



Australian Government
Chief Scientist

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**Innovation and Science Postgraduate Research Education
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MELBOURNE

70 years old – and thriving

This year we celebrate the 70th birthday of the Australian PhD.

The program was first introduced at the University of Melbourne in 1946; and the first PhDs were awarded in 1948.

There's an important footnote to history here: two of the three PhDs in that landmark year were awarded to women.

And one of those women was Dr Joyce Stone, a life scientist, for her paper: "Virus Haemagglutination: a review of the literature".

Of course, at 70 years old, the Australian PhD is but an infant in comparison to the grand old dame of the university itself, now nearly one thousand years old.

On the other hand, in human terms, 70 is a very respectable age. Old enough to be wise – young enough to be vibrant.

Which is not to say that our society always treats septuagenarians with the consideration they deserve.

- If the PhD were a person, she would probably be a pensioner.
- If she were a High Court judge, we would force her to retire.
- If she were a politician, we would encourage her to "spend more time with the family".
- If she went to the doctor, we would check her blood-pressure, restrict her diet and send her to Pilates classes.

Of course we have to keep our 70 year olds fit – just as we need to keep our 70 year old PhD program fit for purpose.

But let me say very clearly, and very slowly – in case anyone would like to tweet it – I am a great fan of the Australian PhD.

In that first year, 1948, we awarded just three. In the first ten years, we awarded 130.

Today, we produce more than 8000 new PhD graduates in just one year – and we welcome close to 12,000 students into PhD programs.

About a third of those students come to us from overseas, because we offer a qualification that stands up anywhere in the world.

That is a testament to a university sector in robust health: far more ambitious and innovative than we tend to give it credit.

And nothing I say from this point onwards negates that view.

Breaking free of the conveyor belt mind

You can probably sense that there's a 'however' up ahead.

Here it is: However. My view of the PhD is not universally shared.

I believe that Australians do respect our PhDs – but we respect them first and foremost as people well prepared for academic life.

We don't approach the PhD as the Germans do: as a sterling qualification for all walks of life.

Chancellor Angela Merkel might hold perhaps the world's most famous physical chemistry PhD. And no German, to my knowledge, has ever dared to describe her as a sad loss to science.

On the contrary, they keep voting her back into office for her scientific mind, analytical powers, and respect for the facts.

So highly do the Germans rate their PhDs that politicians aspire to being referred to as Herr Doktor. Sometimes, that aspiration becomes desperation.

Their Defence Minister resigned in 2011, over allegations of a plagiarised thesis.

The Education Minister resigned in 2013, again, over allegations of a plagiarised thesis.

And then the replacement Defence Minister was also told to resign in 2015, over allegations that her medical thesis on obstetrics copied material from unattributed sources.

Can we imagine an Australian defence minister with a PhD in obstetrics?

Can we imagine our journalists recognising that PhD as a relevant qualification for the job?

Can we imagine that the voters would be so appalled at the merest whiff of academic dishonesty that the minister could be forced to resign?

I have to admit, I struggle.

I see in our commentary an insistence instead on putting people into neatly marked boxes, as they roll off the conveyor belt of education into life.

One PhD student in has to equal one research scientist out – or the research training system has failed.

We are very quick to say “we have too many PhDs”.

What we ought to say is that we produce more PhDs than we can employ in research.

I agree with the second statement. But I do not agree that it confirms the first.

Of course, if you come with that conveyor belt in mind, you can't appreciate the difference.

Setting out the common ground

So let me set out what I consider to be the three points on which we can all agree, before turning to my vision for the future.

FIRST: There will not be jobs in research for everyone who might want one.

Let me put it this way.

I was Chancellor of Monash University for eight years. In that time I shook the hands of 1,459 new PhDs as they walked across the stage.

If their experience matches up to the statistical trend, fewer than 600 would secure as much as a postdoc. Six would end up as professors.

So I endorse the message from the Research Training System Review led by John McGagh: let's be upfront about that reality.

Students should be told before they commit to a PhD that the academic path is fraught.

If they don't know at the start – they'll certainly know by the end.

And that brings me to point TWO: PhD graduates need and want to work.

I think we can take that as a given – and if we can't, then we're really doing something wrong.

So point THREE: it is not enough for a PhD to have a big ambition in research and a superb depth of knowledge in their specialised field.

At a minimum, they need to be capable of adapting what they know to the expectations of a non-academic job.

And I would raise the bar a few notches higher again.

As a CEO, if I am going to pay a premium for a PhD trained worker, I want more than the ability to execute my directions.

I want an individual who can see opportunity in the places I don't expect...

...who give me more than I ask for, by responding to the ambition as well as the letter of my directions...

... and knows no limit to their own personal capacity to achieve.

IBM has defined this individual as the T-Shape Worker – a model that has stood the test of time for 25 years.

In essence, the 'T' is the 'I' and the dash.

The 'I' is the deep disciplinary knowledge and technical skills. The dash is the set of broader attributes an employee requires to function in the workplace.

I'd hire an 'I' over a dash any day.

But then again, why would I limit myself to just a 'T'?

I value the 'I' not just because I need that specific knowledge – but because it proves that this individual knows how to learn.

It might sound paradoxical, but the best way to be a flexible employee is to have mastered a first discipline extremely well.

When somebody has achieved deep discipline knowledge once, it is relatively easy to do it again. And they can do that in the workforce.

If that individual earns a second 'I' without losing the dash – presenting as the Greek letter 'pi' – then I would have confirmation that they can apply this capacity, beyond their primary field.

So a 'Pi' worker would be a quick and adaptive learner.

A 'Pi' worker would have the flexibility and breadth of perception I require.

I want PhD training to give me aspiring 'Pi's.

Meat Pi's, ladies and gentlemen – with quality content, slow cooking for rich flavour, and nothing scraped up from the butcher's floor.

Give me that Pi, and I can set the table and add the salt and pepper myself.

Practical steps to impact at scale

Now I can argue up and down the country that PhDs are not just academics in utero.

And as Chief Scientist, I have already done so, many times. In The Financial Review. In The Australian. In The Weekend Australian. In The Age. For The Conversation. In more speeches and interviews than I have the time to count.

I like to think that somewhere along the line, that might make a difference. But we all know that lived experience is a far better teacher than exhortation.

To that end, we need to get more PhD candidates and graduates into industry roles.

It is as simple, and as staggeringly difficult, as that.

But let us not forget, the PhD program itself was once incredibly small. There were just three graduates, and one institution, in that first cohort.

And if those candidates submitted their theses today, they simply wouldn't pass.

We had to work out how good the PhD could be as we went along.

Even today the offering is being improved by adding non-thesis components, elevating the expectations on supervisors and establishing doctoral training programs.

By the same token, the task of getting many more graduates into industry – in a position to profit from the experience - will not be accomplished in a giant leap. It will be done by constant iteration on a solid prototype.

In that process I want to be useful. The question for me is how.

I've been asking myself that question for a very long time, well before I took up my current role.

But the last few months have given me the opportunity to consult and reflect from a perspective I lacked before, as President of ATSE or Chancellor of Monash University.

Last week I met with Minister Hunt to congratulate him on his new position. And I took with me the outline of a three year Strategic Plan.

It operates across four pillars: education, research, innovation and outreach.

Let me highlight at least three ways that Plan can allow me to champion our PhDs.

First, I can help to re-set the incentives for collaboration.

I see in Australia's universities some of the most capable and innovative leaders in the country. If the Commonwealth higher-education system

rewarded industry-focused programs, then the sector would compete to establish them. And over time, they would become exceptionally good.

So where are those incentives today? And if they are lacking – as the evidence suggests to me they are – what form should they take and how should they be targeted?

The question was raised in the context of the R&D Tax Incentive review, which now sits with the new Minister for consideration.

It is also central to the framing of an engagement measure that the ARC has been asked to develop.

In that role, Aidan Byrne as head of the ARC understands that nuance is key: overdo it and harm research; underdo it and harm innovation.

So that is the first opportunity: adjust the incentives.

Second, I can look across the National Science and Innovation Agenda and think about how the programs might work as a suite.

There are many initiatives which will of necessity bring universities and industry together.

- The new Research Infrastructure Roadmap that I have been asked by the Government to develop
- The Biomedical Translation Fund and CSIRO Innovation Fund
- The Business Research and Innovation Initiative (BRII)
- Expansion of Research Connections
- CRC-Project stream

How can we configure those programs to maximise the opportunities for PhD students?

Finally, I can promote good programs and celebrate success.

Politicians are looking for those programs today. They want to lend their support to models that work.

And we saw that in the election, with Prime Minister Turnbull committing \$28.2 million to help the Australian Mathematical Sciences Institute expand its PhD internships programme.

AMSI's program is modelled on Canada's MITACS scheme, which:

- Has operated since 2003; open to all disciplines since 2007
- Pairs PhD students with suitable industry projects
- Allows placements of up to 2 years
- Students supported by stipend
- More than 10,000 participants thus far

Another model that I am keen to pursue is the French CIFRE program:

- 10% of French PhD students undertake their project as an employee of a company, whilst maintaining links to academic supervisor
- Students sign a 3 year full time work contract with a good salary (minimum 28,000 Euro in 2012)
- Established 1981, more than 20,000 participants to date
- Run by the French Ministry of Higher Education and Research

Conclusion

I conclude by offering a toast to the Australian PhD, the great septuagenarian of Australian science.

And let's not stand for any talk that she's retiring. On the contrary – the next decade is going to be her most active yet.

She will not lose her essential character or her cherished integrity. Like all good PhD graduates, she will keep finding new ways to be useful.

Our challenge is to harness her strengths, and speed her along.

THANK YOU