PROFILE

Michael Plank

Mike Plank is a Professor of Mathematics at the University of Canterbury, specialising in the mathematical modelling of complex biological and social systems. He obtained a BSc(Hons) in Mathematics from the University of Bristol in 2000 and a PhD in Applied Mathematics from the University of Leeds in 2003. He came to New Zealand in 2004 to take up a postdoctoral fellowship at the University of Canterbury, and decided to stay, becoming a permanent staff member in the School of Mathematics and Statistics in 2006. Mike has remained at Canterbury to this day, being promoted to Professor in 2019. He is an internationally recognised researcher and has won many awards including ANZIAM's E O Tuck Medal for applied mathematics research and service, and was also a key member of the team that won the 2020 Prime Minister's Science Prize, New Zealand's premier award for science. In 2021, he was elected as a Fellow of the New Zealand Mathematical Society.

Mike's research is driven by a desire to make a difference, so his work is typically application-driven and relevant to government and industry needs. In particular, he has focussed on mechanistic mathematical and stochastic models that capture emergent behaviour and offer qualitative insight into underlying mechanisms. Using this approach he has studied ecological and social networks, population dynamics, epidemiological models, size-structured marine ecosystems, collective cell behaviour, and intracellular dynamics. His research draws on many branches of applied mathematics including stochastic processes, integro and partial differential equations, dynamical systems, spatial moment dynamics, statistical modelling, and parameter inference.

Mike is perhaps best known to the New Zealand public as one of the key leaders of the Te Pūnaha Matatini COVID-19 modelling team. When it became apparent in early March 2020 that the SARS-CoV-2 virus was going to spread rapidly in New Zealand, Mike, his long-time collaborator Alex James and I, decided to kick-start a Te Pūnaha Matatini modelling programme. Within a few days we were joined by early career researchers, Nick Steyn, Audrey Lustig, and Rachelle Binny. From the outset we realised that New Zealand would need a range of mathematical models to help control the virus, ranging from off-the-shelf compartment models through to more sophisticated stochastic models that captured key details of the local public health response. In an intense period of work from mid-March through to late April 2020, the team worked full-time on these models, meeting for at least an hour a day on Zoom to discuss progress and problems, as we supported the New Zealand effort to eliminate its first wave of COVID-19.

In order to execute its COVID-19 elimination strategy, New Zealand had to resolve a unique set of public health challenges, each of which generated a similarly unique set of mathematical modelling problems. Mike and the team drew on a wide range of mathematical tools to address these problems. Although New Zealand was lucky to be able to follow events in other countries where COVID-19 was less controlled, the resulting observations and corresponding data had to be translated into a New Zealand setting, where they were applied in ways not seen overseas. This included developing models for elimination, border incursion, and outbreak surveillance, as well as investigation of the impacts of COVID-19 on New Zealand communities. Indeed, Mike led the work that became particularly important for understanding the potential impact of COVID-19 on Māori communities.

This work was rewarding, but with very real and immediate consequences for the lives of New Zealanders, it could also be very stressful. I particularly remember Dr Ian Town, the Ministry of Health's Chief Science Advisor, telling us we could take a day off on Easter Saturday during that first Level 4 lockdown. That day represented a rare break for Mike and the team in what was an incredibly demanding period. Mike worked almost full-time on these models for over two years, only broken for several stints of parental leave. Unlike most academic research, the turn-around time for COVID-19 modelling is typically measured in days, sometimes hours, and once complete, the results need to be communicated clearly and concisely to public officials and politicians, not to mention the general public. Mike always brought his calm and considered presence to this work, and led many of the key mathematical developments. Indeed, Mike's work was regularly cited at the Government's daily 1 pm briefings, at times forming key talking points in the government's public health communication strategy.

During the pandemic, Mike also became one of New Zealand's most prominent expert commentators, contributing to well over a thousand media interviews and stories. Communication of the early elimination strategy against COVID-19 was relatively straightforward. However, as the virus became established here in 2021 and the possibility of achieving population immunity diminished, the public health messaging had to become more nuanced. Mike, in particular, stepped up into a higher profile role as a communicator during what was arguably the most difficult point in the pandemic. More than ever, this required well-judged communication of uncertainty and the accompanying risk around government decisions. Mike was able to do this while maintaining his independence and without undermining the government response. This included the need to explain what mathematical modelling can - and cannot - do and dealing with criticism that stemmed from overly simplistic reporting of modelling results. His strength as a communicator made him a trusted and respected house-hold name, and in 2021 he was named a Kiwibank New Zealand Local Hero Medallist as a "known voice and go-to media expert on the virus".

Within the mathematics community, Mike is probably better known for his broader work in biomathematics. His review paper on random walks in the Journal of the Royal Society Interface is the go-to paper for researchers using random walks to model biological processes and has almost 1,200 citations on Google Scholar. He has another paper in Nature with Alex James that combines a nonlinear differential equation model with random matrix theory to provide a new explanation for why complex ecosystems exist in reality, despite a long-standing theory that high-dimensional ecosystem models cannot be stable.

Mike's wider research programme has also had significant impact in industry and government. He is a member of the NZ Prime Minister's Chief Science Advisor expert panel "Towards a vision for fisheries in New Zealand in 2040". His ongoing research on balanced fishing has been cited in reports by the Food and Agriculture Organisation of the United Nations and the International Union for the Conservation of Nature, and discussed in a forum at the European Union Parliament. His research on social networks of at-risk children - again work with Alex James, amongst others - has been influential in Oranga Tamariki and led to several invitations to present at international conferences.

Over the years Mike has served in various governance and editorial roles. He is an Editorial Board member for Applied Mathematical Modelling and the ANZIAM Journal. He has also served as a panellist for the Marsden Fund and Performance-Based Research Fund. Mike has long been a leading member of the New Zealand branch of ANZIAM, serving as current branch President, as well as representing ANZIAM on the Board of the International Council of Industrial and Applied Mathematics since 2016. He has been an Associate Editor for the ANZIAM Journal since 2010 and has sat on ANZIAM's Executive Committee since 2014. As co-convenor of the 2019 ANZIAM Conference in Nelson, Mike led the development and implementation of a Code of Conduct that has since been adopted for subsequent ANZIAM conferences and events. Mike was also involved in development of the Code of Conduct for ANZIAM and the Terms of Reference for the ANZIAM Nominations Committee that aims to ensure a diverse pool of high-quality nominations for ANZIAM awards and their evaluation in a transparent and unbiased manner.

Mike is valued by his colleagues as a collaborative and a highly productive researcher and teacher. He has supervised more than a dozen PhD students in mathematics, and several more Masters students, and published more than 120 journal articles. In 2021, he was jointly awarded the University of Canterbury Research Medal with Alex James for "ground-breaking work that has informed the Government's response to the Covid-19 pandemic in New Zealand." Mike is also a good mathematician to share some beers with, and to be fair, most of us now owe him one for his important contributions to one of the world's most effective COVID-19 responses. So if you do see him at the next Maths Colloquium or ANZIAM Conference, can I suggest that the first round is on you?

Shaun Hendy