

CONVERSATION

Early-career researchers: an interview with Philip Matthews

Philip Matthews is an Assistant Professor at the University of British Columbia, Canada, where he studies the respiratory adaptations of animals. He received his BSc with Honours from Adelaide University, Australia, in 2003 before completing his PhD with Roger Seymour, also at the University of Adelaide, in 2008. He then completed two postdocs with Craig White at the University of Queensland, Australia.

How did you become inspired to study science at university?

I think I have always been a biology nerd. Some of my first memories are of looking at bugs on the ground or catching mosquito wrigglers out of a bird bath with a spoon; but this interest never really went away. As I was going through school, the subjects that I enjoyed the most, and did the best at, were science and biology. I am from Adelaide in South Australia; it was an idyllic place to grow up – very hot summers with cool, wet winters. There was lots of interesting wildlife close at hand. I remember finding an ootheca, the egg case, of a praying mantis. I took it home and I put it in my natural history collection, thinking that it was empty. But when I came home from school one day my desk was swarming with tiny little praying mantises. My mum and dad were very good humoured about it; they encouraged me a lot. Mum was an editor and worked at a printing company in Adelaide that produced a set of encyclopaedias. I read the natural history edition all the time, flipping through until the spine fell off. My dad was a chef; he was big on growing things in the garden and cooking them. In primary school I did general science, and in high school I wanted to focus on biology, so I did that and chemistry. Strangely, I never did physics, which, in hindsight, is a big regret.

How did you decide which undergraduate degree to pursue and which university you would like to attend?

In a lot of countries, people think that as soon as you go to university you move across the country to another city. In Australia, you tend to stay where you are from. For me that meant that I went to Adelaide University. Initially I wanted to do something in marine biology until I realized that I would be limiting myself to studying one system; if I studied zoology, it wouldn't matter where the animals live. In the third year I took a course on ecophysiology and that was my 'aha' moment. Ecophysiology combined everything that I was interested in: it described how animals work. Roger Seymour taught the class and he went on to be my honours and PhD supervisor. It was one of those courses that you really looked forward to; you knew each lecture was going to be interesting, that it was going to blow your mind. It included lectures and practicals where you performed real physiological experiments.

When did you discover that you wanted to do research?

After finishing the third year I wanted to try research. I had signed up to do an honours year at the end of my BSc, so I took a volunteer position in Roger's lab during the summer before. I got to know Craig White, who was a PhD student of Roger's at the time. I helped him with his PhD work on the cost of burrowing in spinifex hopping mice (*Notomys alexis*). We figured out ways to get them to burrow in



a sand filled tube and recorded how much sand they were moving while doing respirometry to get the cost of digging. It was a neat little project. It brought home to me that doing research engages your practical side. You have to be able to build things, to troubleshoot, to solve little problems. Every day you went in and knew it wasn't going to be boring. Then I worked with Roger on my honours project looking at the function of stomatal crypts on *Banksia* leaves, which got an award from the department: The John Bagot Medal for Botany. I really enjoyed working with Roger, so he agreed to take me on for a PhD.

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What did you investigate for your PhD thesis?

I decided that I wanted to get back to doing zoology. I was always interested in insects, so I wanted them to be a part of what I was working on, but I ended up doing a two-part project, half on plants again and the other half on insects. The two halves of the project were united by the fact that the organisms had been terrestrial at some point in their evolutionary history, but they had readapted to living in water. I looked at the adaptations that a plant, the sacred lotus, has to deliver oxygen to its submerged roots. In the other part of the project I looked at how carrying a bubble of air can allow

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diving insects, particularly diving bugs, to extract oxygen from the surrounding water and perform other functions.

Can you tell us about your postdoc positions?

Craig White came back into the picture during my first postdoc; he had just started his lab at the University of Queensland (UQ) in Brisbane. At the time he was putting together an Australian Research Council (ARC) Discovery grant. He was interested in working on insects and he asked if I would be interested in contributing to the grant as a postdoc fellow. That meant that I spent 3 years in Brisbane working on episodic breathing insects. Toward the end of that postdoc I applied for a couple of lectureship positions, but I think my CV was still a bit too green; I got some polite rejections. At that time I also applied for a Discovery Early Career Researcher Award (DECRA); it was the first year that they were offered by the ARC. The funding was designed to help postdocs or early-career researchers establish their own research programmes. It provided a salary for a postdoc to work independently for 3 years and funding for their research programme. However, as I submitted my DECRA application at the end of my first postdoc, I had 6 months to wait before the awardees were announced. During this time, Roger needed somebody to help with his thermogenic flower work, so I moved back to Adelaide for a year. I was very fortunate that my grant application was successful so I was able to return to UQ and Craig's lab with my own funding for a further postdoc.

What was your strategy when you were applying for faculty positions?

I didn't limit myself to anywhere in particular. At one point I was thinking about going to Europe and I visited a lab in Berlin, which I thought might be interesting. When the University of British Columbia (UBC) job came up I was very aware that UBC had this great reputation for doing cool comparative physiology. My dad is Canadian, so I am a dual citizen, and Canadians get priority in recruitment, so I had all of the benefits of being Canadian without having lived there.

The interview was daunting; I had never given a job talk before. I gave a practice talk to some colleagues at UQ and the feedback was, 'You are going to have to do so much better than that'. I was worried, but thankfully, it was the best advice I could have received. I went back and polished it to a high gloss. When I arrived in Vancouver in December – it was grey, rain was coming in sideways and I was jetlagged – I went into 2 days of nonstop interviews. After the first day I was feeling good, but for some reason I had zero sleep that night. I couldn't have been more out of whack the next morning; I think I was running on coffee and adrenalin. It was really eye opening how intense the interview process was. At the end I booked a hotel in Vancouver and I went in and closed the door for 24 h to decompress. When I got back to Australia I had resigned myself to not getting the position, so when I got a phone call from UBC a couple of weeks later, I was expecting a polite 'thank you, but we've offered the job to someone else'. When they said I was their pick, I just about fell off my chair. My partner (now wife) was very supportive and agreed to move to Canada with me. We got engaged en route to Vancouver, during a short holiday in France.

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What are the main differences in style between research in Australia and Canada?

In Canada, PhDs can take 4 or 5 years or even longer. Graduate students here develop the skills to drive their own ideas; they have

more time and scope to explore a larger research area than you get in an Australian university, where you only have 3 to 3.5 years. In Australia you need to complete the project, so you are more likely to take a conservative approach to your research; you don't have the same latitude to start digging down and exploring different areas. My feeling is that given more time, you have more freedom and you can think more broadly, and that is going to be beneficial later on in your career. I guess the down side is that you are entering the job market in your early thirties as opposed to your late twenties. I was quite surprised by how many graduate students here are married; they are having families, which would seem a little terrifying to me given the uncertainty associated with being a graduate student.

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Vancouver is considered one of the most liveable cities in the world; what are the down sides to living in paradise?

Aside from the rain (if you come from Australia and don't like wet weather), it is a very beautiful city, but Vancouver is going through a massive affordability crisis at the moment. Over 50% of the houses in the suburb closest to the UBC Point Grey campus in west Vancouver are now \$3 million CAD or more, and the median house price in Vancouver is 11 times the median annual family income. Recently there was a newspaper article that said that affordability has officially hit crisis levels. The high prices also impact rental prices. It can be a very expensive place to live for graduate students and it can be daunting for new faculty looking to put down roots; for us, the thought of buying a house is just a dream. I think that Vancouver is an extreme example of what is going on in a lot of major cities around the world. The younger generation, millennials, don't have the same opportunities that their parents had to buy a house and settle down in the suburbs.

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Has the affordability crisis made it more difficult to attract students?

I think UBC is very fortunate – it has the draw of being an outstanding university in outstanding natural beauty. If you like skiing or hiking and mountaineering and want to combine that with studying, I think Vancouver still has a draw for undergraduates. But, if you look at the level above, at graduate students and early-career researchers, I think it is making retention an issue. If young people come here and they want to start a family and want to provide the same kind of environment for their kids that they grew up in – a house with a back yard – that is impossible. UBC has faculty apartments on campus and thankfully you can rent them indefinitely. We have been in a two-bedroom UBC apartment since we arrived. My wife and I have a son who is nearly 1 year old and it is OK for now, but as he gets bigger and more boisterous it

may not be enough. UBC has been building apartments on their endowment land, but their emphasis has not been on family apartments. If you are single or a couple with no kids there are tons of apartments, but the availability of family housing on campus is a bit of a problem that has yet to be addressed.

What is your experience of teaching?

I teach a large third-year course in biomechanics for 250 students. I also teach a module on techniques for measuring metabolic rate, as well as leading a seminar course where first-year Master's students meet with a guest seminar speaker and discuss the visitor's research.

Developing the lecture materials was a challenge. UBC hired me to replace a biomechanist who had retired, so they offered the biomechanics course to me. The down side was that I had never taken a biomechanics course or taught a course of this size. I was given the existing lecture materials, but I could not modify them to my satisfaction, so I started rebuilding them from the ground up. I spent a lot of time putting together slides and practice questions. When I arrived at the university, I only had two-thirds of the lectures in the bag. I was trying to write the end of the course while I was teaching it. Looking back, I think I wouldn't try to do everything at once; you need to have a well thought out base, but since you are going to be teaching it over multiple years you can refine and develop it as you go along. Also, look at it as an opportunity to learn new things. Having taught the course for a couple of years, I now find myself looking at research questions with my biomechanist's eye. Teaching the course has exposed me to a field that I had never really appreciated before.

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What has your experience of setting exam papers been?

It is challenging. I was still fairly fresh to a lot of the material the first year that I did it, so I was probably thinking more critically about how well the students were going to understand the concepts, what questions they would find difficult. As you go on, I think that you start to develop 'expert blindness', where it becomes less apparent why something was difficult to begin with. It is important to cast your mind back to when you were first trying to get to grips with this material. Perhaps write notes when you are going through it for the first time to identify material that is likely to trip you up and to identify where the challenges lie.

Do you make your own equipment in house?

Thankfully, we have an excellent Zoology workshop which has helped me to construct pieces of equipment, but I don't know how

long that is going to continue. The two fantastic technicians are close to retirement age. I have been trying to future-proof myself against this loss by investing in 3D printers and desktop computer numerical control (CNC) machines, which are essentially robotic milling machines. I usually ask the workshop to fabricate little Perspex chambers for me – I need them for respirometry or fluid analysis. Now, when I need to build something, I produce a tool path that tells the CNC mill how to machine out a block of plastic. Essentially, if you can draw it, you should be able to build it with this set-up.

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What is your favourite science book?

Can I have two? One is 'Measuring the world', by a German author, Daniel Kehlmann, about Alexander von Humboldt and Karl Friedrich Gauss and their very different approaches to understanding the world. Humboldt travelled and exposed himself to all kinds of uncomfortable situations, whereas Gauss stayed home and explored his mind. The other is 'Longitude' by Dava Sobel, which is about John Harrison's marine chronometer. Even though he was a carpenter, an outsider with no formal training, he could see a solution to the intractable problem of calculating longitude at sea. He built the most accurate time piece of that period and expanded human frontiers by allowing us to travel the globe freely.

Tell us one unusual fact about yourself.

This story happened when I was studying the thermogenic flowers of the giant water lily at Stellenbosch University, South Africa. I was in the Botanical Garden at night, because that is when the flowers bloom, and I accidentally triggered the alarm system. That summoned an armed security team to investigate what I was doing in the garden. Seeing the torches jogging up the path was a kind of 'Oh no!' moment. The director of the Botanical Garden had given me access to the visitor centre so I'd have somewhere to sleep in between taking measurements, but I mucked up punching in the code to disable the alarm. He was cool about it, but it was a slightly alarming situation to be in.

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