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CELL SCIENTISTS TO WATCH

Cell scientist to watch – Felicity Davis

Felicity Davis studied Pharmacy and then pursued her PhD, working on intracellular Ca^{2+} signalling in breast cancer metastasis, with Sarah Roberts-Thomson and Greg Monteith at the University of Queensland, Australia. She then joined the lab of Jim Putney at the National Institute of Environmental Health Sciences (NIH/NIEHS) in North Carolina as an NIH Visiting Fellow to study physiological functions of store-operated Ca^{2+} channels. Felicity then completed a second postdoc with Christine Watson at the University of Cambridge, UK, where she investigated the differentiation potential of mammary stem cells using single-cell lineage tracing. She set up her independent research group in Australia as an NHMRC Fellow in 2018. Since 2021, Felicity has led a lab at the EMBL-Australia Node in Single Molecule Science in Sydney and a team at Aarhus University in Denmark, funded by a Novo Nordisk Foundation Young Investigator Award. Her two groups use advanced imaging and novel mouse models to explore roles for intracellular Ca^{2+} signalling in mammary gland development, function and disease.

The Ca^{2+} signalling lab in Aarhus, Denmark. From left to right: Emma Paydari, Mathilde Folacci, Valentina Rodriguez Paris, Felicity Davis, Krystyna Gieniec, Silke Chalmers, Laura Bjerre Andersen (absent: Trine Lund Ruus).

What inspired you to become a scientist?

I went to a state school in the outskirts of Brisbane and was fortunate to have an amazing high school biology and chemistry teacher. I really loved those classes! But in the classroom, we learnt facts from textbooks. At some point during my studies, there was a transition from exploring what is known to exploring what is not known. It is *this* space (where we begin to ask questions instead of being handed answers) that really fuelled my passion for science. As discovery scientists, we get to come to work each day and ask fundamental questions about life and the universe, and this is what (through the many challenges of academia) keeps the fire going.

You're a pharmacologist by training. Do you think this has in any way shaped the type of researcher you became?

Yes, but I'd first like to emphasize that I love discovery science and this is where my passion lies. Pharmacy was a great undergraduate degree, but I think I knew fairly early on that I didn't want to spend the rest of my life as a pharmacist. My background in pharmacy, however, has helped me to understand where the discoveries that we make in the lab could one day lead, and this perspective is incredibly useful. It also highlighted to me how research on women's health has been neglected, which played a major role in shaping my current research agenda.

What is the main theme of your lab's research and what questions are you are trying to answer just now?

I started my lab with a focus on mammary gland biology, but we've recently spilled over into a few different fields. We currently have projects on mammary physiology, breast cancer, sperm production and immunology. The common ground for us, however, will always be Ca^{2+} signalling. In our mammary work, we explore how cells receive and decode cues from their environment through Ca^{2+} signalling. In this space, we always have a new idea or a new question to explore, and the mammary gland will continue to be a central theme in my lab, due to my dedication to female physiology and women's health research. The spermatogenesis project, on the other hand, came about because we started chasing an unexpected phenotype, and maybe also because I love going off on a tangent and disrupting other fields of biology! The immune cell project started through a collaboration. Generally, I try to collaborate only with scientists with strong integrity, who are kind, curious and (hopefully) a little bit of fun, so when such a person approaches me and asks me to do something a bit out of the box I almost always say yes!

In your research, you apply a number of advanced approaches, including quantitative imaging, mouse models with genetically encoded Ca^{2+} sensors, and organoids. In your view, is this the best time in history to study the biology of organs such as the mammary gland?

In terms of research tools and technologies, I'd say it is the best time to be in science! We now have the capacity to study cells and tissues with breathtaking clarity in space and time. It is mind blowing what we can do, and doing it is a lot of fun. On the other hand, with our work on female biology, I often catch myself thinking 'how do we not know this already?' or 'why are we only just thinking about this now?'. The time to ask these questions was decades ago! There is a lot of catching up to do in this space.

Your research on the mammary gland has appeared on several journal covers (including Journal of Cell Science). Is producing aesthetically beautiful images and videos something you especially enjoy about your work?

Yes, it is definitely one of my favourite parts! It is incredibly fun to sit behind a microscope and explore the communities of cells in the

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The Ca^{2+} signalling lab and visitors dress up as fluorescent protein donating jellyfish for an 'under-the-sea'-themed summer party at Aarhus University.

body. Capturing a striking image draws on one's creativity. Sometimes people see scientists as fairly analytical creatures (and of course that side is important too), but actually scientists rely heavily on their creativity. It is what leads us to ask the next big question, to write a great manuscript or to give an engaging presentation. These striking scientific images, however, don't just help us to explain our science to other scientists, they help us to engage with the public. One of my goals over the next few years is to develop a large museum exhibit in Denmark dedicated to female biology. Scientific imagery will be a cornerstone of this exhibit, and we think that this is a really great way for the public to understand what we are doing and why we are doing it.

You have labs in Aarhus University, Denmark, and also at the University of New South Wales in Sydney. Could you tell us a bit about the reasons for setting up two labs, which also happen to be really far apart geographically?

I get this question a lot! I set up my lab in 2018 in Queensland. I had a small but fantastic team of researchers, and we were very happy as a group. But the truth is, we never quite fitted into the larger institute culture – in terms of our research questions and style, but also our ambitions for equity, diversity and inclusion (EDI). I knew that I needed to find a new home for us, and as it happened, I got two offers at the same time. The opportunity in Denmark, which was generously supported by the Novo Nordisk Foundation, would enable me to have more freedom in my science. But the opportunity in Sydney would allow me to work with an Institute Director (Prof. Kat Gaus) who I respected enormously and who unconditionally believed in me as a scientist. I couldn't decide. And then I thought – why should I? I enjoy doing things that are a bit different, so I think I created a job that was a bit different. Sadly, Kat unexpectedly passed away only a few months after I joined the department in Sydney. By that stage, however, I had made a commitment to my team there. So, here we are, doing things a bit differently – together.

How do you ensure that the two groups interact, especially considering the different time zones?

We have a system, which has been working well for us. I travel to Australia for a few months each year (during the Danish winter!). Most of the year, however, I am in Denmark and I meet with the team in Sydney each week for a virtual lab meeting. We communicate nearly every day on Slack, Whatsapp, email or Zoom. The Sydney team just visited Denmark for some research travel, and now both postdocs have fellowships that will enable them to do this regularly if they want to. We behave as a single unit and we are all great friends. We do video trainings for new techniques. We talk and collaborate on projects. We even send each other calculations to check! We are a fairly imaginative bunch and we find solutions to problems as they arise.

Do you have any 'lab philosophy' for running your groups?

Actually, we have about ten pages of lab philosophy! We have a lab ethos document (which heavily draws on one developed and shared by Dr Izzy Jayasinghe, University of Sheffield). It outlines who we are, what we strive for, how we treat others, how we treat our lab animals, the type of science that we do and how we collaborate with each other and outside labs. It prioritizes kindness over resilience, integrity over output and diversity over uniformity. Having all of this written down in one place helps to keep everyone on the same page. In my opinion, many conflicts in workplaces arise because there is a mismatch of expectations. So, we aim for clarity and transparency from day one.

"We also need to stop measuring success by exaggerated claims of translatability. Natural science, biomedical science and medicine should go hand-in-hand, not head-to-head."

Do you still have time to do experiments yourself?

I am currently in Sydney, and I am actually on a mission to do a set of experiments for one of our papers, which I am enjoying. For the first few years after starting my group, I did a lot of lab work. I used to joke that I was a lab head when the sun was up and that my 'Batman job' (the work I did after everyone went home) was being a postdoc. There was so much to do and, unfortunately, we didn't have enough hands. I also didn't want to overburden my team. I love being at the bench, but these days I'm slowly transitioning into the type of person who enters the lab and creates chaos because they don't know where the reagents are any more and have to ask for everything [smiles]. So, I'm now mostly in the lab to train people, particularly with mouse work. And, as I mentioned earlier, you can't keep me away from the microscopes!

You've recently received a Biomedicine diversity award. What do you think are currently the biggest hurdles to achieving inclusivity and diversity in the academic research system?

This is a really important question, because there are so many problems and such little action (at least by those who are in positions to change the system). I actually just wrote an article on this topic, where I discuss my views on inclusivity in a bit more depth (see https://doi.org/10.1038/s41580-022-00565-9). But to summarize, I think the biggest challenge right now is getting the leaders of our institutes to actively prioritize equity, diversity and inclusion. This will take their time, their money, their perseverance and (of course) a willingness to create disruptive change. It cannot be about forming another under-resourced and overlooked committee. It cannot rely on another women's network, nor another 'motivational' lecture by someone who has simply managed to survive in academia in spite of the sexism, racism or discrimination that they have encountered.

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“[…] the biggest challenge right now is getting the leaders of our institutes to actively prioritize equity, diversity and inclusion.”

You’ve been an organizer of the ‘Emerging concepts in Cell and Developmental Biology’ conference, where you set out to reimagine the scientific meeting, with diversity and inclusion as the focus. Could you talk a bit about that?

Absolutely, but first I should first say that this was a team effort and much of the reimagining came from an amazing scientist in my team, Dr Silke Chalmers. Basically, we looked at each element of a typical conference programme and asked, ‘why we do things that way?’. Is it the best way, the only way, or the only way we know how? It was an interesting exercise. Scientists are very good at refining experimental methods, but perhaps have been less progressive with the way they meet to discuss these experiments. From there, we took a Design Thinking approach. We made some small and some big changes to the usual conference template that enabled our event to be more inclusive. We are currently writing up a ‘how-to’ guide for inclusive and sustainable conferencing, so that the changes that we introduced at our small meeting in Denmark can become part of something much bigger.

If there is a single change in academia you could accomplish overnight, what would that be?

We need to broaden our view of ‘excellence’. This means looking beyond Cell, Nature and Science papers and start valuing and rewarding integrity, mentorship, allyship, kindness, collaboration and imagination. We also need to stop measuring success by exaggerated claims of translatability. Natural science, biomedical science and medicine should go hand-in-hand, not head-to-head.

Finally, what is something that people might not know about you by just looking at your CV?

Many people might not know how much I adore puns! I love annoying my group with them [smiles]. I’m that PI who stays late to re-name all of our instruments with punny names, has pun-based Halloween or Christmas parties, and who comes back from a conference with punny magnets (rather than travel magnets). I am a constant source of eye-rolling. But I wouldn’t have it any other way!

Felicity Davis was interviewed by Máté Pálfy, Features & Reviews Editor at Journal of Cell Science. This piece has been edited and condensed with approval from the interviewee.