Benjamin Schwessinger

Benjamin Schwessinger is a group leader at the Australian National University, Canberra Australia. His main interest is in plant-fungal interactions, particularly rust fungi important to Australian agriculture and ecosystems.

Tell us about your background. How did you first become interested in plant science and fungal interactions?

I grew up in the German (Bavarian) countryside with eight siblings where I was the only son not learning how to bake as part of the family bakery. At school I enjoyed most subjects but dropped biology as it was too 'fluffy' for me and I wanted to study food chemistry instead. But one day shortly before my final exams, I got sick and visited my doctor who told me she would study biochemistry if she had another chance because biochemistry describes life at the molecular level and this is so fascinating. This five minute chat got me to study biochemistry in Leipzig, Germany. There I had one lecture on photosynthesis and I was hooked on plants. I did an Erasmus year abroad at the University of Glasgow, Scotland, changed my degree to Plant Science, and never looked back.

I became interested in molecular plant pathology and ended up as Prof. Cyril Zipfel's first PhD student at the Sainsbury Laboratory in Norwich, UK. Here I focused on the recognition of conserved bacterial proteins by plasma membrane localised receptors in *Arabidopsis*: a very hot topic at the time. I went on to the University of California, Davis, working on the rice immune system with Prof. Pamela Ronald. I then decided to switch direction and tackle fungal rust pathogens of wheat, working with Prof. John Rathjen in Canberra, Australia. Long-read technologies were just taking off and opened a whole new dimension when studying these important fungi. I became drawn into the obscure and fascinating biology of polykayrotic fungi. It took me a long time to find the research area that I'm passionate about, but I am certain I finally have.

What is your lab working on currently?

Over the last several years we have pioneered technologies and approaches for studying polykaryotic fungi at individual nuclear resolution, allowing us to see the chromosomal and gene content of individual nuclei that share the same cytoplasm. Working with US company PhaseGenomics, we assembled HC libraries for wheat stem rust fungus P*uccinia graminis* f. sp. *tritici*, which contributed to a publication suggesting that Ug99, a highly virulent lineage of this fungal pathogen, evolved via somatic hybridisation by swapping nuclei*. Along the way we have shared all our protocols online. Our open science approach has been very rewarding overall, even though it can risk accelerating the competition.

We have several other ongoing projects, including detection of fungal pathogens via genomic tools. Over the last few years, we have also been working with our public health unit in Canberra to track SARS-CoV-2 genomics through the pandemic. It has been busy!

*Li F, Upadhyaya NM, Sperschneider J. *et al.* 2019. Emergence of the Ug99 lineage of the wheat stem rust pathogen through somatic hybridisation. Nature Communications 10, 5068.

Right: Rare moments at the bench.

What does a typical day look like for you?

I aim to go swimming in the morning three to four times a week. It is important to balance out work with activities that enable one to enjoy life whole-heartedly. From there I go home and get my son ready for school if he is with me, or go straight to work if not.

Work is pretty multi-faceted involving teaching, grant writing, committees, supervising students, reading and writing papers, managing budgets and contracts, talking with stakeholders, and of course emails. No day is like any other.

What do you most enjoy about your work?

I really enjoy enabling others to do better science and to have a real-world impact. This impact might be on people's personal lives, e.g. finding a job they enjoy and where they feel good about what they do; on communities, e.g. tracing SARS-CoV-2 through the pandemic; or anything in between.

Early on in my career I was more focussed on getting published in high impact journals, however I cannot really connect with this anymore. While getting published in top journals of course feels good, it is important to focus on the science that enables one to do the things that really matter.

What do you find most challenging?

Fitting in many tasks while trying to maintain high standards. While not a perfectionist, I desire to deliver on promises, especially when these really matter for people's lives. For a long time I did not appreciate how much time it takes to develop new university courses and to teach them well. Having designed three courses in the last 4.5 years has definitely shown me how challenging it is to combine good teaching with outstanding research. I admire everyone who can keep up a solid research program and good teaching across their whole career. It is a true feat.

> "I view science and academia as an ecosystem where all the parts work together to contribute to the betterment of humanity"

What is your lab hoping to work on in the future?

For the next three to four years, our focus will be on studying the wheat stripe rust fungus (*P. striiformis* f. sp. *tritici*) in terms of genome biology, host adaptation, population genetics, and interaction with the plant immune system. We have developed some additional tools for studying protein interactions in wheat protoplasts, and these tools will help us to identify fungal proteins recognised by the plant immune system. I look forward to working on this project with our collaborators from Denmark and Pakistan.

Over the past couple of years, my team has also been working on developing our own genomics protocols using Oxford Nanopore hand-held devices like the MinION. This has involved both applied research and training, working with stakeholders and end users. I am excited by the potential real-world impacts of this technology, and I hope to expand our efforts into the Pacific region by training scientists in neighbouring countries.

What advice would you give to aspiring scientists in this area?

Surround yourself with people who support you and truly want you to succeed for your benefit and not theirs. Think about your values (see Monaghan *et. al.* 2023) and find strategies to implement them. Read broadly beyond scientific papers in your area and beyond science. Reading some philosophy, social science, good fiction, indigenous literature, and such can be a real eye opener. Travel if you can as the West and its ideologies are limiting.

Who are your scientific heroes?

My everyday heroes are the cleaner, the administrators, the people working in stores, and all the staff that support science and academia in its functioning. Also, my university colleagues who teach and supervise students who go on to accomplish amazing things in so many professions. I view science and academia as an ecosystem where all the parts work together to contribute to the betterment of humanity.

I would also like to acknowledge many of the supervisors and mentors I have had the pleasure to work with. These include Lucio Conti, Cyril Zipfel, Pam Ronald, Josh Heazlewood, John Rathjen, Jürg Felix, and many more. I am thankful for their time as they all taught me something different and had a significant impact on the scientist I am today.

Left: Team Schwessinger, early 2022.

Selected Publications from SEB Journals

Monaghan J, Brady SM, Haswell ES, Roy S, Schwessinger B, McFarlane HE. 2023. Running a research group in the next generation: combining sustainable and reproducible research with values-driven leadership. Journal of Experimental Botany 74, 1–6.