



Alys Clark talks with Matthew (Mat) Simpson, Professor of Applied Mathematics at Queensland University of Technology (QUT).

He has worked at QUT since 2010, starting as a Lecturer in Applied Mathematics before being promoted to full Professor. Matthew's research focuses on mathematical modelling, uncertainty quantification and parameter estimation/identifiability, particularly in applications of understanding cell behaviors. In March 2022 he became the new Editor-in-Chief for the Bulletin of Mathematical Biology.

Can you tell us something exciting that you're currently working on?

I hold a project grant from the Australian Government with life scientists Nikolas Haass and Gency Gunasingh. They study melanoma biology, and part of their work involves growing tumor spheroids. They are looking at the distribution of cells within the spheroids, and cell cycle status (cells arrive through proliferation, get older, and then prepare for proliferation) and we can track their age with fluorescent labels. One of the things we're working on with my postdoc Ryan Murphy, is what happens when you grow a tumor spheroid in an environment that changes. For example, you might grow a tumor in a low oxygen environment and then bring it into a high oxygen environment. We are looking at how tumor growth is affected, and how the adaptation of cell behaviors within the tumor changes in response to that. I'm pretty excited about that work because it combines experiments mathematical modeling and data analysis.

You have done a lot of work on cell behaviors from quite generalized theoretical analysis to strongly applied studies. This must take a lot of collaboration. Can you give any advice for someone who might be new to collaborative research?

I think the advice would be to talk to people for a while, before you commit to working with them to make sure you compatible. There's lots of different people doing research in in different ways, and with different attitudes. It's hard to gauge compatibility at the beginning - in terms of what they want out of the relationship, what you you can provide, what you want, and what they can provide. The technical language barrier between different disciplines takes a lot of time and effort to make sure everyone is on the same page. So, take some time talking to people and make sure you're really thinking about things in a compatible way.

Can you recommend any good places to meet new collaborators, for example conferences?

I've met collaborators mostly face-to-face, which of course has been very difficult for the last couple of years. Usually I've met them at conferences or institutions where different types of researchers gather together. For example, here in Brisbane I'm part of a research institute called the Translational Research Institute. It sits behind a major hospital and so there's a lot

of clinical researchers that work there. I started to go there just to join in on seminar series, and that was a way just to see what people were working on. I gave a presentation and then began to talk to people at that institute. That's turned into long standing research projects.

I have done some work with researchers that I have not met before and that has worked quite well. This was 'electronic' - mostly through writing to people about their publications or just asking people for data or advice. But, I think if I were starting in my job again as a new Math Biologist I definitely tell the younger me to go to the Research Institute, sit in on the on the seminar series, and make sure you give a half decent seminar so people know what you do!

Do you have a favorite paper that you've written or that somebody else has written?

I guess maybe I have several! But the paper that I first read about Mathematical Biology, which really made an impact on me was a paper by Sherratt and Murray in 1990. It was about wound healing and described very, very simple wound healing data like rates of wound closing over time. They propose to use partial differential equations and they made it clear that they didn't really know what partial differential equation to use, as they use three or four different types. They show that many of the partial differential equations match the data, and so, for me, that really started to make me think about how biology works. I'm still coming back to those basic questions. I read the paper before I read Murray's book 'Mathematical Biology'. It was a very profound study, and some of the questions raised in are now 30 years old but still haven't been resolved, so I think it's pretty exciting paper.

Its recently been announced that you are taking over the Editor in Chief Role for Bulletin of Mathematical Biology. Do you have any plans for the journal in the near future?

We're definitely planning to keep all the good things that have been developed about the Bulletin, under the leadership of the old Editor in Chief. The Bulletin. receives a lot of submissions and it publishes a lot of papers. One change that we are hoping to make this year is to insert some structure into the editorial board, because the Bulletin is receiving much more diverse types of papers that it was in the past. A tiered editorial board structure, where different editors are associated with different subject areas is I think it's going to help streamline the process. It's going to help to bring some expertise up into the high level of the editorial decision making. Hopefully, with a tiered structure, we'll also be adding more people to the editorial board, to make sure we keep representing the breadth of submissions that receive with all the decisions eventually coming up to me to ratify in the end. This will be a change that will happen soon.

Do you have any advice for people who are thinking of submitting to the Bulletin of Mathematical Biology?

My advice, especially for PhD students, would be to look at some previous publications in the journal. Talk to some of your colleagues if they publish there, and the Editorial Board is pretty large, so some might be lucky enough to work at an institution where there's an Editorial Board member. Go and talk to that person and ask them what they what they look for. We don't have a strict view about what is new in terms of new mathematics, it can be new insights or new biological insights using existing mathematics (and I've got a very broad view about what constitutes new) and so hopefully people realize that we publish across a range of different disciplines by looking over the recent publications.

Finally, can you describe your perfect weekend?

I mostly spend the weekend with my partner, Glenn. We've got two dogs and we spend a lot of time together walking them. So, if I have a city weekend around Brisbane that's a good way to spend it. Other things I like to do on the weekend is to see the symphony orchestra - I really enjoy classical music. But my ultimate weekend would be just to go away with Glenn and the dogs at the beach on the sunshine coast (about an hour away from home). We can forget all the usual home routines, drink a lot of coffee, do a lot of dog walks and relax!