© 2018. Published by The Company of Biologists Ltd | Journal of Cell Science (2018) 131, jcs225607. doi:10.1242/jcs.225607

CELL SCIENTISTS TO WATCH

Cell Scientist to Watch – Siobhan Braybrook

Siobhan Braybrook completed her undergraduate studies in plant biology at the University of Guelph (Canada) and moved to California for her PhD with John Harada (UC Davis) on the transcriptional control of plant embryogenesis, awarded in 2008. Siobhan then joined the laboratory of Cris Kuhlemeier in Bern, Switzerland, with a National Science Foundation postdoctoral fellowship. In 2013, she established her own research group as a Gatsby Career Development Fellow at the Sainsbury Laboratory in Cambridge, UK, to focus on plant cell wall mechanics and organ growth. The Braybrook laboratory moved to the University of California, Los Angeles in 2017, where Siobhan was appointed Assistant Professor of Molecular, Cell and Developmental Biology. Her research group focuses on cell wall mechanics and the coordination of cell shape and tissue growth in plants and algae.

Siobhan Braybrook

What inspired you to become a scientist?

My father is a horticulturalist and I grew up in Canada with lots of outdoor space. We spent a lot of time outside, sometimes helping him with his work, but also just looking at the world. He was incredible at pointing out and noticing things in nature and in the world. I know I internalised that because I do the same today – my partner tells me that when we are walking around outside it's actually impossible to have a good conversation because I'm always going 'oh look at that!', 'oh this over here!' It's not surprising that I have this love for shapes and forms, and that plants then became my scientific passion.

What questions are your lab trying to answer just now?

We mostly work in plants, but also in brown algae or seaweeds. Their common feature is the cell wall – the boundary of each cell and, because of the multi-cellularity of the organism, the connection to all other cells. Therefore, you have to have growth coordination, and our big question is how the cell wall material changes to permit or restrict cell growth. In other words, you want to expand and you are inside a box, so the box has to change to allow you to expand. What are those changes biochemically and how do they affect the mechanical and material properties of that cell wall that relates to its actual change in shape? Ahead of that is understanding what the genetic and hormonal cues are that trigger those changes to occur. Then we are exploring how you get directional cell expansion, especially in a multi-cellular context. It's not just the information that a cell itself has, but its neighbours could influence its growth direction as well, both within and between tissues. From that, we get the questions of how a cell chooses its direction of growth, or chooses not to grow and why, and why that might actually be important for the function of the cell or that of the entire organism.

You use atomic force microscopy (AFM) to look at the mechanics of cell shape changes. Has this method been key for your career?

AFM definitely is one technique that has been revolutionary in our ability to look at *in vivo* mechanics at a cellular level. Before, we looked at whole organs by measuring bulk properties of a tissue; therefore, getting the resolution we can get with AFM has really changed a lot of things and the questions that we can ask as a field. But it is important to realise that, just like any method, it has pluses and minuses. There's still a lot we don't know about how the data relate to the processes of growth. People now look at elasticity – as for an elastic band that you stretch, you let go and that automatically snaps back. It's an instantaneous change in shape when force is applied. But that's not what growth is, or what a cell would normally encounter as a force. You'd rather have to study visco-elasticity, and we are developing methods now with AFM to look at that on a cellular scale, too. With methods, we have to be continually asking ourselves 'Is this the best way to do it?', 'How do we understand what we get out of it?' and 'Is there a way we can push it to ask new questions as well?'

What are your other approaches to answer your questions?

Most recently we have been looking at growth from a biochemical perspective through mathematical modelling. If we start looking at the cell wall as an energy storing system that has different types of bonds within it, and think that these bonds can take different amounts of forces, the distribution of how many 'tough' and 'soft' bonds you have seems to have a really big impact on the ability of a cell to grow in our models. As a consequence, we are now asking how the activity of factors like the pectin-modifying enzymes, expansins and xyloglucan endotransglucosylase/hydrolases (XTHs) for remodelling the cell wall bond network affects cell wall mechanics. This is an example of our modelling work leading to experimental hypotheses.

What challenges did you face when starting your own lab that you didn't expect?

I guess it is very similar for many people – you have no idea what to expect and you certainly haven't been trained on how to do it. You get a job based on your ability to do science, and then you are expected to do many additional things that are quite removed from that. I was very lucky to get the five-year position at Cambridge in the Sainsbury Laboratory. Their Career Development Fellowship

Siobhan Braybrook's contact details: 5121 Teresaki Life Sciences Building, 610 Charles E Young Drive South, Department of Molecular, Cell and Developmental Biology, University of California, Los Angeles, Los Angeles, CA, United States.
E-mail: siobhanb@ucla.edu

Journal of Cell Science (2018) 131, jcs225607. doi:10.1242/jcs.225607

Siobhan at the age of four with her father: "It captures the wonder for the natural world he instilled in me with the big 'If' in the background – What if?".

granted me a lot of freedom and support to explore what I wanted, including mentoring and being surrounded by a group of interdisciplinary people. The Sainsbury lab has all the equipment, so you don't have to go through the business of setting up a lab – although I have just done that in moving to Los Angeles. Cambridge was a wonderful opportunity for me. I had already worked as a very independent post-doc with Cris Kuhlemeier (Bern), and I came into my job in Cambridge with a large amount of preliminary data that I had been developing in the environment that Cris had created.

You mentioned interdisciplinarity – is that something you've implemented from the beginning in your group?

In Cambridge, we were very diverse as a group – we had an engineer, a mathematician, a physicist, an ecologist, a molecular biologist and a cell biologist! It was challenging, but also fascinating. I believe they found it very interesting, and learnt so much from each other, because they were simply very curious about the problems we were looking at. I think the hardest thing about all of it was learning how to manage people, and I'm still trying to do that. You realise what motivates you doesn't motivate other people and so navigating management is a challenge. I think the biggest mistake one can make in the beginning is hiring your first person purely based on skills. If you take your management role seriously and you are invested in the people, then hiring people for whom your lab is not a good fit is so much more work than not having them at all. The best thing is to be very conscious and slow. You can teach people skills, but you can't teach them the soft skills that end up being so much more important – how they think about science and how they deal with experiments that don't work and unexpected results.

Are you still doing experiments yourself?

I still do a lot of AFM. I think it's because it is a very particular skill that people think they want to learn; then they start and they don't like it [laughs]. In general, when it comes to experiments nowadays, it's hard for me to do every single step, and my lab steps in and saves me all the time when I suddenly have to rush off for a meeting. I value that so much and hopefully they don't hate it too much! It's even harder to get some time at the bench now that I'm in Los Angeles because of the committee service, teaching and grant writing here that has increased a lot compared to Cambridge.

> **"You can teach people skills, but you can't teach them […] how they think about science and how they deal with experiments that don't work and unexpected results."**

You've studied and worked in many different places and countries. Is such an experience advantageous to the management side of running a research group?

I had the opportunity of experiencing different ways of doing and thinking about science. That's great, because it allows me to understand people in different places who I might be collaborating with, but it was also inspiring to see things done differently elsewhere and then use it in your lab. I understand what it is like to be a person who is in a country that is not their home, which happens all the time in science; being a foreigner is a very specific experience. Also, it's interesting to be back in the US. It's a different way of doing science here, very intense. I prefer to focus on productivity rather than quantity of time that people spend in the lab, which I think is something I learned in Europe. Not everyone needs to be in the lab 16 h a day in order to get a lot done. Some people do, but not everybody. So people have different things they need to do in order to meet their own, and my, expectations. I think I allow more flexibility because I've seen different ways of doing science.

> **"…continue to do what you do and the possibilities are immeasurable for what it could do for the world."**

How do you achieve a work–life balance when you're trying to establish yourself as an independent investigator?

To be honest, I used to not believe in a work–life balance! My work was my life. When you are doing your PhD and post-doc, your peers are your friends because you've gone somewhere new and these are the people you know. You all do something similar, so it's really easy for work to become everything. Now, what I know for me is that physical exercise is an absolute must. Every day, I do an hour's worth of physical activity. It's good for my mind, it takes me away from my work and I think it's essential, and I really encourage people in the lab to think about using physical exercise as a way to balance their minds. I've made that part of my routine and it is essential for me – I don't give that time up for anything. Also, because I've moved around a lot, I found it difficult to develop a personal life – a partner, for example – when I didn't know if I would be staying somewhere. Now, I have someone who has become a large part of my life here, which has done some other things to the way I balance it.

What is the best science-related advice you ever received?

At the end of my thesis, I had a bit of a crisis of faith where I felt I should be doing more for the world, like join the peace corps or work in civil rights law. I felt like what I was doing wasn't enough. Then my PhD mentor John Harada told me that one never knows what the work will lead to – continue to do what you do and the possibilities are immeasurable for what it could do for the world. I don't work in medicine, I don't try and cure cancer every day, but there are ways within which the things that I do in basic cell biology might have applications. I might see those, or somebody else might.

Journal of Cell Science (2018) 131, jcs225607. doi:10.1242/jcs.225607

So do the work, get it out there, have your eyes open, encourage others to have their eyes open. That is what I learnt from John.

Could you tell us an interesting fact about yourself that people wouldn't know by looking at your CV?

I almost didn't go to university – people expect that academics have this path where they know they'll go to university and of course they'll do a PhD. But that's not the case for a lot of scientists. I was going to be a hairdresser and I was really happy about it! University is very expensive and I wasn't interested in accruing debt. However, a family member passed away and left my parents some money and they were able to support my education. I went, and this is where I am now, but it could have been very different. Still, I have a natural aptitude for hairdressing! I think hairdressing is fascinating and I cut friends' hair every once in a while and it's really fun!

Siobhan Braybrook was interviewed by Manuel Breuer, Features & Reviews Editor at Journal of Cell Science. This piece has been edited and condensed with approval from the interviewee.