

## Preliminary input to the Review of Australian Higher Education

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*The Review seeks to examine the current state of the Australian higher education system against international best practice and assess whether the education system is capable of:*

- *contributing to the innovation and productivity gains required for long term economic development and growth; and*
- *ensuring that there is a broad-based tertiary education system producing professionals for both national and local labour market needs.*

The mathematical sciences community believes that the higher education system is currently failing to make sufficient contribution to both these major objectives and does not measure up to international best practice. In this brief initial submission, some key concerns are outlined.

A sound mathematical sciences base is fundamental to Australia's social and economic well-being because it underpins innovation and is critical to sciences, engineering and technology, finance and economics, security and many other areas. Modern mathematics and statistics are dynamic disciplines and, without a vibrant presence in the universities, Australia will fail to capitalise on new discoveries and applications.

Further, school mathematics provides young people with the skills to participate in a modern economy, make informed financial decisions and be able to assess statistical data including risks. Without an adequate supply of mathematically knowledgeable teachers, many young people do not acquire these skills. The supply of properly trained teachers of mathematics has implications for higher education that involve both mathematical sciences departments and education faculties. The report of the Deans of Science highlights the problems of mathematics teachers in schools who have inadequate training in mathematics<sup>1</sup>.

The mathematical sciences in Australian universities are in serious trouble. The National Strategic Review of Mathematical Sciences Research in Australia completed at the end of 2006 documented just how serious the situation is in schools and universities<sup>2</sup>. In Australia only 0.4% of students graduate with a major in mathematics or statistics compared with an OECD average of 1%. It also found that the major university departments lost more than 1/3 of their teaching and research staff between 1995 and 2006.

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<sup>1</sup> [http://www.acds.edu.au/Prep\\_Math\\_Teach\\_Aust.pdf](http://www.acds.edu.au/Prep_Math_Teach_Aust.pdf)

<sup>2</sup> <http://www.review.ms.unimelb.edu.au> - printed copies available on request

The National Review had two priority recommendations: (1) improved relative funding for the teaching of mathematical sciences in the universities and (2) support for national infrastructure. Improved relative funding for mathematics teaching was addressed with new money in the May 2007 budget. However, little of this money has found its way to mathematical sciences departments<sup>3</sup>. Further, proposed reductions at one university have led to international condemnation that is damaging to the reputation of Australian universities as a whole and mathematics in particular<sup>4</sup>.

Funding for national infrastructure for the mathematical sciences was recommended to be achieved through adequate funding for the Australian Mathematical Sciences Institute (AMSI). Funding of about 25% of the recommended level has been obtained for a three-year period. AMSI is modelled on Canadian institutes and is based on a small permanent staff and devolved activities. Further, AMSI integrates education, research and industry activities, a characteristic of the Canadian institutes<sup>5</sup>. AMSI has also set up an innovative network of access grid rooms to support efficient collaborative small group teaching at advanced levels across several institutions.

AMSI is an example of why innovative funding mechanisms are also needed to underpin some discipline areas. If collaboration and integration of different aspects of the various disciplines are to be fostered, account needs to be taken of the barriers that can exist when funding is specific to research, industry or education even within a single government department. The problems multiply when more than one department or agency is involved.

The Review of Higher Education addresses a number of themes. The first:

*Developing a diverse, globally focused and competitive higher education sector with quality, responsive institutions following clear, distinctive missions to provide higher education opportunities to students throughout Australia.*

needs careful implementation if Australian universities are to remain internationally competitive. In particular, it is in the national interest that universities ensure that their students acquire the mathematical knowledge and skills expected in other countries as part of their degrees. Unless this is accepted, then the other themes such as 'productivity and participation' are redundant.

The recent history of mathematical sciences in the universities indicates that it is not sufficient to allow individual institutions to determine their priorities in all areas. There are some fundamentals that should be accepted in the interest of the nation and students. To quote the international reviewers for the mathematical sciences:

*"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."*

*"The mathematical sciences skill base in any country is too important for its future prosperity to let short-term market mechanisms act alone. We sincerely hope that leaders in Australian Government, academia and industry will collaborate with the*

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<sup>3</sup> [http://www.amsi.org.au/pdfs/Questionnaire\\_summary.pdf](http://www.amsi.org.au/pdfs/Questionnaire_summary.pdf)

<sup>4</sup> <http://terrytao.wordpress.com/support-usq-maths/>

<sup>5</sup> See <http://www.pims.math.ca/> or <http://www.fields.utoronto.ca/>

*mathematics and statistics community to develop an appropriate vision, and spark an Australian renaissance in our field.”*

A key to a renaissance is a higher education system that recognises the key role of mathematical sciences in Australia’s future, the need for the majority of students to include some mathematical sciences in their degrees and that this be taught by mathematicians and statisticians. This is standard in other nations and should be in Australia.

If the above is accepted, there is no reason why every Australian university cannot be expected to offer a three-year sequence in mathematics and statistics. Actions to achieve this, the responsible authority and key performance indicators can be found on pp. 76-77 on the National Review.

It is noted that the Panel intends to conduct the review of higher education on a robust evidence base. The National Review of Mathematical Sciences, and its analysis of the situation in Australia, provides robust evidence of the need for change.

We look forward to providing further input when the discussion paper is released in June.

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