Australian Government

AUSTRALIA'S CHIEF SCIENTIST

ADDRESS TO THE AMSI SUMMER SCHOOL

SYDNEY

9 JANUARY 2012

Good morning,

I thank you for inviting me to speak today.

I should say that I have always found it a pleasure to start the year with a string of openings of various sorts: mostly summer schools, youth fora, conferences and the like. I have done them all. But I think it is a great to start a year in the company of people committed to learning and who are enthused by the idea of learning more.

It is important to have that enthusiasm, and to nurture it when we see it.

This planet of ours faces very many challenges. It always has; and I guess people like me have been standing up at shows like this and reminding people of the challenges we face for a very long time.

Probably each generation has been told that the challenges are great. Maybe the challenges of times past were sometimes less confronting than those of today. But scholars like you through the ages have applied themselves to help us understand the why, the how and the what – building on the knowledge that was available at the time.

It is important that you do. But it is important that we all recognise the context in which you do what you do.

We commissioned a survey recently of senior secondary students. Only a small proportion of the non-science students thought that science had an impact on their everyday lives almost always (I forget the exact phrase). The rest got down to never but the bulk thought sometimes through to more often than not.

At first blush, you might think that they were young people for whom a day could pass when they never used any or all of a mobile telephone - or a land line, switched on or off electricity to some modern appliance or other, ridden in car, pulled on a sneaker, eaten any food, watched TV, listened to radio, taken a medicine or even used a plastic bank-note. People don’t have much reason to pause and think about science and its impact; instead they tend to take it for granted. And that is where we start when we think about the why, the how and the what – or what for – today.

So the students of today, you and your colleagues, face challenges on a grand scale. Challenges like climate change, food security, population growth, sustainability and ageing populations. Yet we start from a position where the worth, the real value of science is treated across a spectrum from ignore through neglect to utter contempt, by too many.

There is a Presidential candidate in the US who has been reported to have declared the scientific evidence of global warming as ‘junk’ and ‘patently absurd.’ Just like that; no ifs, no buts, no can you explain it to me, I’m a lawyer. Just junk.

This is not the language of a man puzzled by scientific complexity, nor even one worried by what he doesn’t know. It is not a man demonstrating an understanding of the scientific process, or the scientific method, or even the role of scepticism in properly conducted science. But they are the words of a man aspiring to the most powerful elected office on the planet.

It is not that I think the candidate should accept the scientific evidence without thought or serious reflection; or simply accept it because the weight of evidence lies on one side. But the issue is also much too important for the evidence to be a casualty of the frenetic search for the maximum vote. I would certainly like to know, were I an American about to vote, that the candidate had seen the evidence on this critical issue, had come to grips with it personally, understood probability, and could explain why he thinks it is ‘junk’ or ‘patently absurd.’ If it could be reported that he could do that, those who agree with him would know why; importantly, those who do not agree may well see something they haven't seen before. But I'm not going to wait in breathless anticipation.

I mentioned earlier a few of the big problems that need solutions. And largely, these solutions will be in many ways dependent on the work of mathematicians like yourselves.

Maths is an enabling discipline. Engineering, physics, chemistry, geology, statistics are all dependent on mathematics. The sequencing of the genome was as much a triumph of mathematics as it was an achievement for biological science. It is fundamental to the commerce on which our society depends and is at the root of much modern medicine. And yet so many people struggle to see its relevance in their day to day lives – as I mentioned earlier.

Somehow (I say hopefully) we must explain to the world at large why it is important. Explain that there are some amongst our cohort of scientists, mathematicians, engineers who will devote their time and their skills to the understanding of the very nature of things. We must explain that there are others who will use that knowledge, add to it, mould it and turn it into applications that benefit humankind. All are valuable, all are critical indeed, and all will play their part in meeting some of our challenges head on.

So we have the responsibility of doing very well what we choose to do, wherever in the spectrum it falls. We must do it ethically, and rigorously and with care. And we must work to take our community along with us – by explaining to it why we do what we do, and how.

The last of these has had too little attention. Gowers wrote a decade ago that of you asked a mathematician to explain what they are working on, you'd often be told that it's impossible in such a short space of time. Worse still, if you push and ask if their work has practical applications, too rarely do you receive an impressive response[i].

Then there is a always a group who have no sense of obligation. Famously, Cambridge mathematician GH Hardy was proud that his work on number theory had a complete lack of practical applications. To Hardy the worth of his work was in its beauty. And I quote: "No discovery of mine has made, or is likely to make, the least difference to the amenity of the world."[ii]

This might be good for some – even good enough for those who believe that the support of their research even their salaries actually grows on trees - good enough for those who thing in terms of entitlement - but it really isn't good enough these days. In any case, this idea of 'impractical maths' is a fallacy - the work of mathematicians over the last fifty years, even in obscure realms of maths, has had an enormous impact.

I imagine most of you in this room would consider yourself first and foremost mathematicians, and continue in honours and post docs because you appreciate the intricate beauty of mathematics. Some of you will being doing it for that reason alone – others with applications or potential uses in mind. Yet, the work of all of you may be fundamental to solving the complex problems we face.

Unfortunately for Australia - though perhaps fortunately for you - demand in Australia for maths graduates has outstripped supply. Between 1998 and 2005, demand for mathematicians and statisticians in the Australian economy grew by 52% – an annual growth rate of 5.4%. Forecasts up to 2013, project an expected growth rate of 3.6%[iii].

And yet in the period 3 2001 to 2007 the number of enrolments in a mathematics major in Australian universities declined by approximately 15%[iv]. Projected figures state that by 2020, there will be more mathematics PhDs retiring from the Australian workforce than entering it. This is in spite of the predicted 55% increase in demand by 2020 for mathematics and statistics PhDs across all sectors of the economy[v].

On the global scale, we are falling further and further behind. In 2003, the percentage of students graduating with a major in mathematics or statistics in Australia was 0.4%. The OECD average is 1%[vi]

So what can we do about it? We need to increase the number of people taking on maths in universities, now. Which means we also need to increase the number of students taking high level maths in schools, now.

Late last year, I was asked by the Prime Minister to develop strategies to increase science and maths enrolments, so I have two months to come up with some good ideas. The advice is still being formulated – so if any of you have really, really good ideas, you can email them to me.

But there are obvious things – like teaching maths/science/stats interestingly at school and university, scholarships, career advice (not every PhD has to take their Professor's job to be a success), links with industry – the list is long. And the other part is to get the community behind us: to show people that maths is vital to improvements in their every day lives – all the time.

So I congratulate you all on making it this far. You will be invaluable to Australia’s future. And there is no doubt we need people like you. And let us tell the whole world about it.

Thank you.

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[i] WT Gowers (2000). The importance of Mathematics. http://www.dpmms.cam.ac.uk/~wtg10/importance.pdf

[ii] G. H. Hardy (1940). A Mathematician's Apology. Cambridge: University Press. pp. 153

[iii] Group of Eight (2009). Review of Education in Mathematics, Data Sciences and Quantitative Disciplines. P6 http://www.go8.edu.au/__documents/go8-policyanalysis/2010/go8mathsreview.pdf

[iv] Group of Eight (2009). Review of Education in Mathematics, Data Sciences and Quantitative Disciplines. P7 http://www.go8.edu.au/__documents/go8-policyanalysis/2010/go8mathsreview.pdf

[v] AMSI (2011). Making Maths Count for Cabinet Ministers. http://www.amsi.org.au/news/87generaland-outreach-news/789-media-release-making-maths-count-for-new-cabinet-ministers

[vi] Group of Eight (2009). Review of Education in Mathematics, Data Sciences and Quantitative Disciplines. P7 http://www.go8.edu.au/__documents/go8-policyanalysis/2010/go8mathsreview.pdf