14th December 2006

Mr Gary Banks
Chairman, Productivity Commission
Level 28
35 Collins Street
Melbourne VIC 3000

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Dear Mr Banks,

Productivity Commission draft research report on
``Public Support for Science and Innovation''

I write in response to the Productivity Commission's draft research report. The draft makes a number of very relevant and pertinent comments relating to the situation faced by the mathematical sciences in Australia today, including the existing ``recognised shortage of engineers and secondary school teachers in science and mathematics," and the fact that these ``shortages have sometimes been accommodated by using teachers without adequate skills in these subjects."

The report also expresses concern at ``declining enrolments in science and mathematics in high schools." It highlights a submission from the Business, Industry, and Higher Education Collaboration Council, stating that ``Quality high school maths and science teaching has a critical flow-on effect on students' choices and success at university."

The Australian mathematical sciences community, and the Australian Mathematical Society in particular, is very pleased to see these issues highlighted. We have long sought to bring them prominently to public attention. We are also pleased to see that one of the draft findings in your report is that ``there should be greater flexibility in pay structures for teachers to help address science and maths teacher shortages."

The Australian Mathematical Society is the coordinating professional society in the strategic review[1] of mathematical sciences research in Australia, released today. The report makes a number of findings that you will, I'm sure, find of interest. In particular, in direct support of the comments quoted above from your report, we note 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.
>
> Australian universities are lowering mathematics prerequisites and this is undermining enrolments in high school mathematics.

Similar conclusions were reached in a report released recently by the Australian Council of Deans.[2] There it was noted 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.

Relating more specifically to mathematics research, the mathematical sciences research review comments that:

> At a time when, internationally, the major scientific advances are being made through collaborations between different branches of mathematics and other scientific disciplines, and by countries that invest heavily in mathematical research and education, Australian mathematicians and statisticians are becoming increasingly isolated and under resourced.
>
> The loss of a small number of key mathematical scientists puts Australia at risk of a major collapse in research capability.

In particular, the review found that the average decline in the Group of Eight departments of mathematics and statistics, over the last ten years, was around one third of permanent academic positions. This accords with ABS data on the distribution of Higher Education Expenditure on Research and Development, which show that while the proportion of expenditure on medical, agricultural and biological sciences R&D grew between 1992 and 2002, investment in the mathematical sciences slumped from 2.7% to 1.9% of total spending.

Moreover, the quantity of mathematics and statistics graduates from Australian Universities represents only 40% of the OECD average, when scaled for population size. The problems that the Productivity Commission noted with the supply of high school teachers with suitable skills in mathematics, is only one part of a large, very difficult problem facing mathematics and statistics in Australia.

The review panel was spearheaded by three eminent mathematical scientists from France and the USA, representing pure mathematics, applied mathematics and statistics. They were astounded at what they saw as the collapse of the mathematical sciences in Australia, which they observed first-hand during their visit here. This is how they expressed their concerns:

> Australia's distinguished tradition and capability in mathematics and statistics is on a truly perilous path. The decline has already taken its toll: the university presence has

been decimated, in part by unanticipated consequences of funding formulas and by neglect of the basic principle that mathematics be taught by mathematicians, and the supply of students and graduates is falling short of national needs.

In our view, nothing short of adequate funding for the mathematical sciences, at both school and university levels, can avert the catastrophic consequences that we see looming for mathematics and statistics in Australia. We would be most grateful if you would bear these issues in mind when drafting the final version of your report.

Sincerely

Peter Hall (President, Australian Mathematical Society)

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[1] ``National Strategic Review of Mathematical Sciences Research in Australia," produced under the auspices of the National Committee for the Mathematical Sciences of the Australian Academy of Science, with financial support from the ARC, the Australian Mathematical Society, Inc., the Australian Mathematical Sciences Institute, and the Statistical Society of Australia, Inc. The full review document can be accessed at: http://www.review.ms.unimelb.edu.au/Report.html

[2] ``The Preparation of Mathematics Teachers in Australia," prepared for the Australian Council of Deans of Science by Kerri-Lee Harris and Felicity Jensz, Centre for the Study of Higher Education, University of Melbourne, 2006.