



# President's column

**Peter Hall\***

## **The campaign for USQ**

Many of you will have noticed the energy that has been invested in defending our colleagues at the University of Southern Queensland, against that university's threat that eight mathematicians and statisticians, out of just 14 employed there, could lose their jobs. The campaign received a very substantial boost in mid-March when Terry Tao took up the cause, and established a number of web pages relating to the challenges we face. His thoughtfulness, influence and legendary capacity for work have given the campaign unprecedented momentum, breadth and depth. The two main web pages are those with the following addresses:

<http://terrytao.wordpress.com/support-usq-maths/>

<http://terrytao.wordpress.com/2008/04/05/please-help-support-mathematics-at-the-university-of-southern-queensland/>

A small number of colleagues have queried with me my reasons for taking the strong position I have on the threat to cut mathematics at USQ. They have challenged me, in a variety of ways, to explain how taking up so vigorously the case of a single university could benefit Australian mathematics as a whole. Actually, the Society has not been directly connected to the USQ campaign, although in some of the publicity it has been pointed out that I am currently the Society's President. However, that linkage is really beside the point. There are sound reasons for doing what we are doing, and I'd like to discuss them here. Because of the importance of these issues, a significant part of this President's Column has already been aired on the internet, at:

<http://austmaths.wordpress.com/2008/05/28/usq-the-supply-of-mathematics-skills-and-mathematics-teacher-training/>

The first point I'd make is that the Society takes up a wide variety of issues, both broad and narrow, relating to mathematics in Australia. For example, in a broad context and in my capacity as President, I write to national bodies such as the Australian Research Council and the chairs of national reviews, drawing attention to problems currently being faced by mathematical scientists. More narrowly, but still as President of the Society, I make submissions to reviews of individual mathematics and statistics groups in Australian universities, and I write letters to Vice-Chancellors relating to their plans, although most members of the Society do not hear about this activity. In particular, last year I wrote to the USQ Vice-Chancellor on the subject of redundancies. That was in late September, when potential job losses were only a rumour. Two months later I wrote to another

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Vice-Chancellor, on the same topic but pertaining to his institution. (The Society's Secretary keeps a record of all this correspondence.) Therefore, the Society taking up the issue of mathematics in a single university, such as USQ, rather than focusing on all of Australian mathematics together, would not be something new or special.

Nevertheless, there are special circumstances surrounding the USQ case, and they pertain not just to the high level of international attention it is receiving. Explaining those circumstances here also gives me an opportunity to discuss a number of problems that challenge us.

Australia faces a crisis in the supply of mathematics skills. When I left school in 1969 there were two careers to which an Australian with mathematics talents could generally aspire: becoming either an actuary or a school mathematics teacher. However, within about a decade the situation began to change. Growth of the IT industry, and the increasing mathematical sophistication of banks, finance companies and government departments, created many new opportunities. Today, all manner of employers in business, industry and government require staff with serious mathematics skills.

The Australian Government's Audit of Science, Engineering and Technology Skills, generally referred to as the Skills Audit and released in 2006, estimated that demand for mathematics skills grew at 52.1% in the eight-year period up to 2005, and forecast that it would grow at around 33% in the next eight years. These figures correspond to annual growth rates of 5.4% and 3.5%, respectively. However, a review of the mathematical sciences, partly funded by the Australian Government and reporting to the Australian Academy of Sciences in late 2006, noted that the number of mathematical sciences graduates, and the capacity of the nation to train mathematical scientists, were both falling. Data gathered by the Australian Mathematical Sciences Institute, directly from mathematical sciences departments in Australian universities, confirm that this decline is continuing. In fact, as the national demand continues to increase, the decline in mathematics skills seems to be accelerating.

Against this background the Skills Audit noted that 'recruiting difficulties exist in respect to high level mathematical and statistical skills'. The audit gave particular emphasis to projections that 'in the sciences, [the] strongest annual job growth between 2003-04 and 2011-12 [would occur] for mathematicians, statisticians and actuaries ...' In particular, the long-term growth in demand for mathematicians and statisticians would outpace that for engineers, where there are well-known and chronic skills shortages in Australia. However, mathematics skills are increasingly difficult to find.

There is evidence that these problems are causing employers of mathematicians and statisticians to overlook Australia when they seek countries in which to invest. Of course, it is virtually impossible to find reliable data on this matter, but there is significant anecdotal evidence. For example, back in 2003, when the problem of finding mathematics and statistics skills was less acute than it is today, the Head of Biometrics (Asia Pacific Region) for the Hoffman La Roche group wrote to the Australian Government as follows:

In 1997, the Pharma Development Management Team of Hoffman La Roche, based in Basel, Switzerland, decided to establish a Biometrics Development site in the Asia Pacific Region. Australia was chosen as the successful country, because we were known to have many excellent statisticians, excellent educational institutions, and a stable political system . . .

The viability of this industry is now threatened because Australia is failing to produce sufficient statistics graduates. It is well known in the statistics profession that New Zealand continues to produce many statistics graduates, and Australia very few. In the late 1980s and early 90s Monash University graduated 10–20 students a year with Honours in Statistics. In recent years this number has been less than a few. This is a catastrophic decline, which is reflected at many Universities around Australia.

Only three of the major pharmaceutical companies have so far chosen to establish large Biometrics departments in Australia. We cannot expect other companies to follow this example, if Australia cannot supply sufficient statisticians to meet the needs of these leading companies. In fact the viability of these three established departments will be questioned if we have to recruit statisticians from overseas.

Along the same line, it is well known that a major Australian employer of mathematical scientists, unable any longer to find in Australia the skills it needs, has started to outsource a significant amount of its work. This company also financially supports the education of foreign mathematics students in their home country, hoping to attract some of them to Australia on graduation.

Linking problems such as this to school mathematics education, the Skills Audit highlighted the 'declining proportion of participation in the enabling sciences and advanced mathematics in schools and in post-school settings'. In particular, data analysis in the Skills Audit 'showed a declining number of undergraduate domestic students in mathematical sciences'. Commenting on the 'challenges in building Australia's science, research and innovation capacity for the future', the Audit noted that 'an adequate supply of well qualified science and mathematics teachers is a key to success'.

Similar comments have been made in many other reviews. For example, the Australian Council of Deans of Science noted in 2006 that:

Three in four schools reported difficulties recruiting suitably qualified mathematics teachers. The shortage of available mathematics teachers was seen as a relatively recent and growing problem, predicted to worsen as experienced teachers retire in coming years.

The 2006 review of the mathematical sciences noted that:

Increasingly, high school mathematics is being taught by teachers with inadequate mathematical training. Nationally, the percentage of Year 12 students taking higher level — advanced and intermediate — mathematics fell from 41% in 1995 to 34% in 2004. This is limiting the level of training that can be supplied in undergraduate degree programs such as commerce, engineering and science.

Last year the Productivity Commission, an independent branch of the Australian Government, and housed in Treasury, released an influential report entitled 'Public Support for Science and Innovation'. (Here, 'public support' is intended to be interpreted as 'support from the public purse', not 'support from the man and woman in the street'.) The Commission went further than most other commentators, proposing pay rises for mathematics and science teachers as a means of overcoming the problems:

In the case of science and mathematics teachers, shortages have been accommodated by using teachers without adequate skills in these areas. This may adversely affect student performance and engagement and decrease future university enrolments in the sciences. In teaching, price signals have not been able to respond to shortages due to the inflexible pay levels and structures. This should be subject to reform.

It is for these reasons that the problems at USQ are of paramount interest to the Australian community of mathematicians and statisticians. At present we are caught in a spiral, where the number of students studying university mathematics or statistics decreases every year, and the number of young men and women training to be mathematics teachers declines too. Therefore the number of school students capable of studying mathematics or statistics at university, at anything but the lowest level, goes down annually. However, outside our universities the demand for professional mathematicians and statisticians is increasing at 3 to 4% annually. That is faster than the increase in demand for engineers — mechanical, industrial, civil, etc. This issue is one to which USQ is central, through the provision of mathematics training for future school teachers. Indeed, one of the strengths of USQ has been providing teacher training. However, the proposed cuts to mathematics and statistics at that university would make it impossible for USQ to contribute meaningfully in the mathematics area. If that were the case, the downwards spiral would take yet another significant turn.



Peter Hall is a statistician, with interests in a variety of areas of science and technology (particularly the physical sciences and engineering). He got his first degree from The University of Sydney in 1974, his MSc from The Australian National University in 1976, and his DPhil from University of Oxford in the same year. Peter is interested in a wide variety of things, from current affairs to railways and cats.