

Challenges for Math in Australia

Australia is facing a substantial under-supply of mathematical scientists. The Australian Government's *Audit of Science, Engineering and Technology Skills* [1]*, generally referred to as the Skills Audit and released in 2006, estimated that demand for mathematics skills grew by 52% in the eight-year period up to 2005, and forecast that it would grow by another 33% in the next eight years. These figures correspond to annual growth rates of 5.4% and 3.5%, respectively, and point to an expansion in demand for mathematicians and statisticians that is outpacing even that for engineers, where there are well-known and chronic skills shortages in Australia.

However, a review [2] of the mathematical sciences, partly funded by the Australian Government and reporting to the Australian Academy of Science in late 2006, noted that the number of mathematical sciences graduates, and the capacity of the nation to train mathematical scientists, were both falling. Recent data [3] confirm that the decline is continuing.

There is evidence that companies needing mathematics skills are not establishing offices in Australia. Back in 2003, when the problem of finding mathematics and statistics skills was less acute than it is today, the Hoffman La Roche group wrote to the Australian Government to explain that the company had chosen Australia for expansion because that country was "known to have many excellent statisticians, excellent educational institutions, and a stable political system... [However] the viability of this industry is now threatened because Australia is failing to produce sufficient statistics graduates." A major Australian employer of mathematicians is funding 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". 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."

At present Australia is 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 Australian universities the demand for professional mathematicians and statisticians is increasing at a rate which outstrips that for just about every other field.

Therefore, when the University of Southern Queensland (USQ), acclaimed for its capacity to train future teachers, decided to shed more than 50% of its mathematics and statistics staff, a very substantial tide of opposition grew. The university argued that its mathematics and statistics programs were no longer financially viable, although data seemed to point strongly to the contrary.

Terry Tao weighed in to help, establishing Web pages [4, 5, 6, 7] addressing the problems. A central issue in the debate has been whether USQ management is passing on extra funding it received from the Australian Government in 2008, aimed specifically at supporting the mathematical sciences. The government, responding to the review, increased per-student funding for mathematics and statistics courses, but many universities are sending the new money to other areas where investment is likely to pay higher financial dividends in the future. Attempts at obtaining reliable financial data from USQ management have not proved successful. While the university has moderated its plans in the face of strong opposition, the planned reductions in the university's capacity to teach mathematics and statistics will still be very significant.

There are a number of lessons that can be learned from the problems being faced in Australia. First, the potential for maintaining mathematics student numbers in universities depends inexorably on the availability of well-trained and strongly motivated mathematics teachers in schools. Australia, with its school education system split among state governments which do not work well together, has failed to address this challenge. Over a long period the mathematical sciences community has striven to resolve the problem, but without much success. For example, letters to state authorities on the subject tend not to be answered.

Secondly, strong competition in higher education, both within and between universities, can lead to short-term solutions and short-sighted policies. In Australian universities the teaching of mathematics and statistics is often in the hands of nonprofessionals in those areas, because they are better funded for the task than professionals. For example, engineering mathematics, and statistics courses for biologists, are typically taught by engineers and biologists, respectively, since those areas receive more money per student than mathematics or statistics. University managers have been known to applaud this situation as "government-encouraged competition".

An additional source of destructive rivalry has been strong competition for full-fee paying foreign students, many of whom have levels of university preparation lower than for Australian students. In the wake of government funding reductions, such students have become a mainstay of Australian university budgets.

—Peter Hall, President
Australian Mathematical Society
(halpstat@ms.unimelb.edu.au)

*See references on next page.