



Maths matters

Back to the future

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The *Gazette* approached me to write a Maths Matters column about the challenges faced by young academics to get their careers going. Somewhat hesitantly I agreed. It is no secret that currently the tertiary sector, and mathematics in particular, is under a lot of pressure. It is perhaps awkward at this time to emphasise issues related to early careers while many others are struggling to keep theirs¹. Still, for the health of the sector, I think we should keep addressing the lack of career paths for young talented researchers.

Shortly before the time of writing, a conference on higher education was held in Sydney where many leading policy-makers spoke. It is very uplifting to hear and read what people are currently saying about the future of higher education, but so far action has been restricted to words only. In the following I quote frequently from the higher education section of *The Australian*.

After years of neglect during the Howard era, everyone is knocking on Julia Gillard's and Kim Carr's doors. The newly elected Federal government appears to be genuinely positive in its attitude toward higher education and internationally competitive research. Unfortunately, not much detail has yet been released about the announced 'education revolution', and for the moment not much action has been undertaken. In cases where money has been put into words, such as the additional funding for universities toward maths students approved by the previous government, university management has, with some exceptions, failed to pass this on to the specific target area².

To use one of Kevin Rudd's favourite catch phrases, it is very important to get it right. What I will try to argue below is that Australia does not need more fixed-term contracts and fellowships, nor the distribution of large amounts of money to just a few individuals with little left for others. What Australia's tertiary education sector needs are clear career paths for new generations of scientists. Australia's leaders should not underestimate the vast pool of excellence that is currently out there. There should be opportunities for those that perform at the highest level, but above all, there needs to be a critical mass of excellence within a safe and collegial environment. In such an environment, science and scientific collaborations will flourish, based on trust and common interest rather than being imposed.

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¹For the most recent developments related to staff cuts in maths departments see <http://terrytao.wordpress.com/support-usq-maths/> for the laudable efforts by Peter Hall, Hyam Rubinstein and Terry Tao to reverse this trend.

²See, for example, Hyam Rubinstein in *Maths still out for the count*, Caroline Milburn, *The Age*, 7 April 2008, and the website of the *National Strategic Review of Mathematical Sciences Research in Australia*, <http://review.ms.unimelb.edu.au>.

Time to act

For many years, the problems faced by young (and not-so-young) people in establishing their careers have not been fully appreciated by university management and governments. This now seems to have changed, and, very slowly, there seems to be an emerging world-wide appreciation of the value of young talent for universities. In order to retain such talent, it is important that governments and universities reflect on their past policies, and make academia again an attractive workplace.

‘They (early career academics) are experiencing a really hard time in working in academe’, said Shelda Dobowski, president of the Higher Education Research and Development Society of Australasia. She said the greatly increased focus on teaching and learning by university management in recent years was highly welcome, but it greatly added to the pressures on new academics. ‘It is more and more difficult to recruit.’³

Australian universities and governments have to act swiftly. Otherwise they will lose talent to more lucrative options in business or more welcoming environments at overseas institutions. At the moment, the government appears to be unaware of the urgency of the matter.

According to Rohan Carr, a director of The Insight Group: ‘Something needs to be done now because it’s going to take time (to fix the problem). In three years’ time (when new funding arrangements are expected to arise from the government’s new review) we’ll have lost three more years’ (worth) of academics. It’s very easy to tip more money into the sector. What you can’t do in a short time frame is retain people or attract them into the sector.’

‘(As an academic) you have to churn out lots of research, you have to have a high teaching load, you have to manage.’ He said that modern business had learned how vital it was to be able to attract and keep talent but most universities were oblivious to this truth. Their procedures often were too slow and cumbersome for hiring good academics and keeping them happy. ‘When it comes to people-management practices, they are a long way from leading edge.’

Over the next decade, skill in securing and hanging on to first-rate academics might become more important for quality and reputation than the established advantages of a sandstone institution. ‘Already some universities are becoming more nimble at this than others.’⁴

This, unfortunately, is indeed a reality in mathematics. Two concrete examples occurred last year at my own university. Two very promising and motivated young mathematicians recently departed. One left for Canada despite the fact that this person had just been awarded a prestigious five-year ARC QEII fellowship. Little effort was made by the university to retain him. The other, a past editor of the *Gazette* who shall remain nameless, has just become a Fellow of the Australian Academy of Science and has been cherry-picked as a professor by another Australian institution. The university was not able to offer a real future.

³Staff say uni bosses ‘incompetent’, Catherine Armitage, *The Australian*, 19 March 2008.

⁴Staff crisis first bill of order, Bernard Lane, *The Australian*, 2 April 2008.

Competitive research

It is well established in mathematics that researchers can make substantial contributions at a young age, and that much innovative and internationally competitive research is done by nontenured post-docs and PhD students. For young people in mathematics and statistics it is therefore very important that research is valued appropriately (i.e. with sustained funding tied to individual researchers). While the previously proposed RQF was a monstrosity, the intention to measure research quality of future academics is a good one. Such measures can be implemented with small administrative effort by keeping track, for example, of invitations to international conferences and editorial positions, as well as successes in peer-reviewed grant schemes. There is of course the danger that governments and universities allow such measures to be used retrospectively for the retrenchment of academic staff. This should at all costs be avoided (a view which may prove to be unrealistic).

There are hints that the Federal government is serious about maintaining and enhancing Australia's competitiveness in research. Australia needs to have a critical mass of top-notch academics who are able to talk to their international peers and grasp state of the art developments. In this way Australia would be able to maintain a leading technological edge. In addition, the reputation of Australia's higher education system should be viewed as an important export product. Once squandered it is hard to rebuild, and the economic loss as a result of a reduced influx of overseas students will not be negligible. Just how dire the situation is was explained recently by University of Western Australia vice-chancellor and Group of Eight chairman, Professor Alan Robson, at the National Press Club in Canberra:

'The proportion of Australian university R&D spending directed to basic research has fallen from two-thirds in 1990–91 to less than half in 2004–05.'

In research output volume, China and India were rising rapidly, and using Thomson ISI data, Australia was slipping behind the UK, Canada and other countries across a range of research fields, including chemistry, physics, mathematics, economics and engineering.

'We are vulnerable to being bypassed, cut off and left behind in the advancement of knowledge. And if we allow that to happen, we can kiss goodbye to an innovative Australia.'⁵

So far, the only tangible initiative from the government to address this issue is the announcement of Future Fellowships for mid-career researchers:

'The 1000 Future Fellowships promised to mid-career researchers will be thrown open to international competition, Kim Carr, the minister for Innovation, Industry, Science and Research has announced.'

'Our aim is to attract the world's best — who may or may not be Australian — and to get them working here on problems that matter to us.'⁶

This could work out really well as a short-term fix, but I am not a big fan of these one-off action items. Without taking anything away from those who are able to

⁵ *Australia lagging on research*, Guy Healy, The Australian, 3 April 2008.

⁶ *Research funding for cream of crop*, Bernard Lane, The Australian, 2 April 2008.

win prestigious fellowships, the scientific community as a whole is not much helped by such an initiative if there is no sustainable future plan to follow it up. Besides, top scientists are not attracted or retained by incidental and scarce injections of money, especially if there are no obvious academic career paths for the future. An example, already mentioned above, is the departure of one of my colleagues to Canada, despite the fact that he had just been awarded a QEII Fellowship.

What is needed is a sustainable system in which the very best people can flourish with strong funding, but which is also able to support a critical mass of both upcoming and established researchers such that a vibrant, collegial and stimulating research environment is maintained. As Alex Reisner put it:

From the Australian viewpoint there is increasing drive not only in North America and Europe but also India and China to increase the employment prospects of the human capital that forms the basis of their nations' innovative infrastructure. It is all very well for Senator Carr to proclaim the worth of Future Fellowships, but: 1) the milieu in which those fellowships will be utilised will compete with research environments throughout the developed world, i.e. how well will the research environments Australia can offer compare so that they will attract the 'best and brightest', and 2) what will be offered to the 'Future Fellows' at the end of their fellowship tenure so that they will remain?

What Senator Carr, Julia Gillard, as Minister for Education, Treasurer Wayne Swan and Prime Minister Rudd, have to develop is an overreaching package, otherwise they wind up with a collection of spokes bereft of a wheel.⁷

Solutions

As argued above, Australia needs to make sure that the tertiary education sector again becomes an attractive workplace for young academics. This holds in particular for mathematics, where in many cases substantial contributions are made by very young researchers. A sensible and sustainable solution has to be found, and it has to be found quickly.

Many of the young people I see around maths departments in Australia are more than pulling their weight. In some instances they could perhaps be encouraged to engage more in the decision-making process of their departments, universities and professional societies. This also means that some of the barriers within the sector's hierarchical structures need to be lowered, so as to involve, rather than disenfranchise, nontenured junior members. Some small but important steps that can be taken immediately are:

- The creation of a student and early career position on the steering committee of the AustMS (with real voting power).
- At the level of maths departments, involve nontenured junior members in discussions and decisions about future directions.

⁷*Brains drain to where the future lies*, Alex Reisner, The Funneled Web
<http://www.the-funneled-web.com/>.

It is quite clear that more government funding should flow into the system, but, as argued above, the system itself needs to change as well. Some simple and obvious adjustments are:

- Require higher education institutions to offer permanent contracts after the expiry term of prestigious ARC fellowships.
- Decouple Fellowship applications from Discovery Projects, and restrict these to sole applicants only. This creates a fairer competition between fellowship applicants.
- Abolish the expensive and divisive Federation Fellowship scheme, and use the substantial savings to increase the number of APD, ARF and APF fellowships.
- Clearly separate fellowships into research fellowships for early career academics and teaching relief fellowships for established academics.
- Change the timeline of the ARC grant system, so that grant starting dates do not fall within a few months from the time they are awarded. This introduces much less anxiety among researchers whose jobs depend on the outcome of such grants.
- Reintroduce a system of smaller grants, open to tenured as well as nontenured staff, so that active researchers can independently interact with their international peers.

I guess it is an unfortunate fact of life that most people with a mathematical background do not aspire to a political career⁸. A small group of Australian mathematicians has done an outstanding job in recent years to engage with senior politicians, but in other disciplines more people seem to be well connected. Such disciplines thus have more influence on decision makers than mathematics. I am confident however that the new Federal government will take a decisive but balanced course of action. I sincerely hope that university management is able to do the same.



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⁸Even worse, some ambitious politicians have a bit of catching up to do in elementary maths: http://www.youtube.com/watch?v=Lp2fj_x3dZs