonging among people with invisible disabilities who might not otherwise know who else is out there. It would also reduce stereotyping from able scientists.

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