Students in the University of Washington's "DO-IT" Scholars program discuss data with an instructor.

Edited by **Jennifer Sills**

Disability inclusion enhances science

The Americans with Disabilities Act (ADA)—a landmark piece of legislation for the support of people with disabilities—turns 30 next year (*1*). As the ADA has aged, the culture around disabilities has grown, revealing that much more can be done. Legislation is helpful, but improvements don't have to come from the top.

Nearly a quarter of Americans live with a disability, yet individuals with disabilities comprise just 17% of the entire American workforce (*2*), 9% of the scientific workforce, and a mere 7% of PhD-holders employed in science (*3*). Barriers to science, technology, engineering, and mathematics (STEM) careers among people with disabilities include the lack of proper instruction, insufficient access to facilities and instruments, and not being accepted by peers (*4*). Students with disabilities report that only two-thirds of course instructors help them engage in lab tasks and that there are no accommodations in half of the labs they enter (*5*), creating missed opportunities to gain the skills necessary for careers in STEM research.

Many world-renowned scientists, past and present, have built successful STEM careers while managing a disability [e.g., (*6*)]. Still, if the average principal investigator were to assess whether his or her research lab is prepared to accommodate a new member with a disability, the answer most likely would be: "I have no idea." The vast range of disabilities—including those with outward characteristics and those that are invisible—makes the necessary accommodations diverse. Fortunately, there is help, such as that offered by the DO-IT program at the University of Washington (*7*). DO-IT works with groups worldwide to create laboratory accommodations, including bringing Universal Design into the lab environment.

Universal Design principles create accommodations for everybody. Many of us enjoy Universal Design every day in the form of curb cuts—ramps that bring sidewalks down to street level—which are helpful for those walking unassisted as well as those using walkers or wheelchairs, pushing baby strollers or pulling rolling carts, or riding bikes or scooters. Translated to the lab, Universal Design takes the form of adjustable height workstations, wider doors and gaps between workstations, easily accessible lab supplies and safety equipment, touch screens, and closed captioning (*8*). As this list attests, everyone benefits, even if they just differ in height. Feeling the need to explain one's disability or limitation can be upsetting, and communicating it can be challenging, causing individuals to avoid certain social interactions and activities. Turning labs into more accessible work environments increases awareness among existing lab members, and an accommodative culture can become the new norm, reducing the social barriers that individuals with disabilities face in STEM environments.

Increasing recruitment of individuals with disabilities in STEM will markedly improve the business of science. It will draw in brilliant minds that previously shied away, foster specialization that pushes fields along faster than ever before, and create the collaborative atmosphere necessary to tackle the biggest challenges facing our planet. Disability inclusion may seem daunting because of financial, logistical, and safety concerns; however, increasing disability representation can start with simple changes like implementing Universal Design principles, engaging with university disability specialists, and embracing an inclusive mind-set, to the benefit of this marginalized group and to our society and planet as a whole.

Aaron C. Hartmann
Department of Organismic and Evolutionary Biology, Harvard University, Cambridge, MA 02138, USA. Email: aaron.hartmann@gmail.com

REFERENCES AND NOTES

1. Americans with Disabilities Act of 1990, as Amended (2009); www.ada.gov/pubs/adastatute08.htm.
2. D. M. Taylor, "Americans with disabilities: 2014," U.S. Department of Commerce, Economics, and Statistics Administration, U.S. Census Bureau, Report P70–P152 (2018).
3. National Science Foundation (NSF), "Women, minorities, and persons with disabilities in science and engineering," Special Report NSF 19–304 (National Center for Science and Engineering Statistics, Arlington, Virginia, 2019); www.nsf.gov/statistics/wmpd/.
4. S. Burgstahler, *Inform. Technol. Disability* **1**, 4 (1994).
5. H. Jeannis, M. Goldberg, K. Seelman, M. Schmeler, R. A. Cooper, *Disability Rehabil. Assistive Technol*. 10.1080/17483107.2018.1559889 (2019).
6. J. Rossen, "12 disabled scientists who made the world a better place," Mental Floss (2016); http://mentalfloss.com/article/87068/12-disabled-scientists-who-made-world-better-place.
7. DO-IT Program, University of Washington (www.washington.edu/doit/).
8. S. Burgstahler, "Universal Design in postsecondary education: Process, principles, and applications" (DO-IT Program, 2008); www.washington.edu/doit/universal-design-postsecondary-education-process-principles-and-applications.

10.1126/science.aaz0271

Climate concerns and the disabled community

Climate change and the loss of ecosystem services are likely to disproportionately affect the world's disabled populations by accentuating inequalities and increasing marginalization of the most vulnerable members of society (*1*, *2*). Disabled populations may experience a limited access to knowledge, resources, and services to effectively respond to environmental change (*3*). Compromised health may make people more vulnerable to extreme climate events, ecosystem services loss, or infectious disease exposure (*4*), and those with disabilities are more likely to have difficulties during required evacuations or migrations (*5*, *6*). For example, Hurricane Katrina was found to disproportionately impact 155,000 people with disabilities ranging from visual and physical impairments to learning disabilities (*7*). The international research community has made good progress at including vulnerable groups such as poor communities, women, indigenous people, and youth in recent international conversations about global environmental change (*8*, *9*), but disabled populations have been mostly absent from the conversation.

In a positive step this past July, the United Nations Human Rights Council adopted a resolution calling on governments to adopt a disability-inclusive approach to addressing climate change (*10*, *11*). However, more needs to be done at the international level. Two leading international bodies assessing the knowledge and impacts of climate change and the loss of ecosystem services—the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)—have, thus far, done little to address the critical implications of climate change and biodiversity loss for disabled populations (*8*, *12*). Global environmental change should be considered a disability rights issue. The formation of dedicated task forces within IPCC and IPBES will be critical for increasing research and including persons with disabilities in the conversation around climate resilience to better tackle this pressing global challenge.

Aleksandra Kosanic[1]*, Jan Petzold[2], Amy Dunham[3], Mialy Razanajatovo[1]
[1]Department of Biology, Ecology, University of Konstanz, Konstanz, Baden-Württemberg, 78457, Germany. [2]Center for Earth System Research and Sustainability (CEN), Universität Hamburg, 20146 Hamburg, Germany. [3]Department of BioSciences, Rice University, Houston, TX 77251, USA.
*Corresponding author.
Email: sasa.kosanic@gmail.com

REFERENCE AND NOTES

1. D. Attenborough, *Nature* **573**, 463 (2019).
2. C. Bellard, C. Bertelsmeier, P. Leadley, W. Thuiller, F. Courchamp, *Ecol. Lett.* **15**, 365 (2012).
3. L. Hemingway, M. Priestley, *Rev. Disabil. Stud. Intl. J.* **2**, 1 (2006).
4. N. Watts *et al.*, *Lancet* **392**, 2479 (2018).
5. J. Twigg, E. Cole, M. Kett, M. Simard, F. Smith, *Disability and Climate Resilience. A Literature Review* (University College London, 2017).
6. D. M. Perry, "Disability and disaster response in the age of climate change," *Pacific Standard* (2017); https://psmag.com/environment/fixing-americas-disability-disaster-response.
7. G. Wolbring, A culture of neglect: Climate discourse and disabled people. *M/C J.* **12**, 1 (2009).
8. IPCC, "Summary for Policymakers," in *Global Warming of 1.5°C: An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, V. Masson-Delmotte *et al.*, Eds. (2018).
9. J. D. Ford *et al.*, *Nat. Clim. Change* **6**, 349 (2016).
10. United Nations, "General Assembly Resolution hrc41, Climate Change and Disability A/HRC/41/L.24." (United Nations, New York, 2019).
11. United Nations, "Disability and development report—Realizing the Sustainable Development Goals by, for and with persons with disabilities" (United Nations, New York, 2019).
12. H. T. Ngo *et al.*, "The draft Chapter 1 of the IPBES Global Assessment on Biodiversity and Ecosystem Services" (IPBES, 2019).

10.1126/science.aaz9045

Collaboration across boundaries in the Amazon

Amidst increasing global concerns over the recent Amazon fires and escalating deforestation in the region (D. Arruda *et al.*, "Amazon fires threaten Brazil's agribusiness," Letters, 27 September, p. 1387), the signing of the Leticia Pact for the Amazon Region on 6 September by Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, and Suriname represents a crucial step toward more effectively and collaboratively tackling the major environmental challenges facing the Amazon (*1*). The Amazon holds over half of Earth's rainforests and a quarter of the planet's terrestrial biodiversity (*2*). Amazon deforestation and related fires have wide-ranging negative impacts that cross political boundaries, including major loss of biodiversity and ecosystem functions (*3*), spread of disease (*4*–*6*), loss of sustainable agribusiness and tourism opportunities (Arruda *et al.*), threats to water security (*7*), and suspension of climate regulation (*8*). Many of these impacts cross international boundaries and pose threats to humans and nature across vast regions (*9*).

The Leticia Pact offers an opportunity to ensure that the responsibility of protecting the Amazon forest and its sustainable resource use is shared among Amazon countries. Cross-boundary collaboration has economic, socio-political, and environmental advantages, substantially reducing conservation costs (*10*). However, to go beyond declarations of intent, the Leticia Pact urgently requires binding targets, resources, and measurable, well-defined actions and milestones (*11*).

As ecologists specializing in Amazon forest and cross-boundary collaboration, we therefore call for the pact's member nations to commit to these goals: Set joint targets for reducing deforestation and maintaining forest cover over 80% in all Amazon countries to avoid reaching an ecological tipping point (*12*); promote environmentally sustainable markets—for example, provide payments for essential ecosystem services and cross-boundary initiatives that both benefit local people and retain native forests; build joint management plans for coordinated surveillance, restoration, and transboundary protected areas; enhance rapid response programs and free movement of environmental, health, and education organizations across borders; foster cross-boundary collaborative research; and finally, promote actions for guaranteeing Indigenous people's land rights across the Amazon.

In the current political climate, strengthening cross-boundary collaboration by translating the Leticia pledge from declarations to actions is a crucial step toward addressing the escalating environmental crisis and its global impacts, enhancing responsible and sustainable resource use across all Amazon countries.

Paula Ribeiro Prist[1]*, Noam Levin[2,3], Jean Paul Metzger[1], Kaline de Mello[1], Micheli Duarte de Paula Costa[4,5], Romi Castagnino[6], Javier Cortes-Ramirez[7],

Da-Li Lin[5,8], Nathalie Butt[9], Thomas J. Lloyd[9], Sofía López-Cubillos[9], Helen J. Mayfield[5], Pablo José Negret[9], Isabella Oliveira-Bevan[10], April E. Reside[9], Jonathan R. Rhodes[9], B. Alexander Simmons[9,11], A. Felipe Suárez-Castro[9], Salit Kark[6]

[1]Department of Ecology, Institute of Bioscience, University of São Paulo, São Paulo, 05508-090 SP, Brazil. [2]Department of Geography, The Hebrew University of Jerusalem, Mount Scopus, 91905 Jerusalem, Israel. [3]Remote Sensing Research Centre, School of Earth and Environmental Sciences, University of Queensland, Brisbane, QLD 4072, Australia. [4]Centre for Integrative Ecology, School of Life and Environmental Sciences, Deakin University, Burwood, VIC 3125, Australia. [5]School of Biological Sciences, University of Queensland, Brisbane, QLD 4072, Australia. [6]The Biodiversity Research Group, Centre for Biodiversity and Conservation Science, School of Biological Sciences, University of Queensland, Brisbane, QLD 4072, Australia. [7]School of Public Health, The University of Queensland, Herston, QLD 4006, Australia. [8]Endemic Species Research Institute, Council of Agriculture, Jiji 55244, Nantou, Taiwan. [9]Centre for Biodiversity and Conservation Science, School of Earth and Environmental Sciences, University of Queensland, Brisbane, QLD 4072, Australia. [10]School of Public Health and Community Medicine, University of New South Wales, Sydney, NSW 2033, Australia. [11]Institute for Future Environments, Queensland University of Technology, Brisbane, QLD 4000, Australia.
*Corresponding author. Email: pprist@hotmail.com

REFERENCES AND NOTES

1. "Leticia pact for the Amazon region" (2019); https://id.presidencia.gov.co/Documents/190906-Pacto-Leticia-Amazonia-Ingles.pdf.
2. R. Dirzo, P. H. Raven, *Annu. Rev. Environ. Resour*. **28**, 317 (2003).
3. IPBES, "The IPBES regional assessment report on biodiversity and ecosystem services for the Americas," J. Rice, C. S. Seixas, M. E. Zaccagnini, M. Bedoya-Gaitán, N. Valderrama, Eds. (Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany, 2018).
4. T. Pienkowski, B. L. Dickens, H. Sun, L. R. Carrasco, *Lancet Planet Health* **1**, e180 (2017).
5. L. S. M. Chaves, J. E. Conn, R. V. M. López, M. A. M. Sallum, *Sci. Rep*. **8**, 7077 (2018).
6. P. R. Prist, M. Uriarte, K. Fernandes, J. P. Metzger, *PLOS Neglect. Trop. Dis*. **11**, e0005705 (2017).
7. E. Bélanger *et al*., *Appl. Geochem*. **87**, 136 (2017).
8. T. C. A. Sumila, G. F. Pires, V. C. Fontes, M. H. Costa, *J. Hydrometeorol*. **18**, 1643 (2017).
9. C. L. Reddington *et al*., *Nat. Geosci*. **8**, 768 (2015).
10. S. Kark *et al*., *Curr. Opin. Environ. Sustain*. **12**, 12 (2015).
11. Take action to stop the Amazon burning, *Nature* **573**, 163 (2019).
12. T. E. Lovejoy, C. Nobre, *Sci. Adv*. **4**, eaat2340 (2018).

10.1126/science.aaz7489

TECHNICAL COMMENT ABSTRACTS

Comment on "Protein assemblies ejected directly from native membranes yield complexes for mass spectrometry"

Judy Hirst, Edmund R. S. Kunji, John E. Walker

Chorev *et al*. (Reports, 16 November 2018, p. 829) describe mass spectrometry on mitochondrial membrane proteins ionized directly from their native environment. However, the assignments made to measured masses are incorrect or inconclusive, and they lack experimental validation. The proteins are not in their "native" condition: They have been stripped of tightly bound lipids, and the complexes are fragmented or in physiologically irrelevant oligomeric states.

Full text: dx.doi.org/10.1126/science.aaw9830

Response to Comment on "Protein assemblies ejected directly from native membranes yield complexes for mass spectrometry"

Dror S. Chorev and Carol V. Robinson

Hirst *et al*. claim that proteins ejected directly from mitochondrial membranes in our study are degraded, are incorrectly assigned, lack lipids, and show discrepancies with "native states" mostly obtained in detergent micelles. Here, we add further evidence in full support of our assignments and show that all complexes are either ejected intact or in known intermediate states, with core subunit interactions maintained. None are degraded or rearranged.

Full text: dx.doi.org/10.1126/science.aax3102

Disability inclusion enhances science

Aaron C. Hartmann

Science **366** (6466), 698.
DOI: 10.1126/science.aaz0271

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. The title *Science* is a registered trademark of AAAS.