

Interview with Dr Martine Barons CMath MIMA

Martine Barons is director of the Applied Statistics & Risk Unit (AS&RU) at the University of Warwick. She is also on the IMA's Research and Finance Groups, and West Midlands Branch Chair.

Can you briefly describe your career path to date?

I started off in accountancy; I had wanted to take A-level Maths at school but was told I 'wouldn't cope', so I took Economics instead, which supported the accountancy trajectory. After 20 years full-time at home, bringing up my family, I wanted a career change. Some voluntary work with an AIDS charity taking sex and relationships lessons in schools, put me on the road to being a school teacher, and since maths homework was my favourite to help my children with, I aimed at becoming a Maths teacher. Of course I had to start with taking the formerly-forbidden A-level. After my PhD I had a couple of postdoctoral positions before taking my current role as director of the AS&RU.

How would you describe your professional expertise?

My own research is focussed on probabilistic modelling for decision support, particularly in graphical models. My role in AS&RU means I draw on my previous experience in business to make links between the needs of business, government and industry and the research going on in my department.

What is your experience in knowledge exchange (KE)?

I have enjoyed European Study Groups with Industry (ESGI), KTN study groups and Turing study groups, as well as public engagement activity in a range of venues, including IMA branch meetings. My role in AS&RU is mainly about KE and we have undertaken everything from research consultancy through to master's projects, which are often a 'taster' for industry partners.

What would you recommend to an early-career mathematical scientist who is passionate about knowledge exchange?

I really enjoy study groups so those would be my first recommendation. Although, being involved in those is easier for PhDs or early-career researchers within a university. The big bonus of a study group is the interaction with non-technical users of mathematics. The challenge of explaining how a particular mathematical approach can add value without using jargon is non-trivial, and a skill that many mathematicians never acquire. The study groups also have the advantage of being time-limited, so that someone doing a PhD is taken from their primary focus for long enough to be refreshed but not long enough to be derailed.

Is there a knack to communicating mathematical ideas to people who are not mathematical scientists?

Analogy and metaphors are very useful when communicating mathematical ideas to people who are not mathematical scientists, and a good visualisation can go a long way: the mug and torus gif on Wikipedia gives a good intuition of what topology is for a non-specialist or beginner. The difficulty we have is that we are uncomfortable with using explanations that are not perfectly precise – precision is part of our training – but we need to focus on the other person's needs which may simply be to understand what the proposed method adds to a decision-making process.



What is the biggest barrier to Knowledge Exchange (KE)?

I think the biggest barrier is that many people don't understand that maths is relevant to their problem. 'Step zero' of the knowledge exchange process is that realisation, and it can be the hardest step because how do we begin a conversation with someone who thinks our skills are irrelevant? I think this is where public engagement and case studies, like the IMA Mathematics Matters, are important. Every one of us is an ambassador in our family and social circles for the power of mathematics to solve important societal and business problems. After that, we can invite people to 'taste and see' through a master's project or study group.

What is the most effective mechanism for KE?

In my experience, the personal touch is paramount. Listen to the problem owner and take the time to really understand what they need, their constraints, priorities and timelines. Then, perhaps talk about some case studies you know about where relevant mathematics has been used. After that, I would look to take the problem owner on to a study group or master's project where established techniques can be used to tackle the problem, or parts of it. After that, the open parts of the problem, which require new methodology or new mathematics can be developed over longer time scales, perhaps through research consultancy or an iCASE PhD.

Do you feel that a change of attitude is required in order for KE to be more effective? If so, who needs to change their attitude?

I think that adjustments in attitude are probably needed all round. Government needs to recognise the fabulous resource it has in its mathematical sciences community and the community needs to repeatedly make that clear as governments change. We can then work together to encourage and enable industry to access mathematics, including imaginative activities of the 'step zero' variety. The mathematical community itself needs to take on board the findings of the Bond report that all mathematics has the potential

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to be impactful and to break down the snobbery surrounding the pure/applied mathematics demarcation. Attitudinal changes are needed to enable (both in terms of funding and career progression) interactions with business, government and industry at all career stages – making it clear that the mathematical community values Knowledge Exchange!

What have you learned that you wish you knew earlier?

Maths can be used to make people's lives better. Before I came to my undergraduate degree mathematical modelling class I had no idea. And by this time I was already middle aged.

Can you tell us an example of knowledge exchange?

I currently have a project with The National Archives (TNA) to help preserve the nation's heritage. I think this is super-cool! In times past most of our heritage was stored as paper documents or artefacts. Nowadays, much of it is born digital. And digital storage has a multitude of risks which paper records do not – carrier degradation, software and hardware obsolescence to name but three. We are developing a probabilistic decision support system to help minimise the risks associated with digital archiving.

What is the distinction between research, education and KE?

There is often a blurring of the lines here, especially for post-graduates. When my students take on an industry project for their master's dissertation, they learn so much about real world problems and how the skills they have acquired are suited to help solve

them and the industry partner also learns what mathematics can do for the problems they care about. So there we have education and KE together. Similarly, the work with TNA is both genuine research and knowledge exchange, since their research assistant (an early-career mathematician) and their technical people are co-researchers. There will be a decision support system plus research papers in the archives domain and the mathematical sciences.

Who inspires you?

So many people, for different reasons. Marj Batchelor, formerly at Cambridge, for her passion for postgraduate students and who significantly supported the development of the Young Researchers in Mathematics conference (sites.google.com/view/yrm-2020/home). Every one of my fellow PhDs for their passion, imagination and generosity. My postdoc supervisors, Jane Hutton and Jim Smith for caring about my career and not just my productivity. Ralph Kenna for his genius marriage of mathematics with mythology. My fellow committee members at the IMA West Midlands Branch for their enthusiasm to spread interesting mathematics.

How do you decide which activities to pursue?

The main constraint is always time. I find Tara Brabazon's advice useful (www.youtube.com/watch?v=r4DFZ8AlTas&t=1000s): will it add a line to your CV? Will it be a paper? Then say yes, otherwise say no. This doesn't capture everything for me, though. I may have done 'Women in Maths' talks before, but it's something I feel passionate about, so I will often agree to these requests.

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