



# Maths matters

## Where to from here?

Alan Carey\*

Universities in Australia are financially at a major disadvantage compared with those in North America and Europe. Yet despite our current situation there is some excellent mathematical research being produced that is creating an impressive international profile. Moreover, there is a new generation of young mathematicians in our universities who will keep mathematics alive in this country in the future if we can find ways to help them remain research active. (By contrast the situation in statistics is dire and requires more drastic action.)

There are some potential downsides. Increasingly, Asian universities are overhauling us. The high dependence of our universities on overseas fee income means that we will be very vulnerable in the near future as higher education becomes more freely available in the region. And most significantly we are starting from a very weak base with a system that has a serious infrastructure deficit and a structural problem with respect to the funding of both teaching and research. On the upside, the recent Federal Budget promises some structural reform that will help. But, as we saw with the increase in mathematics funding under the Howard Government, there is no guarantee that the budget money will flow to the mathematical sciences and continued lobbying and arguing for our case is essential.

I saw three red flags in the Budget. The first is the comment that the Government will re-orient the Institutional Grants Scheme to reward collaborative performance with industry and other end users. This looks like yet another 'leveraging mechanism' whereby government drives universities to spend their budgets on research with a perceived economic benefit. The second flag is that we are to have yet another review of discipline-based costs for teaching and learning. I feel that our current position is not secure and the mathematical sciences community will have to fight even to maintain the status quo. Finally the 'hubs and spokes' model for research collaboration has some potential benefits if properly funded, but is dangerous if it is a further device for leveraging existing spending in a particular manner driven by well-intentioned but misinformed notions of how research really works. For example, we have already seen that the mathematical sciences do not undertake research in a fashion that appeals to the Australian Research Council's (ARC) view of Centres of Excellence for example.

Figures I saw recently indicate that student/staff ratios in Australian universities have risen from 11 students for each staff member 30 years ago to 25 students on average today. These are comparable with those in Asian universities and contrast sharply with those in North America and Europe. On the other hand 30 years ago there was little grant money for mathematics research as this was covered

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by the teaching funding. Taking into account competitive grant income and fee income, my best guess is that mathematics is probably, on average, about half as well funded today as it was back then with a few exceptions. On the other hand, I am constantly impressed by the depth and diversity of Australian mathematics by comparison with our earlier situation.

The Australian National University (ANU) is in difficulties for other reasons largely to do with John Howard's politics. While ANU undergraduates are funded in the same fashion as the rest of the sector, the Institute of Advanced Studies (IAS) Block Grant is not part of the usual Federal education budget but is allocated in a different fashion. In dollar terms it is the same now as 15 years ago which means in real terms this represents about a 50% funding cut over that period. The majority of the grant is spent on large-scale infrastructure (most of national importance) and overheads. The mathematical sciences share is only about 1.2% of the total.

So staff supported by the IAS Block Grant are not full time researchers but are mostly funded by a complex formula with their salary made up from a variety of other sources. They teach undergraduates, supervise honours, masters and PhD students and carry on their research like everyone else. They carry also the responsibility to represent Australia internationally. For example Neil Trudinger is on the Abel prize committee (see his report on p. 249 in this issue of the *Gazette*). Others have joint appointments with overseas institutions and many are engaged with overseas research institutes or have responsibilities overseas on a regular basis. One aspect of the job at ANU is to maintain a high international profile for Australia in the areas of mathematics that we are able to cover, to engage with the leaders in our profession and also to be active in promoting links between Australian mathematicians and our international colleagues. Dealing with the massive funding cuts at ANU in the last decade has forced us to re-think the way we fund our activities. Some of what we have learnt certainly applies at other Australian universities.

One lesson is that to maintain a high research profile for Australian mathematics we are going to have to find ways to tap into international funding sources. For example it is possible now to engage with EU networks on an individual basis. We can also gain support by participating as organisers in programs at overseas Institutes. At ANU we have been active in programs at the Newton Institute, Pacific Institute for the Mathematical Sciences (PIMS), Fields, Mathematical Sciences Research Institute (MSRI) and so on. By being an organiser you can direct funding towards your students or colleagues. I am sure that many other Australian mathematicians have been doing this too. Despite the myopic attitudes of our granting bodies and our governments towards funding international engagement, Australian mathematics is benefitting greatly by such involvement. If the ARC understood this issue better and were specifically tasked with the job of promoting such interaction then we in Australia could derive immense returns from the huge overseas investment in research. At the moment, because there is no serious source of Australian funding for international linkages, this possibility is only just starting to open up. With this future direction in mind ANU has signed a collaboration agreement with PIMS. Our intention is to work for the benefit of Australian mathematical sciences generally in organising joint activities with PIMS. We are also

negotiating with Centre National de la Recherche Scientifique (CNRS) in France for an on-going collaboration agreement.

A further recent change in our situation has been provided by AMSI who have injected a capacity for supporting education and research networking within Australia that is very valuable. However, the failure of the Federal government to give AMSI stable funding is similarly myopic and out of step with our international peers. It is not all gloomy as the recent grant of \$2 million for 2009 demonstrates. It is clear from this that AMSI is high on their agenda and if it were not for the financial crisis we would have cause for optimism. However, as a community we are probably going to have to re-invent AMSI if it is to continue. One difficulty we have to overcome is that outside Victoria it is not seen as a national organisation. It is not possible for other institutions in other states to tap into funding sources to assist AMSI while it remains in its current form. My personal view is that in the future AMSI must have a physical presence outside Victoria if it is to survive and should follow more closely the distributed model established by PIMS which straddles the US and Canada.

Unfortunately there is no simple, achievable, universal strategy to ensure that the working conditions in mathematical sciences departments in Australia are good enough to enable the next generation to flourish. We have seen how the substantial achievement of winning extra funding from the Howard Government was sabotaged at the university level because there was no widespread acceptance within our universities of the importance of increasing the funding of mathematical sciences departments. In this situation we must find further strategies to convince our university administrators to treat the mathematical sciences on an equal footing with other disciplines.

Finally, as an illustration of the kind of international engagement that I am talking about, I will add a few words about the visit of Terry Tao as the Clay-Mahler lecturer. When it became clear to me that AMSI would have to dig deep and take money from other activities to fund Terry's tour I recalled some correspondence that I had been involved in with the Clay Mathematics Institute (CMI). They are keen that former Clay Fellows should deliver at least one lecture series at a suitable venue both to publicise the CMI and their own personal mathematical achievements. So I was very pleased when the CMI agreed not only to fund Terry to deliver the Clay-Mahler lectures for this year but to fund two other outstanding mathematicians (Danny Calegari and Mohammed Abouzaid) to tour with him to create an event that will be inspirational to the public and to our younger generation of mathematical scientists.



Alan Carey studied at the Universities of Sydney and Oxford, then took up research fellowships at the University of Adelaide and the ANU. He held a continuing position at the University of Adelaide, with brief appointments to Flinders University and to ANU, from the mid-80s until 2002. Since then he has been the Dean of the Mathematical Sciences Institute at ANU. He has been a Clay Mathematics Institute Scholar on three occasions, in 2000 and again in 2001 at Harvard, and in 2006 at the Erwin Schrödinger Institute in Vienna. He was President of the AustMS from 2000 to 2002.