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INTERVIEW

Transitions in development – an interview with Rosa Uribe

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Rosa Uribe is an Assistant Professor of BioSciences at Rice University. Having established her lab in 2017, her research focusses on identifying the genetic, cellular and signalling-level mechanisms of neural crest stem cell proliferation, migration and differentiation during embryogenesis. We caught up with Rosa to find out more about her career, her opinions about mentorship and a series of virtual seminars that she co-organises.

Let's start at the beginning: when did you first become interested in science, and when did you decide to pursue a scientific career?

The first time that I was interested in science was when I was in middle school (basically eighth grade) here in the States, when a group of scientists from the University of California, San Francisco (UCSF), came to visit my science classroom. They showed us how to extract DNA from fish sperm and do some basic things at the bench – I was super enthralled by that. Although I became interested in science at that time, I didn't understand that I could be a scientist. Scientists were just abstract people who came to visit my classroom, and were teaching us some outreach things. Although I thought that was super cool, it was only many years later that I decided to pursue a scientific career, when I was in college finishing my sophomore year at San Francisco State University. Before that, I had been pre-med and again there was this disconnect with my interest in science and realising that I could be a scientist. For someone with my background, I was always exposed to the fact that for somebody who is interested in science, or the human body or biology, the only path is to go to medical school. Nobody ever told me that science is a viable path, and that somebody who looks like me can actually do that. It never even crossed my mind. By the time I realised I could pursue an actual scientific career, it was well into college. I decided to do a PhD after I took genetics as a course, which completely enthralled me. So within one semester of medical school, I changed my mind and decided to pursue a PhD instead.

For your PhD, you moved from your undergraduate degree at San Francisco State to work with Jeffrey Gross at the University of Texas. What motivated your decision to join his lab?

While I was an undergraduate at San Francisco State University, I attended my first national scientific conference, which happened to be in Austin, Texas. At these conferences, they have big exhibit halls where grad students are handing out pamphlets encouraging you to apply to their school. I happened to come across the University of Texas (UT) Austin booth and noted that there were a lot of really great sounding labs that aligned with my interest in developmental biology and genetics. When I applied to go to graduate school there, I got an interview and Jeff Gross was one of the first people that I met as a graduate student interviewee at a mixer, and I was completely enthralled by the description of the science in his new lab – he was a brand new PI at the time. So although I decided to go to UT Austin for various reasons, an important reason was that I was very interested in Jeff's work. I then decided to join his lab after doing rotations, realising it was a great fit overall.

After your PhD, you did a postdoc with Marianne Bronner at Caltech, switching from working on eye development to investigating the development of the GI tract. Why did you decide to change fields and why did you want to study gut development?

When I was finishing up my PhD with Jeff at UT Austin, I had many discussions with him about the next step that I wanted to pursue in my scientific career, and a postdoc was definitely the main choice. He recommended Marianne Bronner's lab because I had told him

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that I was interested in a global phenomenon in the field: how does a stem or progenitor cell progress into a differentiated cell lineage or cell type? Marianne's approach was very broad, because she looked at the neural crest cell, which gives rise to various different cell types. Jeff also recommended her because he knew that she was an excellent and well-known mentor in the field, and strong female role model. After contacting Marianne, I decided to join the lab and focus on the population of neural crest cells that migrate into the primitive gut and become nerves within the gut. After taking a really deep dive into the literature, I realised that, although much research had been focused on structures that are above the neck, there was far less known about the neural crest derivatives below the neck. Moreover, I saw a huge gaping hole in the literature with regard to the enteric nervous system. Realising this obvious gap in the field, I could come in and help contribute toward it, also taking my previous expertise into account. I also knew there had only been a couple of labs that had used zebrafish to look at nerve formation in the gut, so I thought it would be the perfect opportunity to bring some more zebrafish researchers into the field.

You've already mentioned that you appreciated having Marianne as a strong female mentor. During your time at Caltech, you took part in a Women Mentoring Women programme. Why was it important for you to join such a programme, and what have you taken away from it?

When I started my postdoc at Caltech, I immediately noticed just how many trainees were on campus at Caltech. Although it is a small campus, it has a lot of graduate students and postdocs. When I found out that there was a programme on campus called Women Mentoring Women, I knew immediately that I had to join because I felt that, as a new postdoc, I would be able to provide some guidance to early graduate students in the field and give them advice, encouragement and a chance to talk informally. I thought it was a really cool idea and I had never seen anything like that before, so it was super innovative to me. Ultimately, it ended up being incredibly fulfilling. I got paired with a graduate student at the time, named Nadia, and we still keep in touch after all these years. She is currently a postdoc at UCSF, and we touch base at least every year. I'm very happy to see her progress along her field, which is structural biology. It's been very nice to have had a mentee for such a long time, who is not directly tied to development, and I actually feel that I've made a contribution to another fellow woman scientist's trajectory.

You started your own lab after your postdoc. What were your most important considerations when you were looking for group leader positions?

When I was looking, it was very important that the place be a university that had a PhD programme, because mentoring actually is very important to me. I knew exactly what type of lab I wanted to compose, that it should include everything from undergraduates and graduate students, to postdocs and even staff scientists. I knew that there were only a few universities around the country that would fully enable that. When I decided to apply to Rice University, among other universities, it filled all of those criteria. The institute at Rice University had a PhD programme, with students deeply within the tradition, as well as a strong research infrastructure.

How was the transition to becoming a group leader?

The transition was a whirlwind. When I was finishing up my postdoc with Marianne at Caltech, Rice University told me about an exciting cancer-related grant that I could apply for to help my transition into building my lab. When I won that grant, it was a huge motivating factor in helping make my transition smooth. When I arrived, I was lucky to have a very nice lab manager at Rice University to help me physically get the lab up and running. However, the transition was also really fun, because I was planning the lab and finding some of the first students who were going to join. So overall, the transition was fun, fast and exciting!

Do you have a best and a most challenging moment from that time?

I think there has been a series of great moments – anytime that I've had a trainee either join the lab or succeed in something that they need to do along their journey, especially after they've gone through a challenging time in writing one of their reports, or writing or passing their candidacy exam. The moments where I could help them get through those challenging times and celebrate their successes along the way have been the best and most rewarding thing thus far. Obviously getting cool data is always nice. But the cool data is generated by somebody who worked really hard to get it, and I really think those are the best moments.

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Can you summarise the research themes of your group at the moment?

At the moment, our research is quite broad. We study the development of the enteric nervous system, but that's a huge portion of the peripheral nervous system. We also look at how neural crest cells transition from a stem state to derivatives other than the enteric nervous system. So we study neural crest cell proliferation, specification and differentiation primarily into the enteric lineage, but we're also looking at their early fate decisions, when they are deciding between becoming either a pigment cell, a cardiac cell or a gut neuron cell. We also want to understand how, later on, after the cells are no longer neural crest stem cells, they are differentiating into specific derivatives like a neuron or glial cell, how they are maturing into those respective cell types and how the microenvironment allows them to do that.

How did you navigate the field to find your research niche?

I consulted with Marianne a lot about the neural crest field, what had already been looked at and what needed some attention in her opinion because she knows basically everything about the neural crest history and neural crest biology. I also wrote grants really early on in my postdoc with her, which really helped me to frame specific problems, or gaps in the field that I knew I could pursue with my own research at the time. These ideas were confirmed when I went to both national and international meetings and presented some of my preliminary work at the time. There, I got overwhelmingly positive feedback throughout the years about the projects that I was working on. A lot of people concurred that it was an area that was really lacking a lot of research attention. I also put my own spin on it: coming from a zebrafish background, there were very few researchers at the time who were using fish to understand this particular problem about development of the enteric nervous system. Knowing that there were only about three other researchers in the whole world with that

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same approach was a huge sign that I need to work in this field and try to move it forward.

In your opinion, what are most exciting areas in the field right now or future questions still to be answered?

Compared with what we know about the brain or the spinal cord, we know far less about the enteric nervous system. To me, the most exciting areas are the unknowns: we still don't understand the fundamental mechanisms of how the neural progenitor cell becomes distinct cell lineages within the enteric nervous system. For example, we know a little bit about the various subtypes of neurons that exist, but it is an embarrassingly small amount compared with what we know in the spinal cord or the retina, for example. And so the most exciting area to me is just the sheer vastness of the unknown.

You've already mentioned that you get really excited about the success of the people you are mentoring and about new people joining the lab. What has been your approach for getting new members into your team?

If somebody expresses interest in either rotating in the lab, doing an internship or some type of research experience, I take the approach that I'm going to take this person and have a mentoring relationship with them. I make sure that we are on the same page, not only about the science and scientific goals, but I also want to have a nice working mentoring relationship with the person.

How important do you think mentorship is in navigating an academic career?

It is the most important thing hands down because, for me, it was the one of the main reasons that I am where I am today, if not the reason.

What were the most important lessons that you have learned both from Jeffrey and Marianne about mentoring young researchers?

Jeff taught me solid scientific communication skills right off the bat. When I joined his lab as a trainee, not only was he super enthusiastic about the science and really happy to talk for hours about it, but he taught me how to effectively write both manuscripts and grants. To this day, I still use the grant and paper writing skills that I learned under Jeff. Besides that, he was a very wonderful mentor, because he relates to all his trainees as a human. He understands that life happens during graduate school, and that sometimes you need to let somebody just take some time to figure out what's going on in their life. To me, that's a huge mentoring trait that helped me as a trainee and I wish to emulate that as a PI. Marianne was just an overall excellent role model for showing me how one could get everything done while keeping their composure and really being an excellent example all around.

Did you have any additional mentors apart from those two throughout your scientific career?

Two in particular come to my mind. One is Johann Eberhart at UT Austin, who was a committee member when I was a PhD student. Not only did Johann teach me zebrafish embryological techniques that I still treasure to this day, but he has also provided encouragement along every step of the way since I have left UT Austin. He has given me both professional and scientific mentoring advice, as well as just being a colleague to listen in on things. Another mentor that comes to mind is John Wallingford. When I was a graduate student at UT Austin, I rotated in John's lab and learned a lot about robust science and how to communicate your science passionately. Over the years, he has always been very supportive of me, and I highly value his opinion.

What advice would you give to people starting their own lab?

My number one piece of advice is to not hesitate to spend your startup. Don't wait, don't save it for a rainy day; spend it to hire people and to buy things to get your research moving, because that's what it's for. It's to help get you off the ground and running into the research field as fast as you can go.

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Throughout your career, you've had two publications in Development – do you think that publishing in our journal helped your career in any way?

My first research paper as a first author was published in Development. It taught me the ropes of what it takes to fully get a study out from beginning to end. Because it was my first paper, I'm still quite proud of the study and what we discovered about random retinal progenitor cell proliferation and the timing of neuronal differentiation. I feel that publishing in Development has helped me along the way, because I still take the lessons that I learned when I was first preparing that paper with me today and I have carried them for all of my subsequent submissions, even now to this day.

Three of your papers, one of which is a collaboration, have been deposited on a preprint service before publication. How do you feel about the concept of preprints? And do you think that you will deposit all of your papers in the future on a preprint server?

Yes, I'm very optimistic about preprints. When they first came out, I was a little hesitant to put my work on a preprint server before peer review. But we finally just went ahead and did it in 2019. It was a great experience to disseminate our work faster, because that paper in particular was under peer review for several months. Our more recent work, now published in eLife, was also put on a preprint server to get it out fast. Speed was important because, first, the field moves really fast and it allowed us to get feedback from the community instantly. Second, the instant that I put that preprint out, I was contacted by several fellow neural crest researchers with either questions or suggestions, or just general comments. So I would absolutely advocate for publishing preprints, and we will continue to do so in my lab, as long as all authors agree, of course.

In 2019, you became a Choose Development faculty and research mentor for Choose Development undergraduate fellows via the Society of Developmental Biology. Why did you decide to become a mentor for this programme? And, as a PI, what have you taken away from being a mentor to undergraduates?

I had a student working in my lab for a summer, named Jessa. Meanwhile, I had a colleague over at UC Davis who had been raving about this Choose Development programme and she had her own Choose Development mentees. Then when I saw the call from the Society of Developmental Biology (SDB) about applying for the programme as a mentor and hosting a student, I knew that I could be

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a good mentor for Jessa and had her apply for it. Knowing that my colleagues were also part of the programme and had trainees in it made me think it was a great fit. And SDB agreed and chose Jessa and me as a mentor-mentee pair, and it ended up being a really great experience for both of us.

Last year, you also became a co-founder and co-chair of the Neural Crest Research Colloquia (NCRC) virtual series. Please tell us more about this series, how the idea came about and what you are trying to achieve with it

The series is, broadly speaking, about neural crest cells. Essentially, I noticed that there was a huge need in the community during the pandemic to bring together neural crest researchers in a speaker platform. Not only did this mean that we could continue to share our results with each other across the globe, but it would also allow young investigators or newcomers in the field, who are not as well known, to share their research on a broader platform. When the co-founders and I were deciding to put this together, we just rolled our sleeves up, figured out the first cohort of speakers that we wanted to invite and sent invites. All of the people we invited were very happy to give a talk, and we have had an overwhelmingly positive response. Now we've just wrapped up the first season of the NCRC speaker series and because of the tremendous interest from other people who wanted to speak, we will actually continue this series for the 2021/2022 academic year. So stay tuned!

Did you ever consider an alternative or non-academic career path?

I've already mentioned that I used to be pre-med so, before graduate school, I was considering going to medical school – but I also had some other ideas, none of which were ever serious. I had also considered going into a completely different field, the arts, but that never happened because I became obsessed with genetics and developmental biology, and the rest is history.

Finally, is there anything that development readers would be surprised to learn about you?

Yes, I am a twin!