



Mathematical minds

Christine O'Keefe*

Gazette: What led you to become a mathematician?

O'Keefe: Well, I was interested in everything at school — particularly languages — but maths really kept me interested because of the problem-solving aspect. It seemed to me that a lot of subjects involved learning as much as I possibly could, and then just writing it out in an exam. In maths, I was presented with something that I had potentially never seen before, and then I would need to figure out how to solve it on the spot. I particularly remember solving related rates questions in matriculation — figuring out how to do it was always really satisfying.

I actually enrolled in medicine at the University of Adelaide. It was only in the last couple of weeks before university started that I changed my mind and decided to do maths instead. My elder sister was doing medicine, and that's actually part of the reason that I changed. I watched her just reading enormous text books trying to remember as much as possible, and I thought, 'Well, what's the fun in that?'

Gazette: Was changing from medicine to mathematics a big decision to make, particularly at the last moment?

O'Keefe: It certainly was. Everyone told me that if I wasn't sure, I should start in medicine, because it's easier to get out than to get in. Eventually, I went to the admissions office, and I walked up to the counter with my little piece of paper and I said 'I want to change my enrolment' and they said 'No need. It's right. You start medicine in two weeks. See you later'. And I said 'No, no. I want to change my enrolment. I want to do mathematics'. There were some people sitting in the room waiting, and one of them said 'You're nuts! I'd give my right arm to do medicine'. So I even had to ignore random people sitting in the waiting room! That was an interesting experience.

Gazette: Which areas of mathematics do you currently work in?

O'Keefe: I work in privacy technologies. My first consultancy project when I joined CSIRO was with the Department of Health and Ageing in 2000. I looked at consent for the transfer of electronic health records, and that's when I got really interested in the whole area of consent and privacy, what you could do with technology to augment the policy, and the legislative side of privacy. Often, it was putting together building blocks that I knew something about. I already knew about encryption and various cryptographic techniques, and privacy technologies

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are often built on those. It was early days for research in privacy technologies in Australia, and it's still quite a small community, which I think is good.

Before joining CSIRO, my main research focus was finite geometry, which included drawing on techniques from geometry, algebra and combinatorics. I got interested in some areas of information security that relied heavily on geometrical techniques — secret-sharing schemes — which are all about sharing a key amongst a number of users, so that they have to collaborate to access information. While I don't directly use finite geometry now, I do use some of the things that I learned when I was in the cryptographic community. So that provided a stepping stone from my previous research field into the new one.

Gazette: Why did you choose this career path over a perhaps more traditional academic path?

O'Keefe: I guess there were a number of reasons. I had a QEII Fellowship while at the University of Adelaide and during that time I started to think that I'd like to try something else for a while. I did a couple of consulting jobs; one was to do with tracking anodes through a smelter — the Portland aluminium smelter — and I got a real kick out of doing something that people actually used. Also, it seemed to me that academia was going into a pretty difficult time; maths departments were diminishing, and it was looking like it would be a hard place to be for a few years. Those two things came together, and I decided that I'd have a go at something else. I started an MBA, and I started spending time in the telecommunications consultancy group. Then I noticed a job advert — CSIRO were looking for a mathematician — and I applied for that. It's actually a funny story. The applications had closed and I met none of the selection criteria. But I rang them to ask if they'd still accept an application, and they said yes, so I applied. I didn't get the job I applied for, but they made a new one for me.

Gazette: What is the best career advice you've ever received?

O'Keefe: I think it was to go ahead and make that call to CSIRO and ask them if they would be able to consider a late application from me.

Gazette: It's interesting how something that seems so insignificant has made a big difference in your life.

O'Keefe: Yes. It's hard to know what I would have done otherwise. I was thinking that as a pure mathematician, I was good at thinking deep thoughts, but how was I going to convince anyone that I could do anything else? It was Bill Henderson, who many readers will remember from the University of Adelaide, who said 'Go on. Just ring them and ask them.'

Gazette: Did it seem like a momentous decision to make?

O'Keefe: Yes, it did. It was quite scary to leave academia, which was the only real job I'd ever had, and take a step outside that and change research area. That's a big thing, because suddenly everything I knew was irrelevant — all of the journals

I knew weren't relevant anymore, along with my network of contacts. It was a challenge to start again in a new area. Probably the hardest time was during the first international conference on finite geometry after I'd left the field. I didn't go but all my buddies were there. I missed it then.

Gazette: Did you get to a point along that new path where you thought you'd made the wrong choice and wanted to return to academia?

O'Keefe: No, never. In fact, I've often thought I should have gone sooner. I had a lovely time in academia and a really good career there, so I don't really mean that. But I do love CSIRO. It's a good organisation to work in.

Gazette: You're on numerous boards, councils and advisory committees. How do you balance research with such a demanding role in leadership and administration?

O'Keefe: It's quite tough, actually. I find that I have to give research the same priority as the other things, and remember to do it. For example, this morning I decided to spend a couple of hours revising a paper before I turned to other matters. I need to make research a priority, and leave the administrative tasks and so on until later in the afternoon.

Gazette: Do you think you're a very career-driven person? Have you actively sought out opportunities?

O'Keefe: It has largely just happened along the way. People have come and said to me things like, 'Do you want to set up this group?', 'Do you want to lead this group?', 'Do you want to lead this project?'. The recent work I've done with the Population Health Research Network, establishing a Centre for Data Linkage, was essentially from an invitation to get involved. People come and ask me to do stuff quite often, which is nice. Like everyone, I like to feel that I'm making a contribution and a difference, rather than being very ambitious.

Gazette: How did you feel about winning the AustMS Medal in 2000?

O'Keefe: It was absolutely a delight; wonderful! I felt it was a great honour. I remember when I got the call—it was fabulous; quite a surprise, and to share it with Mathai Varghese, who was also at the University of Adelaide was really nice too. It was actually quite interesting, because the day that the medal was presented was the day after my 40th birthday—you know you have to be nominated before you're 40—and I had organised to have a birthday party on the Saturday night. I'd hired a hall and invited a hundred people. I thought that the presentation would be on the Monday, but the presentation was going to be in Brisbane at 10 o'clock on Sunday, the next morning! I did manage to get there. I'd had no sleep, having finished the party at about 3 am. I caught the plane to Brisbane at 5:30, walked in slightly late and then gave a talk about my work.

Gazette: As the first woman to win the AustMS Medal in its then over 20-year history, you were featured on the National Pioneer Women's Hall of Fame Signature Quilt, 'A Patchwork of Empowerment'. What do you think about that?

O'Keefe: I think it's fantastic. I was contacted by the then Office of the Status of Women in the Australian Government Department of the Prime Minister and Cabinet. When the AustMS medal was announced they did make a bit of the fact that I was the first woman ever to have won it. The signature quilt at the National Pioneer Women's Hall of Fame was intended to celebrate firsts for women, so they were looking for women who were first to do something in their field. I got this lovely letter asking me if I'd like to have a patch on the quilt. They'd got a gorgeous little piece of fabric, with rulers and compasses and protractors—it had all these little geometrical instruments on it; I don't know how they found it—and they also sent a small calico square to sign. The quilt is quite big. My parents have been to see it but I haven't, so I'll have to go and visit it one day. So I tell people that I've been quilted! It is a great honour.

Gazette: *Is there a particular highlight of your career so far or achievement that you are proud of?*

O'Keefe: The thing that just came to mind is one of my students, who went on to become one of the most highly respected researchers in his field. While I don't feel that I can take much credit for his success, the fact that he went on and became a great success is fabulous. Also, I suppose that changing research area and being brave enough to leave one thing behind and start again on something else is an achievement. That's something that not everybody gets the opportunity to do, or can see it through.

Gazette: *You seem to have a very busy professional life. Do you do anything to relax?*

O'Keefe: Of course! I do a lot of outdoors activities. I go skiing in the winter. I bush walk and I do a bit of orienteering and rogaining. I'm training for a half-marathon at the moment. I also sing in a choir—we'll be singing Mozart's Requiem in a month.

Gazette: *What advice do you have for people considering moving out of academia into places like CSIRO?*

O'Keefe: Give it a go if you're interested. The main thing is to do what calls to you, because that's where you'll find the most fulfilment.



Dr Christine M. O'Keefe was awarded a PhD in pure mathematics from the University of Adelaide in 1988, and gained an MBA from the Australian National University in 2008. Christine is currently strategic Operations Director for the CSIRO Preventative Health National Research Flagship, a multidisciplinary research team of more than 100 scientists working on improving health and wellbeing through early detection and prevention. She was awarded the Australian Mathematical Society Medal 2000 for distinguished research in the Mathematical Sciences and the Hall Medal of the Institute for Combinatorics and its Applications 1996 for outstanding contributions to the field.