

Mentorship strategies to boost diversity in paleontology

Drawing on research as well as their experiences as women of color in paleontology, Aja Carter and Erynn Johnson, who earned doctoral degrees from Penn, coauthored a paper offering advice for making the field more inclusive.

Scientists Erynn Johnson and Aja Carter use a 3D printer to make shell shapes

Erynn Johnson and Aja Carter both earned their doctoral degrees in paleontology from Penn, employing pioneering techniques, such as 3D printing to replicate the forms of ancient creatures. In a new publication, they share advice for attracting and retaining students and trainees from underrepresented groups to paleontology.

According to data from the [National Science Foundation \(https://www.nsf.gov/\)](https://www.nsf.gov/), just three people of color earned doctoral degrees in paleontology in the United States in the year 2020. Two were from Penn.

[Aja Carter \(https://research.upenn.edu/profiles/aja-carter/\)](https://research.upenn.edu/profiles/aja-carter/) and [Erynn Johnson \(https://mvlab.yale.edu/erynn-johnson\)](https://mvlab.yale.edu/erynn-johnson), both of whom are now pursuing postdoctoral studies—Johnson at Yale, and Carter here at Penn, in the [School of Engineering and Applied Science \(https://www.seas.upenn.edu/\)](https://www.seas.upenn.edu/)'s [GRASP Lab \(https://www.grasp.upenn.edu/\)](https://www.grasp.upenn.edu/)—were taken aback by the news of their singularity. But the news lined up with other experiences they had had in the field. More digging revealed that Carter was the first African American to earn a Ph.D. in paleontology at Penn and the first African American woman to be awarded a Ph.D. in the [Department of Earth and Environmental Science \(https://earth.sas.upenn.edu/\)](https://earth.sas.upenn.edu/).

In a new perspective piece in the paleontology section of the journal [*Frontiers in Ecology and Evolution* \(https://doi.org/10.3389/fevo.2022.876906\)](https://doi.org/10.3389/fevo.2022.876906), they draw attention to the lack of diversity in their chosen field and offer concrete advice for how to address it through effective mentorship.

Penn Today spoke with them about the publication, which they coauthored with [Elena Schroeter \(https://bio.sciences.ncsu.edu/people/easchroe/\)](https://bio.sciences.ncsu.edu/people/easchroe/), an assistant research professor at [North Carolina State University \(https://www.ncsu.edu/\)](https://www.ncsu.edu/).



What have you been up to since finishing your doctoral degrees two years ago?

Aja Carter: I was awarded a [Vice Provost Academic Diversity Fellowship \(https://research.upenn.edu/postdocs-and-students/penn-provosts-postdoctoral-fellowships/\)](https://research.upenn.edu/postdocs-and-students/penn-provosts-postdoctoral-fellowships/) at Penn, so I'm doing my postdoc work here. Instead of taking a footstep into a new field, I took a big leap into a different field, and now I'm working in the [KodLab \(https://kodlab.seas.upenn.edu/\)](https://kodlab.seas.upenn.edu/) which is part of the

GRASP Lab (<https://www.grasp.upenn.edu/>) in Penn Engineering. I'm slowly trying to build up new work in paleobioinspired robots.

Erynn Johnson: And I'm at Yale, doing more paleo research, but I'm actually also based in an engineering school. It's funny that we both moved in that direction.



Was there a particular experience or observation that led you to write this piece?

Johnson: In grad school, when the two of us went to conferences together, we would look around and realize we were the only people in the vicinity who looked like us. It was a strange thing to absorb. But once that thought is planted in your mind, you carry it through the rest of the conference, how few people in that room are representative of your background.

Carter: One of my favorite professors at Penn, Hermann Pfefferkorn (<https://earth.sas.upenn.edu/people/hermann-w-pfefferkorn/>), who is retired now, was basically the unofficial historian of the Earth and Environmental Sciences Department. Every year I was in grad school he would give this presentation of the grand history of the department. And at some point we realized that I was the first African American woman to earn her Ph.D. from the department. My initial reaction was, 'Surely not. Me? That's absurd.' But Hermann and I did some digging and found it was the case.

I thought it would be great to write this paper because there are relatively small things that could be changed to make a big difference. The big thing is money—we all need more—but so much of what Erynn and I did in our Ph.D.s, like learning how to use 3D printers, was free, we just needed to know who to talk to. Adapting our teaching and our mentorship and our outreach often doesn't require money.



Talk about the process of writing the paper.

Carter: We wanted to share our professional and personal experiences so that, if you don't believe me and my experiences, we have facts and numbers to back them up. What we learned early on in doing research for this piece was that there is a ton of information out there for supporting underserved undergraduates. If you go to a retention department at a university, it's probably going to be focused on undergrads. And that's great because getting through undergrad is the first really solid building block you need to get through grad school. But having just finished our Ph.D.s, we were like, 'Whoa where is the rest?' Just because we got here doesn't mean we have it all figured out. So, we have recommendations in there about supporting trainees at all levels, undergraduates, grad students, postdocs, and early-career faculty.

We were very intentional about publishing this paper in a journal that is focused on paleontology. We really want to lower the barrier to entry for people who look like us—and people who want to help people like us.

Johnson: The hard thing about being in a field with so little diversity is that there's not really that many people who we can look to who have had similar experiences. The hope is that if you foster people at the lower rung of the academic ladder, then we will build up a system where there are enough people who move up and then become that support for future students.



What do you feel is missing from paleontology in particular, given the lack of diversity?

Johnson: We know from research that having diverse minds in a room produces better ideas, better results. So, it's not even about what the room looks like, it's about the fact that the thoughts in the room are currently very limited by the pools they're coming from. And it's especially ironic in paleontology because part of our responsibility is to understand the diversity of life. We don't want to look at the entire history of life through a narrow lens. That's a shortcoming that the field is facing at the moment.

Paleontology has been used to misrepresent different groups, artifacts have been taken from people and lands without permission. Inequity has clearly colored the way the field has developed. Some people think it's like stamp collecting—an adventurous hobby for people with the resources to do it—but it shouldn't be seen as a luxury type of science. We need to create space for people who come from all different backgrounds.



What are a few of the key messages you hope people will take from your article?

Carter: A big one for mentors at the undergraduate and graduate levels is being open to different ideas and communicating the fact that you are there to help. A lot of times people from underrepresented backgrounds are going to be reluctant to ask for help, so mentors need to be open and offer it proactively.

One example is that, typically in geology, field work is seen as this rite of passage: You have to tough it out, sleep in tents. But depending on your background, that might not be something you're comfortable with. So, we need to make space and be open, maybe stay in hotels or leave that option open.

We also know that some graduate students are supporting families, and so there needs to be an awareness of that and some flexibility built in to enable students to meet deadlines while still taking care of themselves and their families.

Johnson: Clearly what we are contending with is not an issue of a lack of interest because almost everyone thinks dinosaurs are cool. There is just a disconnect between the level of interest the public has and the grad school data we found.

One thing Elena mentioned in one of our first meetings about this paper is that whenever she is designing a lesson plan, she thinks about how her poorest student would accomplish what she is asking. So, let's say the curriculum calls for the student to visit a museum outside of class. How would this person find the time to

do that, how would they pay the admission fee, the bus fare to get there? Could they take time off work to go?

The reality is, even if a student is not reaching out to tell you that these are barriers, they may just look over the syllabus and decide not to take a course based on factors like these.



How do you feel now that you've gotten these messages out there?

Carter: It's really easy to look at the data and feel that things are very bleak. There's been very little improvement in graduate school completion rates for people of color over 40 years in paleontology and geology. It can be profoundly isolating to think about. Writing a paper like this takes time and energy, but we have skin in the game; we think it's worth it.

Johnson: You can look at the data and say, There's only three of us who got Ph.D.s—that's not many people. But the other way of thinking about it is, it wouldn't be that hard to double that, or triple that. We have to keep improving those numbers. That's the thing that lit a fire under us. This is a small field, and change can be made one student at a time.

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SUBTOPICS

Earth and Environmental Science, Undergraduate Students, Graduate Students, Diversity, Equity, Inclusion, and Accessibility, Teaching, Q&A

SCHOOLS

School of Arts & Sciences, School of Engineering & Applied Science

