

Comments to the National Committee on Mathematics

A.H. Dooley
Professor of Mathematics
President, Academic Board,
UNSW

Tony Dooley holds a PhD from ANU (1977), and subsequently held postdoctoral positions at Flinders and UNSW before taking a tenured academic position at UNSW in 1983. He has held visiting positions at many international universities. He has served on the ARC expert advisory panel for Mathematical, Information and Communication Sciences, the New Zealand PBRF panel, and on the College of Experts of the United Kingdom EPSRC. In Australia, he has served on the Academy of Science's National Committee on Mathematics and the AMSI board. He is currently President of the Academic Board at UNSW.

The following is a summary of some critical issues in Australian Mathematical funding based on thirty years' experience.

Departmental Funding Mathematics Departments in Australia are principally funded on the basis of weighted enrolments. Discipline weightings are 1 for Arts subjects, 1.3 for mathematics subjects, 1.6 for computer science and 2.2 for Engineering subjects. The fact that funding is by enrolments, means that many Engineering and Commerce Faculties prefer to teach their own students Mathematics rather than allow the experts to do it. In my view, the result is that students get lower quality mathematics education. Furthermore, the higher weightings mean that at a university level, the organization gets a better rate of return on Mathematics taught as Computing or Engineering.

A good sustainable model for a generic Australian mathematics department is that of relatively few honours students of extremely high quality, and a major load of service teaching in the lower years. There are insufficiently mathematically gifted individuals for the nation to be capable of producing many thousands of quality honours graduates per annum, and clearly the demand is not there. The current funding model causes Deans to dream of rationalizing small classes (say of less than 20). Thus, in order to preserve the life-blood of the development of new talent, honours streams must be cross-subsidised. The natural place for this cross-subsidy to come from is the large service teaching cohorts of students who are not mathematics majors, but who need mathematics: Engineers, Physical and Biological Scientists, and increasingly students from Commerce and Finance.

The argument to the serviced faculties as to why they should support this, must be that Mathematicians can provide a better quality of teaching, more efficiently. Unfortunately, other faculties often interpret the situation that they are subsidizing Mathematics honours instead of being able to use the first year EFTSU to subsidise their own honours students. These pressures have led to the substantial erosion of numbers of students (and hence of research and teaching staff) across Australia.

Research Funding I joined the ARC Expert Advisory Panel in 2000, just after Mathematics had been moved from the Physical Sciences panel to the MICS panel. It is true that ARC grants in Physics and Chemistry have a different culture, as they need large equipment. Mathematicians had organized themselves into large teams, centred on project-oriented research in order to adapt to the Physical Sciences model. This was not necessarily good for Mathematics, but at least it got some money into the discipline.

The argument for getting together with the computer scientists was that the grant sizes are commensurable. This has not been totally true, as applications in photonics now form part of this panel. Nevertheless, there is greater cultural synergy. In the years 2000-2002, Computer Science was relatively less strong in Australia, and NICTA had just been founded, which meant that Mathematics was comparatively stronger in the panel. It is my (subjective) impression that the standard of Computer Science has improved, and that mathematics is now getting a smaller percentage of the MICS panel funds for Discovery Grants. I believe that younger Computer Scientists are more able to get funding than younger Mathematicians. It would be interesting to do the statistics to see whether my impressions are correct or not.

AMSI was a good initiative, funded for 3 years by the Victorian Government, and subsequently by contributions from the member universities. The Victorian Government funding ran out last year, so that AMSI is now totally dependent on contributions by member universities across Australia: fortunately it has built up a surplus which can tide over several years, but I am not sure how sustainable it is in the long term: if mathematics department budgets are further reduced, they may start withdrawing from AMSI. Ideally, the Federal Government would be picking up some of the shortfall, but as it funded ICE-EM (which has a high-school focus), I think that this is unlikely. AMSI has made a strategic alliance with a Centre of Excellence in computational biology out of Melbourne University in order to shore up its position. This may lead to a re-direction of AMSI's mission.

I was happy to be a member of the MASCOS team: for one of eight CoE's across all disciplines to be in Mathematics was a great feat. It was certainly partly due to the fact that AMSI was a partner that we succeeded. MASCOS can apply for an extension for 2007-2010. Nevertheless, the national funding for mathematical research institutes is small compared with most other developed nations, however one calculates it.

Place of Mathematics in Australian Society Proper mathematical research needs the full spectrum of activity from the pure/ blue skies end to the hard applications. Unfortunately, successive governments have had a short-term point of view: an outline of the national benefit is routinely requested: the answer that the research may benefit society in 20 or 50 years does not seem an adequate answer! There is a real danger that focusing on deliverables will kill exactly that longer-term perspective which is needed for Mathematics.

It is not yet clear exactly what form the Research Quality Framework will take. It does, however, seem likely that it will create a competitive environment between universities,

and this is not beneficial to Mathematics, where collaboration and early sharing of ideas seems the best way to do good research.

Generally speaking, the Australian public doesn't understand that one can do research in Mathematics, nor why anyone would bother trying, and cannot see any advantage to funding it. I often hear it claimed that we can simply "import" what Mathematics we need from overseas.

Place in the world During the 1960's, it was difficult for Australian mathematicians to interact with the rest of the world. We were not on the trajectory of the standard visiting path of international speakers (with some notable exceptions). Through the 70's 80's and 90's, my generation built a good reputation across a good spectrum of areas. I now see this as being arrested and wound back, even though travel is relatively cheaper and email facilitates collaboration. The wind-back is largely due to budgetary constraints: less travel money, less time for research and less national leadership.

I ask the Committee to consider the following questions:

- What would have happened to Terry Tao's career if he had stayed in Australia to pursue his doctoral studies?
- Why have so many good people left...people in their early 40's, who, in any normal country would have been fêted? Klaus Ecker, Alex Dimca, Leon Simon, Matthai Varghese, Jim Wright, Werner Ricker, to name just a random sample off the top of my head. Some of these could not get ARC grants!
- I assert that if all the good Australian Mathematicians who are overseas were somehow to come back, we would have a phenomenal world presence.
- Why are there no Federation Fellows in Mathematics proper (with apologies to Kevan Burrige)?

During my career, the pendulum of research has hovered over the USA and Europe. Anyone who has been to Asia recently (especially China) can see that there is going to be a shift towards Asian countries. Australia should be positioning itself to align itself with this shift, but I see little evidence of that. Perhaps I am seeing this more clearly as UNSW moves to open a campus in Singapore: it seems at the moment possible that Mathematics there will be taught out of the Engineering Faculty!

Australia has produced many fine mathematicians. However, it is getting increasingly difficult for them to have a satisfying career here. Unless something changes in Government or Community attitudes (which are linked, after all), I am pessimistic about the future.