Mathematical minds

Peter Taylor*

Gazette: What led you to become a mathematician?

Taylor: Unlike other people you've interviewed recently, I can't say that it was always my ambition to be a mathematician. In fact, I've become a mathematician by a fairly circuitous route. The advice I was given at school was 'you're good at mathematics and you like the outdoors, so you should become a civil engineer' and so I enrolled in civil engineering at the University of Adelaide. It took about three weeks before I realised that it wasn't for me. I then took up a physics major but realised by the end of the second year that what I really liked and was good at was mathematics. I ended up majoring in applied and pure maths and subsequently did Honours in applied maths. I needed to do something different after Honours and worked in Canberra for the Public Service for three years before coming back to the University of Adelaide to begin a PhD. The flexibility of the program, which was a property of the degree in those days — it certainly isn't the case now in universities — was very helpful to me on my path to becoming a mathematician.

It seems to me that a lot of school students don't get good careers advice about the opportunities in mathematics, so one thing that universities need to do is to make it possible for students who have started off on a different career path to move into mathematics. Of course, there's a tension between this and the idea that maths is a progressive discipline. The requirement to build on previous knowledge tends to give our courses tight prerequisites which can make it hard to move into mathematics halfway through a degree.

Gazette: So, while you did well at mathematics and enjoyed it at school, the advice to you was to go and be a civil engineer?

Taylor: Yes, and it grates on me. My Year 12 maths teacher was an experienced and senior maths teacher, and I think he ought to have recognised that I was reasonably talented at mathematics. While he encouraged me as a student, he never encouraged me by mentioning the possibility of pursuing a career in mathematics. He should have, but he never did. I think that if I met him now, I would ask him why. I remember, however, a time when my Year 11 teacher had to come to the university for a meeting, and saw my name on my office door. He knocked and said that he was quite pleased that one of his ex-students had an office in the mathematics building.

As school and university teachers, I don't think we realise how influential we can be on the paths that students take, simply by commenting on the possibilities. One thing that I've always tried to do in my academic career is to talk to students, to

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try to find out where they think they might be heading and point out options to them.

Gazette: Is there anything else you'd like to say about your undergraduate mathematics experience?

Taylor: The only other thing I would say is that, in those days, and also when I was a PhD student, the applied maths department at the University of Adelaide was a fantastic place to be. The number of mathematicians in various places around the country that came from Adelaide in that era shows just how influential it was on the mathematical scene nationally. I put that down to superb academic leadership, in particular by Ren Potts.

Gazette: Why then, after Honours, did you go into the Public Service?

Taylor: The short answer is that I needed to grow up. I think when you're reasonably talented at academic work, there's always a point along the way where you have to learn to be organised, and you can't just do it on your natural ability. For me, this occurred in Honours when the workload became heavier and I had other things in my life. I don't think, to be perfectly honest, that I'd learned good work habits before then. The upshot was that at the end of Honours, I wanted to do something different.

It's quite serendipitous how I ended up being offered one of the government's administrative traineeships with the Public Service Board. There were only 30 of them offered each year, and I only applied because I was eating lunch with a girlfriend of mine at the time and she wanted to apply so I decided that I might as well fill in the form.

Once the offer was on the table, I thought it was a good option. I lived in Canberra for three years, and I think it was really good development for me — I learned a lot of things. Even though I was working in an area where the sort of analytical skills you get taught in a mathematics degree were useful, I wasn't really doing mathematics, other than a small amount of statistics every now and again. I was part of a team that implemented a new unemployment benefits system nationwide. I'm pleased that, even now at Melbourne University, I can talk with some authority about implementation of systems, which I wouldn't have been able to do if I hadn't had that experience. There are various other little things that I learnt — how to write a business letter, how to have a decent phone manner, and all that sort of stuff. It sounds silly, but I'd never learned those skills as part of my undergraduate degree. I think degrees now are probably more focused on generic skills than they were.

After about three years, I wanted to move back to Adelaide and start a PhD, and ever since then I've been a mathematician.

Gazette: What drew you into doing a PhD then?

Taylor: I always wanted to do it, just not straight after Honours. The danger with that is, if you go off into the workforce, you get accustomed to your standard of living. You might acquire commitments like a mortgage, and once you've done that, it's harder to go back and become a student. I was very lucky, because at that time

Adelaide University employed tutors with six-year contracts, so you could have a job as a tutor and do your PhD part-time which is what I did. I actually think it's a very good model. Unfortunately, it stopped happening in Australian universities because there was pressure to make Level A jobs into continuing positions, which I think has actually been really bad for the mathematical sciences.

Gazette: Bad in what respect?

Taylor: It's not clear until after you've finished your PhD whether academia is the right thing for you, because every academic ought to make research a priority, and you're still training to do research while you're doing a PhD. This could be a controversial viewpoint, but I think that the best entry level for an academic job is Level B. Before that, one should think of Level A as a training level, which it was when we had tutorships.

An interesting aspect of my career is that I've never been a postdoc. In fact, apart from when I've been on sabbatical, I've never been a full-time researcher, not even when I was doing my PhD. So from the beginning, I've always juggled teaching and research. Also, by the time I finished my PhD, I was quite an experienced teacher. These days, I often see people applying for their first lecturing position after a postdoc, and they don't have much teaching experience.

Gazette: Tell us something about your time as a PhD student.

Taylor: I had a fantastic PhD experience. I did my PhD between 1983 and 1987, but since I was only enrolled part-time, it was two-and-a-half enrolment years. Back then it wasn't very common, but I had joint supervisors — Bill Henderson and Charles Pearce — and I think they were an ideal pair. Bill was a very intuitive mathematician — very good at developing ideas and making suggestions. He was an outgoing person and had the unique knack of not being afraid to put ideas on the table that might turn out to be completely useless. Charles wasn't as verbal as Bill, but he was more of a good analyst. I learned that what I had to do with Charles was go to him if I had a particular problem. I had to write it out properly and leave it with him to think about. Once I learned how to work with both supervisors it worked really well. The other thing is, as I have already said, the whole environment of the department was great.

Gazette: So what happened once you finished your PhD?

Taylor: I had a two-body problem with one of the previous *Mathematical Minds* interviewees. I was married to Christine O'Keefe, and so while she finished her PhD, I spent the last year of my six-year tutorship as a lecturer. We moved to Perth in 1989 as contract lecturers for the University of Western Australia. After we were there for a couple of years, the Department of Applied Maths at Adelaide University had two tenured jobs on offer, and Hugh Possingham and I were both appointed. Christine got a QEII Fellowship working in Pure Maths at Adelaide University.

We really enjoyed living in Perth. As I've said, Adelaide was a great place for mathematics, but the lifestyle in Perth was great — we made a lot of friends there — it was just the better opportunities academically in Adelaide that made us move

back. I think that if the University of Western Australia had put a little bit more on the table, we might have stayed there.

I stayed at the University of Adelaide throughout the 1990s, and in 2002, I moved to Melbourne. I was a Professorial Fellow at Melbourne University for a year, half in Electrical Engineering and half in Mathematics and Statistics. During that time I applied for, and was offered, the Chair of Operations Research. I've been Chair of Operations Research at Melbourne University since 2003 and I've been Head of Department since 2005.

Gazette: So you weren't tempted to go overseas at any stage?

Taylor: Good question. I think it's something that everyone needs to think about. It is absolutely clear that you need to be internationally connected to be a successful academic in the mathematical sciences. So if you are serious about it, and if you're in a university you ought to be serious about it, you've got to be part of the international scene. If anyone asks me, my goal is to be part of what I would call the international A-grade in my area of research. But you can get that in different ways. You can certainly get it by living and working overseas for some time. I never had the opportunity to do that because of the fairly nonstandard route my career took.

However, I did take every opportunity to go overseas to conferences and to make academic visits. Early on in my career I had many opportunities to travel. It was at the time that the Teletraffic Research Centre was starting up at the University of Adelaide, and it was generating enough money for those people who were involved in it to have enough consulting funds to travel quite frequently. Bill Henderson and I would go overseas maybe three or four times a year, even when I was a very young academic. It's an opportunity that most academics at that level don't get. This is one of the things that I thank Bill for. He was very generous in supporting travel when I was his student: in later times, when I have been able to generate funds myself, I've tried to take the same attitude with my students and postdocs.

There is a trade-off in undertaking consulting activities for industry. It certainly does cost you in time. Sometimes you get good academic problems so it can feed into your research work, but that doesn't always happen. One thing it does do, though, is give you enough funding for your academic activities. In my entire career I've never had to worry about having enough money to go to an international conference.

I can quite proudly say that I have co-authors from about 14 countries on five continents. The way that I've achieved that in my career is a bit different to the way a lot of people do, but it can be done.

Gazette: In which areas of mathematics do you work?

Taylor: I describe myself as an applied probabilist, or if I want to be a little more precise, a stochastic modeller. I enjoy examining the mathematical structures that

underlie and are motivated by real-world stochastic applications. I've found interesting problems throughout my career in the areas of telecommunications, network modelling, queueing theory, reliability, ecological and biological modelling.

I'm getting interested in the interaction of these sorts of areas with optimisation and control. Early on it was simply a matter of trying to model a real-life situation. However, usually the reason you want to model a real-life situation is that you want to affect it in some way or work out an optimal strategy. So, I'm getting more and more interested in stochastic optimisation: problems like the online distributed control of a stochastic network. I still have an interest in queueing theory, Markov chains, and stochastic processes in general — in fact, the whole spectrum of applied probability.

Gazette: What is your vision for the AustMS during the term of your presidency?

Taylor: I've discussed this in some detail in my President's column, so I'll just expand of a couple of things that I said there.

I've always been active in ANZIAM, including holding the position of Chair in 2006 and 2007, and will continue to play a part in that community. It hasn't been very often that the President of the Australian Mathematical Society has been an active ANZIAM member, so I hope to try to bring these communities together.

In recent years, there have been various reviews of mathematical sciences. The most recent one was Gavin Brown's Group of Eight review, where he talked about the fact that there are fewer students getting good mathematical education at school. There are recommendations, for example, that every high school maths teacher ought to have done a maths major at a university, and every primary school maths teacher ought to have done at least one mathematical subject. These are worthy ideals, and we ought to support them, but there are other practicalities, like what does a principal do if they're trying to find teachers for their school and there isn't anyone who satisfies these criteria? Liaising with school communities to determine the best way to attract mathematically inclined students to the profession may be difficult, but it's an issue that I'm going to be paying some attention to.

On the issue of women in mathematics, I had a few conversations last week at the AustMS conference about that, and subsequently some email. My perception is that progress is being made at the junior levels. There are certainly more women doing PhDs than there used to be, and I think there are probably more women, for instance, at the early-career researchers' workshop. My perception without actually counting is that the representation is reasonable. But it is certainly true that there still aren't enough women at senior levels. It might just be an issue of enough time having to elapse before more women reach that level. But maybe there are still systematic obstacles to the career advancement of women in mathematics, which is something we need to examine.

There is a general concern that there was no new ARC Centre of Excellence in any of the mathematical sciences established in the 2010 COE round. I am one of the chief investigators of the ARC Centre of Excellence for Mathematics and Statistics of Complex Systems (MASCOS), whose funding from the ARC ceases

at the end of this year. MASCOS has worked well and produced lots of good mathematics, but found it increasingly more difficult to fit into the ARC idea that a centre has to provide 'scale and focus'. Scale was always fine, but it's hard to focus mathematical research in the same way that you can focus, say, laboratory science research.

Mathematicians typically provide enabling results, and we don't all work towards the achievement of one goal. There have been approaches to the ARC regarding the best way to help mathematical research, and I think we know what the answer is. Overseas there are research centres like the Mathematisches Forchunginstitut Oberwolfach in the Black Forest, the Mathematical Sciences Research Institute at Berkeley in California and the Isaac Newton Institute for the Mathematical Sciences in the UK. The mathematical community would like one of these in Australia. However the funding is probably not available at the moment. The AustMS needs to play a role in representing the interest of the mathematical research community to the government in order to get as close an approximation as it can.

We also need to represent the mathematical sciences community externally to government in Australia and to the world.

Gazette: Why do you do mathematics?

Taylor: I think a lot of people do mathematics to please themselves. For me, if I sit down and I put some deep thought into a problem I'm looking at, and at the end I've understood it when I didn't understand it before, then the feeling is fantastic. You've created some knowledge that wasn't known before — I find that a real thrill.

That being said, the biggest thrill I get in my job is when a PhD student of mine graduates. We have academic parents and academic children, and in that sense, your graduating PhD students are forever your academic children. If you've done a good job of being a supervisor, then you've made a real contribution to their life, and I think that's amazing.

I also really like some aspects of teaching. I love standing up in front of a class, even a big undergraduate class. I've got to admit that I'm not so enamoured by the assessment side of things. I understand it's necessary, but from a personal point of view, it doesn't turn me on so much.

So there are three thrills: doing research, seeing PhD students graduate, and being in front of undergraduate students. These are all things about mathematics that I really enjoy.