

CONVERSATION

Early-career researchers: an interview with Sandy Kawano

Sandy Kawano is an Assistant Professor at George Washington University, USA, where she studies biomechanics and physiology to address the origins and maintenance of biodiversity. She received her undergraduate degree in Evolution, Ecology, and Biodiversity from the University of California, Davis, USA, in 2008 before completing her PhD with Richard Blob at Clemson University, USA, in 2014. After completing postdoctoral fellowships at the National Institute for Mathematical and Biological Synthesis, USA and the Royal Veterinary College, UK, she was appointed Assistant Professor at California State University, Long Beach, USA from 2017 to 2019.

Where do you come from and what's your family background?

I was born and raised in California, but my parents are Japanese–Brazilian immigrants to the USA. My parents moved to San Jose, California, USA, in the 1980s, before I was born, to seek better opportunities. When they arrived, my dad worked at a plant nursery, but eventually he became a car mechanic and now owns his own auto-repair business with my mum, who helps with the bookkeeping and business management. We spoke a mixture of three languages at home, Portuguese, Japanese and English. My first language was Portuguese and when my sister and I were learning to speak, our sentences were often a mix of Portuguese and Japanese. We couldn't speak English very well and our parents were afraid that we wouldn't assimilate and would fail. They had attended classes that taught adults how to improve their English-speaking skills, but then vowed when I was three that they would only speak English at home until our English improved. It was tough and I often feel that I lost my heritage, because I didn't get the experience of growing up speaking primarily Portuguese or Japanese and we missed out on going to a Japanese school.

Education was something that I needed extra time to connect with. When I was about six or seven years old I think that the teachers were concerned about my cognitive abilities, because I advanced slowly. I went to special classes where I completed puzzles and tests so that they could get me to the level that I needed to attain. In second grade, I completely failed a project because I didn't know how to write a report and my parents didn't know to ask anyone for help. If I'd gone to the teacher I think things would have been better. I learned that it's okay to ask for help. My sister and I had to recognise at a very early age that we couldn't always rely on our parents, because my dad didn't finish grade school and, although my mother finished high school in Brazil, it was very different from the US education system.

How did you transition from high school to university?

I had some high school teachers who were very supportive and encouraged me to pursue a career in biology. They helped me to understand the importance of education, but I didn't get into a four-year university course, because I didn't have high enough grades.



Instead, I went to a community college, De Anza College in Cupertino, USA, but I was determined to get to University of California (UC), Davis, USA, because they had an excellent veterinary programme. Fortunately, there was a Transfer Admission Agreement between the two schools, which guaranteed admission to UC Davis if I completed my general education at De Anza after two years, so I signed a contract agreeing to that.

While in community college, I became more interested in biodiversity than veterinary science. Fortunately, UC Davis has one of the top Evolution and Ecology programs in the USA, so I entered the Evolution, Ecology and Biodiversity bachelors programme when I transferred. However, my imposter syndrome – the feeling that I wasn't as good as the other students and didn't belong there – was very strong by then and I had missed out on research opportunities at De Anza. Fortunately, UC Davis has a Transfer Student Fellows programme, which helps students from community colleges get a head start in research. That allowed me to dive straight into my third-year coursework and start work with Judy Stamps as an undergraduate research assistant. She was studying the behaviour of fly larvae. It was my first research experience and I absolutely loved it. When conducting an independent research project in her lab, I noticed that the fruit flies that were raised on apple were very small and their wings were shrunken together. That made me realise that I'm really curious about why morphology is different in different environments. I started studying the research of Peter Wainwright, one of the functional morphologists in the department, and he had the biggest influence on my academic career. Originally,

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I was too intimidated to apply to his lab as an undergraduate researcher, so I applied to take care of the fishes. Peter welcomed me into his group and I was surrounded by people who were incredibly supportive and excited to teach me about their work. That sort of inclusiveness made me want to become more involved and I think Peter could see that I had a thirst for knowledge, so he invited me to enrol in research courses with him. Since then he's been one of my main mentors.

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At what point did you start thinking about doing a PhD?

I took a little convincing and had a lot of support from people saying that I should look into a PhD programme. I think it was a few months into my research project with Peter that I started thinking that I could do this for a living. Initially it was intimidating; my sister and I were the first generation in our family to go to college and the idea of being the first person to go to graduate school was terrifying. I had no idea what the process was like, which is why I applied to the McNair Scholars Program, a nationwide scheme that helps students from underprivileged backgrounds apply to PhD programmes. It provides students with financial assistance as well as training in presenting research, applying to graduate school, and preparing for the Graduate Record Examinations. Peter and I talked about my general interests. He recommended research programmes across the USA, I applied to seven or so and ended up going to Rick Blob's lab at Clemson University.

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What was the experience of starting a PhD like?

Entering into a PhD programme is tough. Moving to a different part of the US was difficult, but that was where I started to discover who I am as a researcher and to develop the vision I wanted to pursue in the future. I like to say that Rick helped me find my inner palaeontologist. I have always been fascinated by fossils, and during my last year as an undergraduate I became infatuated by how vertebrates evolved to move on land after I read Neil Shubin's book 'Your Inner Fish' about a tetrapod-like fish called *Tiktaalik*, which lived almost 400 million years ago. The book became the inspiration for my dissertation. As an undergraduate I thought, 'it would be incredible to study *Tiktaalik*, but I'll never do anything that amazing; I'll never get to see that fossil'. But I did, because of Rick. He helped me form a dissertation that went above and beyond what I could have thought of myself and connected me to the natural history museums containing the fossils of the key stem tetrapods during that transition. I visited many museums across the US, including the Academy of Natural Sciences in Philadelphia to study specimens of *Tiktaalik* before they were shipped back to Nunavut, Canada. I also compared the terrestrial locomotion of salamander limbs and mudskipper fish fins, which are models for early tetrapods and tetrapod-like fishes, and developed a musculoskeletal model that determined that walking on land was twice as stressful on salamander hind limbs as on the forelimbs. That allowed me to model the locomotor capabilities across the fin–limb transition.

Rick helped me find my inner palaeontologist

Rick also trained me with professional development activities that set the stage for my career. As a graduate student, I was required to teach to earn my stipend, but he gave me opportunities to lead teaching activities so I could list those leadership roles on my CV. He also taught me how to build a course syllabus, invited me to give a guest lecture in his class and gave me feedback on how I could improve. By the time I got to my faculty position I had already experienced teaching in both a large and small classroom. In addition, I mentored some undergraduate students and served on university and department committees. In many ways, it was challenging to juggle so many things as a graduate student and I felt overwhelmed at the time, but it was essential to my success now as a faculty member, because those experiences equipped me with the knowledge that I needed to hit the ground running when I started my own courses.

How did you decide where to go for your first postdoc?

During my PhD, I had a wonderful opportunity to collaborate with a statistician, Billy Bridges. He helped me apply different quantitative analyses to my data, which gave me an appreciation for just how powerful mathematical approaches can be. I also learned about the new statistical program called 'R', which was revolutionising data analysis, so I took a course and I got interested in studying how different quantitative methods affected results. That's why I applied to the National Institute of Mathematical and Biological Synthesis (NIMBioS), USA, – colloquially pronounced 'nimbus', like the cloud – because I wanted to get additional training on the mathematical framework to quantify biological phenomena. During my PhD, I had worked on a project to study the biology of how gobies in Hawaii climb waterfalls, so during my postdoc I took a mathematical approach to the problem and asked which statistical models we should use and what the consequences are of using different models.

When did you begin applying for faculty positions?

I started applying only a few months after I defended my PhD. I did not feel ready, but NIMBioS has a strong postdoctoral development programme designed to mentor and enable the success of postdoctoral fellows, which demystified the job search process. They helped me put together my job application materials and prepare for the interview process. But, I figured it would take a while for me to be competitive, so I applied for post-doctoral fellowships at the same time. I knew that I wanted to go back to the water–land transition work and I had been wanting to work with John Hutchinson at the Royal Veterinary College, UK, for years. We applied for a Marie Curie fellowship, which we were awarded. However, I was also offered a tenure-track faculty position at California State University, Long Beach (CSULB), USA, the same year. I negotiated to defer the job offer for twelve months, so I could work with John in 2016, and joined CSULB in 2017.

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Can you tell us about your first faculty position?

CSULB is a student-centred teaching institution that has only a few PhD programmes. My course load was reasonable, with two courses per semester, which ranged from 20 to 60 students. In addition, I worked on updating the course curriculum and equipment for our physiology teaching labs. I was well supported starting up my research programme, but I had to structure questions that would be feasible for undergraduate and Master's students. Then, at the beginning of my second year, some exciting tenure-track positions at research-intensive institutions were advertised in my areas of expertise and a number of colleagues asked if I had thought of applying for the job at George Washington University (GWU). At the time, I thought that was crazy.

How did you make the decision to apply for a second faculty position?

This was an incredibly difficult decision. I felt very attached to the faculty at CSULB (they were, and still are, my friends) but one of my mentors advised me you can't control when your dream job comes up and that it's not uncommon for people to move after their first post. I put together a list of the things that I need to be happy in life and the things that make me miserable. That helped me recognise that there were important parts of my career that were still missing. The decision ultimately came down to the fact that there were so many benefits to applying to GWU. The position was an incredibly strong fit with my research: it is a more research-intensive institution and the Smithsonian National Museum of Natural History – which currently houses some of the fossils that I need for my research – is just down the street. If I had not applied, I think I would have regretted it for the rest of my life.

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When I interviewed there, my goal was to show that I had the potential to develop a highly productive research programme. I presented the research foundation that I had already laid down and the techniques that I would bring to George Washington to help with on-going projects. I also wanted to show them how I could foster new collaborations within the department and across the university. I didn't hear back until a few months after the interview, so I was completely speechless when GWU offered me the job.

Some of your papers have attracted media attention, can you tell us about the experience?

It started with the Society for Experimental Biology meeting in 2013. They emailed people to see if they would like to submit a press release for their presentations. Rick and I put one together. It was on the study where we compared the function of fins versus limbs for moving on land. I finished my presentation and then I was approached by Victoria Gill from the BBC. Oh my goodness, my jaw just dropped; I hadn't even rehearsed because I didn't think anyone would want to talk to me about my work. It was very exciting and then the story absolutely exploded. The SEB had put the press release on EurekAlert! so it was seen by a number of different agencies, including the LA Times. I had to learn quickly how to summarise my research into sound bites. That was fun. Often times the metric for success for academics is their publications, but to see your name in headlines is a whole other world.

What are the main pressures experienced by early-career researchers and how have you dealt with them?

I think publishing is a big pressure and challenge. Academics are often evaluated in terms of number of publications, often referred to as 'publish or perish', because there's such a strong emphasis on publishing. It can be difficult for early-career researchers because some projects take years to develop. Some of my friends who work in ecology or do fieldwork can't control when plants grow, or when animals become available, so they have to wait it out. That's tough if they're expected to publish one or more papers per year; it could make early-career scientists feel like they need to publish something when it's not ready. I'm still working on dealing with that pressure. I need to publish more often, so I've been finding ways to be more productive. I use an online timer to keep track of where I'm spending my time so I can try and optimise my time usage more productively. In academia, we often think we need to show we are leaders, that we can do everything. Now, as a faculty member, I have accepted that I can't do everything; that's when I go to colleagues and get collaborators who are experts in a technique or area so that we can build something better than individuals working alone.

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What do you think are the main challenges facing minorities in the current research environment?

While there have been some valiant efforts to improve the recruitment of under-represented and underserved communities in science, we still face challenges in the retention phase. Something that we often encounter is the 'minority tax'; we end up taking on a lot more service activities. For instance, we serve on more committees and we mentor more students because we're some of the few people that look like them. It has a disproportionate impact on our productivity, because we are taking on additional roles at the university and throughout the scientific community. Inclusion is another important topic. I really loved how Verna Myers, an expert on diversity and inclusion, phrased it; 'Diversity is being asked to the party, inclusion is being asked to dance'. It's not simply a matter of statistics – of how many people we have from this ethnic group or that demographic – we need to make sure that they are truly valued and an active part of societal change. But, there has to be compromise between giving back to your community and advancing your own career; you won't be able to help others if you crash and burn.

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Where's your favourite place to go on holiday and why?

There's still a lot of the world that I want to explore. Some of my favourite places are ones that allow me to go hiking, or involve exploring natural phenomena – especially near water. The Pacific Northwest of the US is one of my favourite places, especially the

San Juan Islands. One of my best vacations was a short trip to the Isle of Wight in the UK, because I went fossil hunting. It was very calm and quiet, which you need after working in a busy metropolitan area. Any opportunities where I can observe wildlife and explore nature to get a good mental break really help keep me

motivated, because the biological phenomena I see in nature help to inspire my research and remind me why I became a scientist.

Sandy Kawano was interviewed by Kathryn Knight. The interview has been edited and condensed with the interviewee's approval.