

CONVERSATION

Early career researchers: an interview with Graham Scott

Graham Scott is an Assistant Professor at McMaster University, Canada, where he studies the integrative biology of how animals cope in challenging environments. He received his Bachelor's degree in biology before completing a Master's degree with Trish Schulte and then a PhD in 2009 with Bill Milsom at the University of British Columbia, Canada. He moved on to continue his postdoc training with Ian Johnston at the University of St Andrews, UK. Scott received the Animal Section Presidents' Medal from the Society for Experimental Biology in 2012, he was an author on the Journal of Zoology Paper of the Year in 2015 and he was awarded the Robert G. Boutilier New Investigator Award by the Canadian Society of Zoologists in 2017.

Where did you start out in your research career?

I did my PhD at the University of British Columbia (UBC) in Vancouver with Bill Milsom, which meant that I had the good fortune of studying bar-headed geese, a species that flies across the Himalayas during their migration between south and central Asia. I got to study their various respiratory and cardiovascular mechanisms for coping with low oxygen while they are flying at high altitudes. My PhD was largely based in the lab and we worked on high-altitude animals that were raised in captivity, which we compared with low-altitude birds in captivity. I also had the amazing opportunity to go and do fieldwork during my PhD. That was more of a collaborative effort and it was fantastic, because we went to a beautiful part of west central Mongolia, about 500 km west of Ulaanbaatar on Terkhiin Tsagaan Lake, and worked with a great group of researchers in an area that few people get to explore. We went there because there were large breeding colonies of bar-headed geese. It was a great place to access the birds, to be able to instrument them and measure various aspects of their behaviour and physiology while they were actually carrying out their migration.

Who inspired you to follow a career in research?

I started where I am situated now, at McMaster University, Canada. I did an undergraduate thesis with Chris Wood and he inspired me to stay in research because I loved my undergrad experience so much. It set me on the path to where I ended up, so I owe him a lot for getting me interested in how animals work and how they cope with extreme environments. Then I did my Master's with Trish Schulte at the University of British Columbia, Canada. She was absolutely fantastic too and she really inspired a love in me for studying integrative physiology, right from genes and molecules up to whole animals.

What are you currently working on?

My lab is doing a variety of different things right now, but they all revolve around understanding how animals cope with low oxygen in their environment, and most of that work involves trying to understand animals that live at high altitudes. We are studying high-altitude deer mice as well as various species of birds that live in



Ron Scheffer

high-altitude environments. We are trying to understand what is unique about them, and what convergent strategies have arisen in different high-altitude animals that allow them to cope with the challenges of living at high altitude. We are also curious about how plasticity – environmentally induced changes – helps them to cope with those high-altitude environments.

You set up your first lab about 6 years ago; what do you remember about the experience?

It was really daunting when I started; it felt like I was given a set of keys and sent on my way. You don't get a handbook as a new faculty member on what to do, and what not to do, and how to set up a lab and recruit students. It felt like it took a little while until I was confident that I could do the job, and this is something that many of my young colleagues feel as well. I think it takes a year to a year and half before you can convince yourself that you can even do it. I just took it one day at a time and slowly worked towards setting up a lab. It was hard because I needed to go and buy all of the equipment that I thought I would need for the next 5–10 years without really knowing exactly what I was going to be doing. I needed to start recruiting students, but I had competing desires to take on lots of students and ramp up my lab quickly, but also not to rush into anything and take on anyone that maybe wasn't quite ready. It was tough. And I was writing grants at the same time, so it was an exciting time – which is funny because in hindsight I feel like I miss those days – but I remember it being very daunting as well.

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What would you do differently?

I think there were certainly some mistakes that I made starting out, which mostly arose because I rushed into things. I spent money on equipment that I thought I was going to need and rushed into making decisions because I wanted to get going quickly. One bit of advice that I would give to young faculty members is to relax and to slow down a little bit because I feel that I made a few rash decisions and I could probably use some of the money now, which I spent early on, on something else. I also happened to luck out and get a lot of great students when I started; I think that was probably the most important thing, getting good quality people in my lab, not just for productivity and getting my science going, but also for having a fun time and creating a great social group and work environment where everyone likes to come in to do science.

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Your spouse also has an independent research career – how do you manage the two-body problem?

Firstly, I think the most important thing to me is that I love research and I love my job, but work is only one part of my life and it is really important to strive to promote all aspects of life. My spouse is incredibly important to me, so when we make decisions that impact one another we always do it with the other person in mind, and that has often required that we make sacrifices for each other. When we make decisions we don't necessarily make them for what is best for our individual research careers, we make decisions that are the best for both of our careers, and what is most important for our family, now that we have little kids.

We met during our PhDs in Vancouver at UBC. When it came time to figure out where we went to do our postdocs there were a lot of places that we both wanted to go where there were no opportunities for the other one, so we had to find postdocs in a place where we could both do something that would help us move towards independent research careers. That wasn't easy, but I think it ended up working out quite well. We didn't want to live apart and we didn't want to spend years going to the ideal place in pursuit of a job; we wanted to live our lives together and so that is the kind of thing that we had to do. We both had excellent postdoc experiences that we really enjoyed. I had a great time at St Andrews, UK, while my wife Angela did a postdoc at the University of Edinburgh, UK, so we didn't work in the same city and had longer commutes as a result. It wasn't easy and it doesn't get any easier when it comes time to finding two faculty positions in the same place, but I think it's worth it. My family is the most important part of my life, so that does dictate a lot of decisions for me.

When your youngest child was born, you decided to take parental leave – what effect has that had on your career?

I think it has been fantastic. When I was on parental leave with my son, I had a lab, I had grad students. In fact, I had a couple of grad students who were brand new. Even though I was taking parental

leave and I was devoting all of my time to making sure that my son was cared for, I also had several trainees that relied on me as well; there were things I couldn't walk away from. It meant that every day I bundled up my son into the car and we drove into the lab and came in and walked around with the stroller and visited my students to get up to speed on what was going on. My son wasn't even a year old and he was spending time hanging out with my students. It gave me the opportunity to spend a lot of one-on-one time with him, but it also meant that after my son went to bed I was madly writing emails from 9 to 11pm just to stay on top of things. That is the juggling act we do. I wouldn't have not done it for the world and I don't think it had much of an impact on my career or my professional development because a lot of the things that I didn't do during my parental leave weren't essential to my research productivity. The most important thing was that my students and lab kept working. I just needed to make sure that things just kept going on their own.

Earlier in your career you contributed to Outside JEB – what did you gain from the experience and would you recommend it to anyone else?

I would absolutely recommend it to anyone, it was such a fun experience. On the one hand, it could be a little bit stressful at times to find appropriate papers that I was excited to write about, but on the other hand, I think it was a really good experience to be thinking broadly about what might be interesting to comparative physiologists in general. Probably the greatest value I got from the experience was going through the process of writing the articles. It was really great to learn how to distil the message in such a way that it was clear, but accessible, to a broad audience. I think the skills I gained in that process are really valuable for grant writing, and for writing anything where you need to communicate with the general public. I think it is a great experience.

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You received a JEB Travelling Fellowship in 2007; how did that award help your career?

It was great and so much fun because it allowed me to do research that had nothing to do with my PhD. Chris Wood invited me to be part of a project to study the mechanisms of hypoxia tolerance in fish from the Amazon. He suggested that I apply for a travelling fellowship from JEB. Bill Milsom was quite happy for me to spend a little bit of time doing a different project if I found my own money; as it was totally unrelated to my PhD I didn't feel that it was appropriate to ask him to pay. Having the opportunity to apply for that independent funding and be part of a research expedition was great. Those sorts of opportunities are really important for developing independence and developing a research program that goes beyond a single project. As a trainee, it is really valuable to get experience outside of your primary project because it starts to develop a coherent research program. For me that was great, because most of the work that I do is focused on studying animals that live in low-oxygen environments. Some of that work is on fish, which is partly as a result of those early experiences. It [the JEB Travelling Fellowship] gave me an opportunity to meet and collaborate with people such as Dal Val and Vera Almeida-Val in Manaus, Brazil, who I still collaborate with. It was a fantastic opportunity.

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In your opinion, what are the pros and cons of Open Access publishing?

I am of two minds about Open Access publishing and I haven't decided how I feel about it. I think it is great for science to be openly accessible, particularly in parts of the world where libraries don't provide the level of access that I have at my institution. But one of the things that troubles me a lot about the Open Access system is that we don't get any extra money from our research grants to fund Open Access publishing. In fact, I think most researchers feel that there is less research money out there so it has become really hard to afford publication fees. It used to be that the money for providing access to journals was in the hands of the universities, but now it is expected to come from research grants. I think that is fine for people who have big research grants, but it hinders the ability of researchers with smaller grants to get their work into those Open Access journals. If they are also the most highly sought after journals, then you could see it developing into a two-tier system where only those with money are getting high-impact publications, which doesn't seem to be really ideal for science when money, rather than ideas and discoveries, buys high-impact papers. I am troubled by Open Access publishing and I'm not sure how to resolve the issue of making access to the literature universal without overburdening researchers with the costs of publication.

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Scientists often travel to remote locations; how can researchers cut their carbon footprint?

I struggle with that. I think it's one of the challenges to doing the type of research that I do. On the one hand, I think it is great to study animals and to learn about how they live in challenging places and to provide that knowledge to the general public, because an appreciation of animals is good for conservation and biodiversity. But on the other hand, there is a carbon footprint cost. I think there are a lot of ways that we can reduce our carbon footprint; while we are on the ground, it is not hard to be self-reliant in the field and to have minimal impact. I think the carbon cost of flying is something that is hard to get around. One of the things that we could do, and have done, is to recruit a lot of help from the local community. So, rather than bring in all of the help that we need, we often recruit locals that don't have to travel long distances; that is also a huge benefit to local communities. A lot of times we are providing people with a valuable source of income and we have also interacted with local students, which provides a valuable training opportunity for people that we are working with in their native countries.

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If you were cast away on a desert island, which of your favourite papers would you take with you?

I think there were some great early papers on high-altitude deer mice that I absolutely love, where they look at the role of haemoglobin in high-altitude adaption: Lee Snyder and Mark Chappell were involved in that work. I also really enjoyed the initial series of papers where Weibel, Taylor, Hoppeler and others first started introducing the idea of symmorphosis, kind of a classic idea that for many reasons we have come to think is not always correct, but I think the idea got people thinking a lot about how respiratory systems work, how they evolve and how they change in different animal groups.

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