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CONVERSATION

Early-career researchers: an interview with Michael Rosario

Michael Rosario is an Assistant Professor at West Chester University, USA, where he studies elastic mechanisms in biology. He received his undergraduate degree in Integrative Biology from the University of California, Berkeley, USA, in 2009 before completing his Master's degree in Organismic and Evolutionary Biology at the University of Massachusetts, Amherst, USA, in 2013 and his PhD in Biology at Duke University, USA, in 2015. Rosario completed a National Science Foundation Postdoctoral Fellowship with Tom Roberts at Brown University, USA, before moving to West Chester University in 2018.

Can you tell us about your family background?

I was born in Mountain View, CA, USA, and I am an only child, but I spent a lot of time with my cousins, aunts and uncles. My dad is one of seven children and they all immigrated to the United States from the Philippines. Dad trained as an electrical engineer in the Philippines, so he decided to move to Silicon Valley in California. By the time I was born, my parents had saved up enough money to buy a house that could accommodate a lot of the family while they were getting on their feet, so I grew up with three or four uncles and aunts around most of the time. I was never lonely growing up, but being surrounded by non-native English speakers meant I adopted a heavy Filipino accent despite being born in the States. Lots of kids at school picked on me because of it. Without many friends, I ended up being very close with my family throughout my childhood. In the fourth grade, when I was 10 years old, my parents bought a single-family home in Santa Clara, CA, and I changed schools. Without my cousins around, I finally felt like an only child. But my dad had a computer with an internet connection, so I experimented with the internet constantly. I soon found online message boards and created my own websites using HTML. I also found message boards dedicated to music production and began collaborating with musicians in Oregon and Utah by the eighth grade, when I was 14 years old. I surrounded myself with technology very early.

What sort of subjects were beginning to interest you at school?

Physics, biology and maths were the subjects that I gravitated towards. It wasn't until I got to college that I started to think about what I was really interested in and how these things could be integrated with my interests. I decided to go to the University of California, Berkeley, USA; it had a good reputation and I felt that it would challenge me intellectually. The most important thing was that it was close enough that I could come home whenever I wanted, but far enough that I could feel independent. Early on, my parents instilled very strongly in me that I should use this as a platform to enrol in medical school; they really wanted a medical doctor in the family, so it was obvious that I should try out biology. Originally, I intended becoming a molecular cellular biologist – just because those classes overlapped with the pre-requisites for medical school. But I realised that I was just taking those classes because they were required and not because I was really interested in them. In fact, I became very disinterested. So, in my junior year I changed majors from Molecular and Cellular Biology to Integrative Biology, which led to a difficult conversation with my parents. But it was very clear to them that I would not be happy going to medical school, so they trusted that I knew what I was doing.

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What attracted you to integrative biology?

I found so many interesting courses and I also started doing undergraduate research. All of these things blended together to make it seem that I could do things within biology that weren't just biology. For example, I could mix engineering and biology, I could mix physics and biology, which made it exciting again. I didn't realize this was possible until I met Sheila Patek, my undergraduate research advisor. I was looking for a part-time job on the Berkeley undergraduate jobs website and I found a posting for a paid research position to study mantis shrimp. I didn't know anything about them at the time. Coincidentally, I had taken up archery at Berkeley and fell in love with it. I thought it would be really exciting to bring an archer's perspective to the study of an organism that powers its strikes with elastic energy. Sheila noticed my fascination with elasticity and hired me as an undergraduate researcher. Being in her

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lab as an undergraduate was one of the most profound periods in my life. I had never had a mentor before that really prioritised my success or my motivations. She saw things in me that I had never thought were useful to research, science or even society.

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What did you decide to do next?

After graduating, I was going to spend a year at home, like a typical millennial, trying to figure out the next step and Sheila moved across the country to the University of Massachusetts (UMass), Amherst, USA. I thought that our relationship was done. But after a few months, she contacted me and asked if I would be interested in joining a programme at UMass to help under-represented minorities in academia. This was another very long conversation with my parents. Sheila invited me and my family to Amherst to see what it was like and to see the programme. We spent 2 days there looking at the region and talking to people. Sheila had a big effect on my parents. She had a conversation with them explaining that she understood that having their only child move across the country would be difficult, but she wanted them to know that she really believed I could be successful on this path. My parents were convinced, so I applied, got into the programme and followed her to Massachusetts.

Could you tell us about the programme that supported you at UMass?

It was the North East Alliance for Graduate Education and the Professoriate (NEAGEP) and it spans multiple institutions to support and mentor minority students, to give them an idea of what graduate school is like and to support them through that journey. It was incredibly helpful for me, because I still wasn't sure about research and academia. The scheme gave me a 6 month period where I could learn what it was like to do independent research, what my department was going to be like, and to surround myself with graduate students. If, at the end of 6 months, I decided that it wasn't for me, then I could just not continue. So I took a chance. I moved to the East Coast in January 2010 and it was quite different from California. It was my first experience with snow and public transportation. But it was also the first time that I was able to work as an independent scientist, rather than a person who is paid to get something done. NEAGEP encouraged me to develop my own projects, my own thinking, my own skillsets. Also, as part of the programme we had monthly or bi-weekly meetings where we held workshops and social events.

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Can you tell us about your time in the Patek lab?

I started my PhD with Sheila at Amherst in August of 2010, but three-and-a-half years later, she broke the news that she was moving to Duke University. I was left with a decision: do I stay in Amherst with the network that I've built or do I follow Sheila to a different place and continue under her mentorship? It was very scary, because I had spent so much time and energy falling in love with Amherst, the people there and the department. I put off the decision to the very last second, but eventually I realised that I couldn't see myself being successful without Shelia's guidance; she knew how my head ticked and, more importantly, she understood what training and networking I needed to complete my projects. I had completed all of my graduate coursework, so I left UMass with a Master's and decided to transfer onto the PhD programme at Duke in August 2013. Once the decision was made, everything became mechanical – I had to find a new place to live and figure out how to move. I had visited Duke before I made the decision and found that there was a community there that I could fit into. One of the major things that made me a little hesitant about moving was that Duke stipulated that I would have to take their oral examinations to become a graduate student there, but I had already taken my oral qualifying examination at Amherst, so I had to take the examination twice. The move happened when I was away doing a summer internship in California with the Department of Energy at Sandia National Laboratories. Almost the entire lab relocated, including the postdocs, and a friend of mine who was also a graduate student started at Duke around the same time as me, so it was nice to join a new place with familiar faces.

How did you decide what to do after graduate school?

Sheila instilled in me the confidence to always apply for things right before you think you're ready, so – during my last year – we decided to apply for a National Science Foundation post-doctoral fellowship that I could take to another lab, with the idea that if I got the fellowship it would accelerate my projects and shorten my time at Duke, but, if not, I could continue to develop research for my dissertation and have another year to reapply and develop my network and career opportunities. Fortunately, I got the fellowship. I was ecstatic, but it also meant that I had to finish my PhD in a couple of months in order to take advantage of the opportunity. Despite that, everything worked out really well. By the end of my PhD, my network included researchers who were interested in elasticity and were also interested in muscle physiology. Also, I had the computational skills from my Department of Energy computational science graduate fellowship to do some really sophisticated programming for simulations.

I decided to take the fellowship to Brown University, USA, to work with Tom Roberts. That seemed like the next logical step, because I was thinking about how muscles affect elasticity and Tom had a really rich history in understanding how tendons affect how muscles work. It was a really good transition. I intended working on frogs, but I became really interested in the dynamics of tendons on their own, so I ended up working with rat tails for two-and-a-half years.

At what point did you start applying for faculty positions?

By the end of the first year of my postdoc I was being encouraged by many of the faculty at Brown to think about entering the job cycle as soon as possible, if only as a practice round. This resonated with the training and guidance I received when working with Sheila, so it sounded like a good plan to me. I also spent a lot of time talking to other postdocs. We were all going through the same thing, having the same problems, sharing resources, which was incredibly helpful. When I first arrived at Brown, the postdocs had organised 'postdoc happy hour' where they would share documents and review each other's applications. By the time it was my turn to apply for jobs, they had all left and the happy hours had stopped, but a lot of their resources were still floating around, such as lists of websites to check out, sample budgets and sample cover letters. The cover letter was the most difficult thing for me to write, so it was nice seeing

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multiple examples. Some of the postdocs had also left resources from their failed attempts, so we could compare and contrast to see what worked and what didn't. I applied for 20 jobs, and received two on-campus interviews and three phone interviews.

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My first on-campus interview was here at West Chester University. It was a rush and it was incredibly intimidating. I discovered very quickly that I had to learn what they needed in a colleague and, at the end of my visit, there was a very intense exit interview. Practically every faculty member was there and they could ask any question that they wanted. However, I had prepared myself throughout the day by trying to gain a better understanding of what was important to the department, what was important to me and how those things overlapped. When West Chester gave me the offer a couple of months later, they wanted the decision by the end of the week, which was incredibly difficult. I still had another on-campus interview and a phone interview scheduled. I spent a lot of time reflecting on my time at West Chester trying to figure out what my 5 year plan would be and if I would be happy. Ultimately, I realised I had really fallen in love with the place. The faculty seemed happy, lively and supportive. The students I met were engaged and interested. There was no doubt in my mind that this was really where I wanted to be. Also, the faculty at West Chester is unionised – the union negotiates and bargains on our behalf on everything from benefits and salary to policies – and I was comfortable with that.

What challenges have you faced as a minority?

The biggest problem that I have faced has been not seeing faculty members that look like me. That was why I never really considered going into academia and why I thought that there might not be a career for me in research. I would never have got here without the support that I have received throughout my career. As a minority at West Chester, I hope that I'm having a positive effect on how students view the faculty. I feel that I connect with all of my students, despite having about 300 per semester, because they see someone who is not the traditional-looking professor and I am relatively young, so I can still relate to their interests and struggles.

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Can you tell us about your involvement in a science café?

The science café is a grassroots movement to bring research and science out of the university to the public. They usually occur somewhere like a café, pub or a communal meeting space outside of the university and they are all across the world. We try to invite people who have interesting things to say about science and make it relatable for the general public. I got involved when I started at UMass as a graduate student. The founders of the UMass science café, Sarah Goodwin and Norman Johnson, had received funds from the Society for the Study of Evolution to fund the project. They asked the graduate students if anyone was interested and I found the perfect way for me to contribute; I wrote a theme song, which we always started with, and I changed the lyrics for each meeting depending on who was speaking to make it relevant to them and their research. It served as a nice little introduction and it helped to settle everyone down when they heard the ukulele start playing. I hope to provide this public service here too, when I have more time.

What advice would you give to someone starting off on their PhD now?

I think that the most important thing that you can do is to keep building skills. It is also important to surround yourself with people who can do the things that you want to do and then to learn from them. During my postdoc, I learned electronics and, right now, my lab looks like an electronics lab. I have a drawer full of Raspberry Pis and Arduinos and I built a 3D printer that is constantly making parts for all the research equipment in my lab. If you don't find me in front of my computer programming something, I'm soldering wires together. I think that's an incredibly useful skill set, which I think a lot of biologists are missing nowadays. It's not that hard to learn and it has made me feel free in terms of making, modifying and repairing my lab equipment. Eventually, I hope to release plans to build an affordable materials testing machine using a Raspberry Pi and commercially available electronic components. My goal is to design a materials tester that I can bring to schools for demonstrations and experiments. I currently have a working model, but I am trying to find ways to make it cheaper.

The most important thing that you can do is to keep building skills

What's your favourite science book?

Right now I'm in the middle of reading 'Improbable Destinies: Fate, Chance, and the Future of Evolution' by Jonathan Losos. It addresses what could happen if you were to replay evolution, if you were to go back in time and let things happen randomly again. It's interesting to try to reconcile the randomness of evolution with the guiding hand of selection. Would you end up with the same biological solution to selective pressure? What would happen if a meteor didn't cause the extinction of the dinosaurs? Would you end up with another species, maybe not even a mammal, developing humanoid characteristics and developing societies in the way that we have today? It's an interesting thought experiment.

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