Maths matters

What do we need: herd immunity or a lone gold medallist?

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There's been quite a heated stoush in the newspapers lately, following the release of the Bradley Review of Higher Education in Australia[1]. In particular, some of the larger better-resourced universities are running an opposing position that favours 'diversification', and words like 'competition' are being tossed into the argument. There are sinister rumblings that quality research won't be possible under the Bradley reforms, and that we will all slip into mediocrity as a result.

At first reading, it all sounds noble enough, and most of us in Mathematics Departments could only agree that our beloved discipline has been savaged over the past decades. Furthermore, most of us who've been in the system for a while have 'review fatigue', and enjoy a healthy scepticism about the capacity of any government-inspired review to deliver any actual improvement.

However, I think it's worth digging below the surface of these objections to the Bradley Review, and asking how mathematics might be affected. Beneath some of the talk about diversity in the sector is the suggestion that research, and particularly the funding that goes with it, should be concentrated in only a few universities. And not surprisingly, the same universities that are proposing this concentration are recommending that they themselves should be the sole beneficiaries.

From my point of view in one of the smaller universities, this talk of research concentration by the large, to their own advantage, has all the altruism of a school of hungry piranha fish. It might, however, possibly appeal to politicians and their ilk, since it could seem to offer the prospect of easy answers to difficult questions, along with the advantage of snappy photo opportunities in the midst of a large and well-equipped research group. But I think we need to dig below even the self-interest of these suggestions, because they raise fundamental questions about what research is, and who gets to do it.

In an opinion piece in *The Australian* newspaper's 'Higher Education Supplement' (Wednesday 18 February 2009)[2], it was argued that we should get rid of our 'one-size-fits-all' notion of universities, which was described as a worn-out approach. It was argued that the teaching-research nexus is a 'myth'. By ending this myth, the way would presumably be clear for concentration of research, and its funding, in the hands of a self-appointed few.

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[1] http://www.deewr.gov.au/HigherEducation/Review/Pages/default.aspx

[2] http://www.theaustralian.news.com.au/story/0,25197,25069582-25192,00.html

I believe this argument is fundamentally and fatally flawed, and fails on its own logical criteria. It is disingenuous to suggest that all research processes in every discipline are equivalent and therefore need equal levels of concentration. The 'one-size-fits-all' description of research certainly does not work.

One of the many things I love about mathematics is its egalitarianism and its subversive impudence. Good mathematics can be done by all sorts and classes of people. This is an exciting time to be a mathematician, particularly with the relative cheapness of computing power and memory and the easy access to information afforded by the internet. Perhaps there are some disciplines that might be reliant on expensive equipment for their next research idea, but this is not a prerequisite for mathematics to thrive, although admittedly having occasional access to a group of talented people may enhance our own research creativity. At least as far as mathematics is concerned, there is just no compelling economic argument for demanding that research should be concentrated in only a few centres.

There is also the question of what, actually, constitutes mathematical research? I believe that anyone who is seriously studying mathematics at university level is engaging in research of one sort or another, though perhaps with somewhat limited horizons. After all, every student who struggles with a new mathematical technique or concept, and attempts to apply it to a new situation, is genuinely undertaking the process of research. If they are coming to terms with existing knowledge, then the fruits of their research will, of course, not be original or publishable, but I would argue that the *process* they are undertaking is not qualitatively different from what we all do when we develop new results for a research paper. I would therefore suggest that, far from being a 'myth', the teaching-research nexus is a vibrant reality in mathematics, even if it might not be in some other disciplines.

I want to argue that mathematics at all levels is so important that the benefits of having it available across the sector far outweigh any gains from concentrating it in a few locations. In fact, is it even possible to curtail research in those institutions deemed to be research-inactive, without imposing draconian teaching hours or administrative burdens on staff? I believe not. The twin activities of teaching and research in mathematics are too closely entwined for that to be an achievable outcome, much less a desirable one.

Will Australian mathematics become mediocre if we do not attempt to concentrate research? Actually, I hope so! After all, 'mediocre' literally means somewhere in the middle, and I don't think we are that far advanced yet. Too many universities still promote science-type degrees in which mathematics is seen as an optional extra, perhaps available to select clients with unusual tastes, rather than the fundamental language of technology that it really is. When students can graduate with degrees in biology, computing or environmental science and have had almost no exposure to basic calculus or statistics, then that's a major cause for concern. And at the school level, the opportunity for keen students to study mathematics is actually shrinking, as Nalini Joshi has argued in the national press. All this convinces me that mediocrity in Australian mathematics is still a worthy goal to be aspired to.

A mathematically and quantitatively literate population bestows a kind of 'herd immunity' on the community in the sense that everyone benefits, including people who themselves may have no interest in mathematics. This situation is certainly what we need, if we are to maintain our first-world living standards in the long term. For this to occur, we need a wide dissemination of mathematics to a reasonable standard, rather than a narrow concentration in a few centres to the neglect of everywhere else. Furthermore, this is precisely what is needed in order to foster the next generation of gold-medal-winning research stars that the system claims it wants to produce.

Larry Forbes is the professor of applied mathematics at the University of Tasmania. He was privileged to have done his PhD in 1981 at the University of Adelaide under the supervision of Len Schwartz and Ernie Tuck. There, he was introduced to the delights of free-surface hydrodynamics and integral-equation methods. He subsequently held assistant professorships at the Hydraulics Lab at the University of Iowa and in the Mathematics Department at Kansas State University. He then obtained a position at the University of Queensland in the Mathematics Department, and was there from 1985 until 1999. In 2000 he took up the professorship at the University of Tasmania. He was head of the School of Mathematics and Physics from 2001 until 2008, which is a chic occupation for someone with a mild aversion to administration, and he also served briefly on the ARC mathematics panel. He has research interests in fluid mechanics, dynamical systems and the design of medical imaging equipment, and has been in the fortunate position of enjoying long research collaborations with a number of colleagues and friends who work in these areas.