

# Making a Place for the Next Generation of Geoscientists

Early-career scientists from the AGU Mentoring Network discuss how the global pandemic has exacerbated long-standing issues with the availability of positions in and the diversity of the geosciences.



Credit: iStock.com/Nattakorn Maneerat

By Miling Li, Nicholas A. Sutfin, Margaret Christie, Maheshwari Neelam, and James A. Bradley © 6 November 2020

The COVID-19 pandemic has drastically slowed productivity and progress for many researchers and academics. Negative impacts have affected early-career scientists and underrepresented groups disproportionately and may be long lasting [*Maas et al.* (<https://doi.org/10.1038/s41559-020-1233-3>), 2020].

This is particularly true in the Earth sciences, where diversity has made only small strides since the 1970s (<https://eos.org/opinions/raising-our-voices-for-diversity-in-the-geosciences>) [*Bernard and Cooperdock* (<https://doi.org/10.1038/s41561-018-0116-6>), 2018].

As AGU Mentoring Network early-career mentees, we draw from our own experiences to reflect on how the pandemic is exacerbating systemic issues faced by early-career scientists.

The current upheaval is an opportunity to implement changes that can create more inclusive and diverse academic environments while also supporting the needs of early-career scientists. As AGU Mentoring Network (<https://www.agu.org/Learn-and-Develop/Learn/Mentoring-Programs/MentoringNetwork>), early-career mentees, we draw from our own experiences to reflect on how the pandemic is exacerbating systemic issues faced by early-career scientists in the Earth sciences. We offer recommendations to address three challenges: availability of permanent research job opportunities, support for early-career scientists, and diversity in the Earth sciences. (<https://eos.org/agu-news/why-diversity-matters-to-agu>).

## Relaxing the Strained Geoscience Job Market

The pandemic is triggering freezes in tenure-track faculty positions (<https://www.nature.com/articles/d41586-020-01656-3>). This roadblock hits a market that was already becoming increasingly competitive as the number of Ph.D. graduates increases relative to the number of available positions [*Schillebeeckx et al.* (<https://www.nature.com/articles/nbt.2706>), 2013]. Certainly, academic institutions are facing various levels of financial distress right now, but we argue that extensions to temporary contracts (postdocs, fixed-term teaching positions, and visiting lecturers or professors) will aid academics and should be beneficial for academic institutions in the long term by retaining strong talent. Without such investment, the decreasing number of instructors will further compromise an already challenging student experience, which may discourage future contributions from alumni (<https://www.insidehighered.com/news/2020/04/10/next-level-precarity-non-tenure-track-professors-and-covid-19>)—a negative feedback loop that institutions have obvious incentive to avoid.

Our community should also use the academic slowdown to reevaluate the importance placed on steering Ph.D. students into faculty positions. More diversified graduate training could help students develop professional skills needed for job markets not only in academia (<https://eos.org/opinions/preparing-graduate-students-for-stem-careers-outside-academia>), but also in the public and private sectors. For example, academics in geosciences could be trained to work on applied problems with agencies to address the growing need for alternative energy and carbon sequestration, predictive climate models, postwildfire erosion, extreme storm and flooding events, volcanic and earthquake hazards, landslides, sea level rise and loss of coastlines, and decreasing quantity and quality of freshwater resources. In doing so, training could focus

more on working with communities or policymakers to assess increasing risks from compounding natural hazards exacerbated by climate change.

The pandemic's influence on academia has compounded leading concerns surrounding retirement: lack of financial security and fear of losing connection with the scientific community.

The pandemic's influence on academia has compounded leading concerns

(<https://www.chronicle.com/article/a-professors-last-crucial-decision-when-to-retire/>), surrounding retirement: lack of financial security and fear of losing connection with the scientific community. The rising mean retirement age limits opportunities for early-career scientists [McChesney and Bichsel, 2020] as well as increasing uncertainty among seasoned geoscientists. More concerted efforts by institutions to assist early- and midcareer faculty with planning for retirement can reduce the financial constraints and uncertainty.

Fear of losing ties with the professional geoscience community can be remedied by facilitating better ways for emeriti to remain engaged within their scientific and institutional communities. Professional scientific societies like AGU can provide discounted membership and conference registration, as well as opportunities to serve on committees and engage in decisionmaking. Institutions can provide office and lab space, laboratory access, social engagement, and other resources [*Baldwin and Zeig*, (<https://link.springer.com/article/10.1007/s10755-012-9247-7>), 2013]. One excellent example is the vibrant Scientist Emeritus Program (<https://www.usgs.gov/center-news/reimagining-our-scientist-emeritus-program>) at the U.S. Geological Survey and other federal agencies, where emeriti engage in program development, mentoring, stakeholder outreach, research and development, data rescue, and records management.

## Keeping Early-Career Scientists on (Tenure) Track

As the pandemic keeps labs closed and delays or cancels fieldwork, publication delays will deter career advancement for research scientists and junior tenure-track faculty [*Termini and Traver*, (<https://doi.org/10.1186/s12915-020-00821-4>), 2020]. Successful grant proposals often require proof of concept and preliminary data, both of which are especially challenging for early-career researchers to acquire right now. Later-career faculty should seek out early-career researchers to involve in grant proposals. Such partnerships offer win-win situations for both groups: Later-career faculty can assist junior faculty and postdoctoral fellows in navigating proposal preparation, whereas early-career scientists can contribute fresh perspectives and methodologies.

We suggest that funders can keep early-career scientists on research paths during this time by providing seed grant opportunities for preliminary data collection and by introducing policies that require fewer preliminary data for proposals. Funding agencies could also offer opportunities for early-career scientists to explain how their research has been impacted by COVID-19 and to request that grant reviewers take

these impacts into account in making their recommendations [*Gibson et al.* (<https://doi.org/10.1016/j.cell.2020.05.045>), 2020].

We need an examination of pandemic-induced costs that helps institutions develop equitable means to accommodate faculty needs.

Many institutions have paused or extended tenure clocks to compensate for the interference in research and teaching caused by the pandemic. Offering pretenure sabbatical and flexible teaching schedules once travel restrictions are lifted and labs reopen so that these faculty can more readily find time to conduct research is one way to aid career development. But individuals are also experiencing a wide range of challenging conditions (<https://eos.org/opinions/perspectives-on-parenting-while-researching-during-a-pandemic>) in their personal and professional lives. In fact, simply pausing tenure clocks may even exacerbate both racial and gender inequalities (<https://www.insidehighered.com/advice/2020/07/07/response-pandemic-better-alternatives-pausing-tenure-clock-should-be-considered>) for tenure applications and promotions. We need an examination of pandemic-induced costs that helps institutions develop equitable means to accommodate faculty needs. The University of Massachusetts is one of the first to offer suggestions for systematically documenting (<https://www.insidehighered.com/advice/2020/09/04/advice-academic-administrators-how-best-support-faculty-during-pandemic-opinion>) pandemic-related impacts, both short and long term.

The loss of in-person networking has disproportionate impacts on scientists who are just starting to build their research communities and on newly recruited faculty trying to establish themselves among new peers and graduate students. Universities and colleges should be creating or strengthening mentoring programs for junior faculty that offer guidance and support to help them address the challenges of the pandemic.

A positive example of innovative networking can be found at the University of Delaware, where Estella Atekwana, the dean of the College of Earth, Ocean, and Environment, held individual meetings with all junior faculty members this past summer to understand their situations and provide individualized suggestions. The college started a networking series called Lunch and Learn with the Deans this fall to connect junior faculty and university leadership. University administrative officers were invited to explain topics pertinent to junior faculty, such as faculty promotion and tenure procedures, teaching evaluations, grant proposal assessment, and how these procedures are all being adapted because of the pandemic. Meanwhile, societies like AGU are adding additional networking opportunities into this year's all-virtual Fall Meeting, which will likely engage more scientists than usual across a large, international group of attendees.

## **A Multicultural Approach to Increase Inclusion and Diversity**

The economic, social, and health ramifications of the COVID-19 pandemic are much more likely to impact scientists in groups historically underrepresented in the Earth sciences

(<https://www.nature.com/articles/s41559-020-1266-7>). [*Schell et al.* (<https://doi.org/10.1038/s41559-020-1266-7>), 2020].

Female scientists, especially those early in their careers, are more adversely affected than male scientists, largely because of the systemic gender roles and expectations still plaguing our society [*Viglione* (<https://doi.org/10.1038/d41586-020-01294-9>), 2020].

Although many institutions declare that diversity is important, they struggle to retain and promote (<https://eos.org/opinions/promoting-racial-diversity-in-geoscience-through-transparency>) the diverse staff they hire. A positive example of addressing this challenge can be found at NASA Goddard Space Flight Center, where a culture and climate survey was conducted that led to insightful discussions and recommendations, which leaders have committed to follow. One such initiative is the “listening session” organized by Goddard’s diversity and inclusion office, which encourages individuals to express concerns around equity issues.

The professional effects of the pandemic may allow institutions to facilitate systemic change. We suggest that scientists be recognized and rewarded for their efforts—whether through K–12 outreach programs, innovative teaching strategies, or recruiting and mentoring underrepresented students—to improve diversity at their institution or more broadly in their field. Faculty can diversify and decolonize their syllabi (<https://www.socialsciencespace.com/2020/07/rodney-coates-outlines-a-12-step-program-for-decolonizing-academe/>) and recruit underrepresented scientists to give talks and seminars (<https://eos.org/opinions/whats-in-a-seminar>). Furthermore, candidates for hire, promotion, and tenure should be assessed on both their scientific merit and their conscientiousness toward diversity.

It is difficult for institutions alone to protect their temporary research and teaching staff, yet these workers will be critical in the postpandemic era and thus must be supported now.

In a 2019 study (<https://muse.jhu.edu/article/712604>), researchers found that the availability of mentorship for faculty from underrepresented groups varies widely. Receiving high-quality mentorship—in the form of guidance about written and unwritten institutional rules, assistance with building professional and social networks, and providing collaborative research opportunities—was found to help faculty prevent career miscalculations. However, in some cases, mentoring faculty were not sufficiently trained, resulting in cynical advice that further entrenched a culture of implicit biases and harmful status quos [*Espino and Zambrana* (<https://muse.jhu.edu/article/712604>), 2019]. Therefore, it is important that mentors are properly trained, particularly when supporting new faculty from minoritized backgrounds.

Temporary faculty, such as visiting instructors, adjuncts, and contract government employees, are often a more diverse group than permanent workers. They are also much more vulnerable to the whims of

their institutions. Given the financial challenges most universities and colleges are facing, it is difficult for institutions alone to protect their temporary research and teaching staff, yet these workers will be critical in the postpandemic era and thus must be supported now. We call on state and federal governments to provide institutions with stimulus packages to support temporary research staff—this support in turn buoys the scientific programs to which these staff contribute. In May, the Canadian government (<https://pm.gc.ca/en/news/news-releases/2020/05/15/prime-minister-announces-support-research-staff-canada>) set a positive example by issuing financial support to avoid the layoffs of research staff in labs across the country, noting that the support will help sustain long-term research innovation.

At many institutions, women are still penalized for starting families during their research career. Introducing more worker-friendly parental leave policies would go a long way in helping women achieve workplace parity with men. Workplaces that have already extended parental leave in the United States have shown success. For example, *Dodelzon et al.* (<https://doi.org/10.1016/j.acra.2020.06.008>) [2020] reported that providing paid family leave for 14 weeks at their academic radiology department improved employee satisfaction and reduced stress levels.

## Time for Systemic Change in the Geosciences

The COVID-19 pandemic has exacerbated long-standing hardships and disparities in the geoscience job market regarding shortages in the number of available positions overall and in the opportunities for underrepresented groups to be hired into these positions. Our scientific institutions are at increasing risk of losing highly qualified scientists if we do not adequately address these problems.

Recent social justice movements, including Black Lives Matter and Me Too, have increased attention on racism and sexism. In the geosciences, they have brought to the forefront the struggles of early-career faculty, particularly those who identify as women, LGBTQ+, or persons of color. Now is the time to address the burdens that have been experienced by these groups.

The recommendations mentioned here should assist all early-career faculty, but we hope they will particularly help those from underrepresented groups and mark the beginning of a new era of inclusion and diversity in the Earth sciences. These solutions are neither easy nor complete and will require an adaptive approach that is continuously evaluated. It is imperative for the future of the field that diversity is not only attained but is also actively maintained to create an inclusive environment for all current and potential future Earth scientists.

## Acknowledgments

The AGU Mentoring Network (<https://www.agu.org/Learn-and-Develop/Learn/Mentoring-Programs/MentoringNetwork>) partners groups of early-career scientists (mainly postdocs and new faculty) with senior mentors, who

meet virtually each month for a year. This group of authors was led by Julio Betancourt (U.S. Geological Survey emeritus) and W. Berry Lyons (Ohio State University). Group discussions are centered on career development, job searches, establishing independence, doing impactful research and service, honing writing and speaking skills, and balancing work and life. This year's Mentoring Network groups have also been navigating and reflecting on the impact on these topics from the global pandemic, widespread civic unrest, and U.S. visa changes. We thank Julio and Berry for thoughtful discussions, guidance, and contributions that greatly improved this article. This article will serve as a springboard for discussions that will be held during the New Generation of Scientists—Virtual Mentoring Macelwane Breakfast at AGU's annual Fall Meeting (10:00 a.m. to 12:00 p.m. Eastern, 15 December 2020). Macelwane Medalists (<https://www.agu.org/Honor-and-Recognize/Honors/Union-Medals/James-B-Macelwane-Medal>) and Mentoring Network Fellows will lead breakouts and panels about the impact of COVID on personal career trajectories and structural solutions to support early-career scientists.

## References

---

Baldwin, R., and M. Zeig (2013), Emeritus colleges: Enriching academic communities by extending academic life, *Innovative Higher Educ.*, **38**(5), 355–368, <https://doi.org/10.1007/s10755-012-9247-7> (<https://doi.org/10.1007/s10755-012-9247-7>).

Bernard, R. E., and E. H. G. Cooperdock (2018), No progress on diversity in 40 years, *Nat. Geosci.*, **11**(5), 292–295, <https://doi.org/10.1038/s41561-018-0116-6> (<https://doi.org/10.1038/s41561-018-0116-6>).

Dodelzon, K., S. Shah, and A. Schweitzer (2020), Supporting a work-life balance for radiology resident parents, *Acad Radiol.*, in press, <https://doi.org/10.1016/j.acra.2020.06.008> (<https://doi.org/10.1016/j.acra.2020.06.008>).

Espino, M. M., and R. E. Zambrana (2019), “How do you advance here? How do you survive?” An exploration of under-represented minority faculty perceptions of mentoring modalities, *Rev. Higher Educ.*, **42**(2), 457–484, <https://doi.org/10.1353/rhe.2019.0003> (<https://doi.org/10.1353/rhe.2019.0003>).

Gibson, E. M., et al. (2020), How support of early career researchers can reset science in the post-COVID19 world, *Cell*, **181**, P1445–1449, <https://doi.org/10.1016/j.cell.2020.05.045> (<https://doi.org/10.1016/j.cell.2020.05.045>).

Maas, B., et al. (2020), Academic leaders must support inclusive scientific communities during COVID-19, *Nat. Ecol. Evol.*, **4**(8), 997–998, <https://doi.org/10.1038/s41559-020-1233-3> (<https://doi.org/10.1038/s41559-020-1233-3>).

McChesney, J., and J. Bichsel (2020), The aging of tenure-track faculty in higher education: Implications for succession and diversity, Coll. and Univ. Prof. Assoc. for Human Resour., Knoxville, Tenn.

Schell, C. J., et al. (2020), Recreating Wakanda by promoting Black excellence in ecology and evolution, *Nat. Ecol. Evol.*, **4**, 1,285–1,287, <https://doi.org/10.1038/s41559-020-1266-7> (<https://doi.org/10.1038/s41559-020-1266-7>).

Schillebeeckx, M., B. Maricque, and C. Lewis (2013), The missing piece to changing the university culture, *Nat. Biotechnol.*, **31**(10), 938–941, <https://doi.org/10.1038/nbt.2706> (<https://doi.org/10.1038/nbt.2706>).

Termini, C. M., and D. Traver (2020), Impact of COVID-19 on early career scientists: An optimistic guide for the future, *BMC Biol.*, **18**(1), 95, <https://doi.org/10.1186/s12915-020-00821-4> (<https://doi.org/10.1186/s12915-020-00821-4>).

Viglione, G. (2020), Are women publishing less during the pandemic? Here's what the data say, *Nature*, **581**(7809), 365–366, <https://doi.org/10.1038/d41586-020-01294-9> (<https://doi.org/10.1038/d41586-020-01294-9>).

## Author Information

Miling Li ([milingli@udel.edu](mailto:milingli@udel.edu) (<mailto:milingli@udel.edu>)), School of Marine Science and Policy, College of Earth, Ocean, and Environment, University of Delaware, Newark; Nicholas A. Sutfin, Department of Earth, Environmental, and Planetary Sciences, Case Western Reserve University, Cleveland, Ohio; Margaret Christie, Department of Environmental Studies, McDaniel College, Westminster, Md.; Maheshwari Neelam, Science Systems and Applications Inc., Greenbelt, Md.; also at NASA Goddard Space Flight Center, Greenbelt, Md.; and James A. Bradley, School of Geography, Queen Mary University of London; also at Interface Geochemistry, GFZ German Research Centre for Geosciences, Potsdam

**Citation:** Li, M., N. A. Sutfin, M. Christie, M. Neelam, and J. A. Bradley (2020), Making a place for the next generation of geoscientists, *Eos*, **101**, <https://doi.org/10.1029/2020EO151355>. Published on 06 November 2020.

Text © 2020. The authors. [CC BY-NC-ND 3.0](https://creativecommons.org/licenses/by-nc-nd/3.0/)

Except where otherwise noted, images are subject to copyright. Any reuse without express permission from the copyright owner is prohibited.

---

This article does not represent the opinion of AGU, *Eos*, or any of its affiliates. It is solely the opinion of the author.

---