



Australian Government

Chief Scientist

PROFESSOR IAN CHUBB AC

JACK BEALE LECTURE

***NO FREE RIDES TO THE FUTURE: SHORING UP THE SCIENCE TO
SUSTAIN US***

******* CHECK AGAINST DELIVERY *******

6:30PM – 7:30PM

13 AUGUST, 2014

**THE JOHN NILAND SCIENTIA BUILDING
UNIVERSITY OF NEW SOUTH WALES**

Tonight I want to talk about the future.

I know that it's not a novel thing to do; not even a new thing to do. Indeed, Hansard records that the word 'future' was used 848 times in the Australian Parliament just last June;¹ a number that appears to be the highest monthly count on record.

I will use the word 'future' a lot, too, tonight. **Not** 848 times – but often enough to emphasise the point that we can choose the sort of future we get: we can take what comes and muddle along; **or** we can work out what we want and earn it by planning, prioritising and persistence.

I am **not** one of those who thinks that good things will just happen because we expect them to.

I think we need to organise, evaluate and cohere – to make sure that we align our efforts and our investment with our national interests; that we focus on areas that are of particular importance or where there is a particular need; and that we build to a scale that will make a difference both to ourselves and to a changing world.

I am comfortable saying that here because I think Jack Beale would say the same.

He was a scientist and a statesman, an innovator and a man of business. He was a politician who thought about the future.

In many ways, he put the future of our planet – particularly its water resources – on the map. He was ahead of his time.

He was Australia's first environment minister – and among the first to think that such a role might have a place in our politics.

¹ <http://parlinfo.aph.gov.au/>

He made his motivation very clear when he said: *Australia is the lowest, flattest, hottest and driest continent on the earth and we have to manage it accordingly.*²

Of course, in Jack Beale's day, in his political life, some things were probably a little less complicated (even less complex) than they appear to be now.

Certainly there was no Facebook, or Twitter or selfies when he entered politics in NSW in 1942 - some six years before Australia produced its very first home-trained PhD graduate. Thinking aloud and floating ideas might have been more attractive at a time when your critics faced you and the discussion was more civil.

Jack Beale was also in politics at a time of reconstruction after World War II. It was a period when people of vision saw a need to build a different Australia – a better Australia.

And it was one where research and education were seen as vital to the building of that better Australia - a stronger Australia that earned its place in the world because of the contribution it was willing and increasingly able to make.

They thought a lot about the future in those days – and it was clear that they had learnt from history and didn't want to repeat it.

I wonder if we can say the same of our thinking about the future today.

² *Death of the Honourable Jack Gordon Beale, AO, a Former Minister of the Crown*
<http://www.parliament.nsw.gov.au/Prod/Parlment/HansArt.nsf/d891a0806177d17eca256d100026e9aa/36f4c3b525f62a8eca25720a0021a398>

Is the word “future” just a convenient handle we grasp to hint at our wisdom, or our vision, but is really a handle without substance? Is it easier to dream about the future than it is to act in the present?

Or are we seeing a real intention to develop a meaningful and comprehensive approach to secure a future we want?

The sort of future we would want to hand on to our children and grandchildren and our great grandchildren; a future for them that we would be pleased to have for ourselves?

The sort of future that Jack Beale’s generation aspired to leave for us?

I’m not sure that it is clear. We have certainly heard the word tied to the recent budget - so we know that a future without debt is a good thing. I can accept that.

But I also know that I want more.

I want an Australia that is more than just what is left after the economic trimmings work their way through the community’s digestive system. I want an Australia in which our economy is organised to support our aspiration and not to limit it.

As I’ve said elsewhere, we wouldn’t order a truck load of bricks without knowing the type of house we wanted to build. Yet we fiddle with individual bits of the economy and wait to see what it all adds up to.

Of course we have to change. Presuming that *she’ll be right* because it most often has been is no longer an option – surely.

And what has been described as the national motto, that is ***no worries***, doesn’t serve us well either.

The world was a very different place when somebody decades ago made those colloquialisms the quintessential Australian response to almost any circumstance.

But there was always an ambiguity at their core.

At their best, they stand for optimism – a willingness to shoulder a challenge with courage and ambition.

But they can just as easily stand for a collective shrug - a willingness to accept whatever comes to hand; an apathy or even complacency.

Too much of the latter and the world will leave us behind.

The managing director of Google in Australia Maile Carnegie reminded us of that recently when she said...*the long-term challenge for Australia is how do we, as a minimum, keep pace with the global revolution that is happening? But the more immediate challenge is to make sure that we don't slip further behind.*³

And why would the world care if we appear not to care: *no worries; she'll be right?*

Of course, we are frequently told that our future competitiveness cannot be underpinned by our natural resources alone.

We are a nation in 'transition' we hear.

But to what; and how?

There is not likely to be any country in the world with all the answers. But as we decide the **what** and the **how**, if we decide we want to act, we can observe and we can learn. Because we

³ Carnegie, M. (2014) From article *Google chief warns of skills shortages* by Steve Meacham, The Australian, 1 July.

do know that nations all around the world are resetting their economies.

We **know** that new technologies are pushing smart companies to the lead.

New industries and new sources of wealth **are** emerging. New skills **are** required for workers at all levels as economies change. A **new** culture of risk and reward is spreading.

Countries **at all levels of development** are now focusing on the capabilities required for building new jobs and creating wealth.

And they are acting now to secure the skills, investment and international alliances for their future.

At the core of almost every agenda is science, technology, engineering and mathematics (which I will refer to from here as **science**). It is the *almost universal preoccupation*⁴ now shaping the world's plans.

It is a preoccupation that crosses all boundaries of language, culture and geography.

We too need to recognise that it is the knowledge that science will offer, and the **sensible** application of that knowledge to agreed goals, that will build a stronger Australia.

Australia must forge its path in step with the rest of the world. We must remain in the game with a differentiated and readily adaptable economy that supports the aspirations we have for the country. And we must ensure that we bequeath a planet that can sustain the coming generations.

⁴ Russell Tytler Simon Marginson, Brigid Freeman, Kelly Roberts, *STEM: Country Comparisons*. 2013: Melbourne, Victoria.

I put to you that these aspirations are not exclusive and that science is at their core.

Whether it is our climate, our health, our ageing population, our food supply, our economy or our security, it will be scientific discovery and the use of scientific knowledge that will give us the capacity to respond.

None of this is new – indeed, it is widely accepted.

Wherever I go, I hear that science is important and Australia should be good at it, something the Commonwealth's Commission of Audit also identified. I even hear it confidently asserted that the outlook must be rosy: after all, we are often told that in science we're clearly *punching above our weight*.

So – *she'll be right. No worries.*

But is that true? Not really. Some recent and comprehensive forthcoming work done by my office provides some interesting indications.

We compared our performance with that of 11 western European countries, the United States and Canada. It is clear that our best are very good.

We do well amongst the group in terms of our share of the world's top 1% of cited research papers; but our **average** (field weighted) citation rates are below all of them.

Our patenting rates are poor; and the linkages between our researchers and business are among the worst in the OECD.⁵

⁵ See Australian Council of Learned Academies (2014), *The role of science, research and technology in lifting Australian productivity*, Canberra; available: <http://www.acola.org.au/index.php/projects/securing-australia-s-future/project-4>; and Department of Industry (2013), *Australian Innovation System Report - 2013*, Commonwealth of Australia, Canberra; available: <http://www.industry.gov.au/science/policy/AustralianInnovationSystemReport/AISR2013/wp-content/uploads/2013/11/AIS-Innovation-Systems-Report-2013-v3.pdf>.

Less than one in three Australian researchers work in industry; half the OECD average of 60 per cent⁶ and substantially less than the US, where some two in three researchers are in the business sector.⁷

Just 1.5 per cent of Australian companies developed new to the world innovations in the latest year for which statistics are available, compared to between 10 to 40 per cent in other OECD countries.⁸

That, as I say, is our current performance.

Looking to the future – by which I mean looking into schools - we sit in the middle of the pack for primary and secondary students' performance in science and mathematics literacy.⁹

While I accept that indicators such as these are not all perfect, they do offer an insight into where Australia sits overall.

Bluntly, we are middle-of-the-road. Not better – not *punching above our weight* as we so often declare in a fit of misguided and unhelpful enthusiasm.

I think it is no coincidence that we sit where we do.

Australia is now the only OECD country that does not have a contemporary national science and technology, or innovation strategy.

Our science investment and policies are too heavily dependent on so-called 'terminating program' grants, funding offsets and

⁶ OECD, Research and Development Statistics Database, www.oecd.org/sti/rds.

⁷ Scientific and Cultural Organization Institute for Statistics (2013) United Nations Educational, UIS.STAT., UNESCO Institute for Statistics, Quebec.

⁸ Department of Innovation (2011), Science and Research Australian Innovation System Report – 2011, Commonwealth of Australia, Canberra; available:

<http://www.industry.gov.au/science/policy/AustralianInnovationSystemReport/AISR2011/index.html>.

⁹ OECD (2012), PISA 2012 Database; snapshot available: <http://www.oecd.org/pisa/keyfindings/PISA-2012-results-snapshot-Volume-I-ENG.pdf>.

sporadic commitments to infrastructure. And worse, they have suffered from a lack of coordination. As each agency, department or university independently makes its necessary budget adjustments, our national science profile is what's left over. And it is compounded by the study choices of undergraduate students, given the numerical dominance of university researchers in our profile. What is important may not be popular.

As I said before, we have long presumed that good things will just happen. That in amongst the churn we will still have what we need when the time comes. *She'll be right*, we might say. *No worries*.

But science is a long haul. It is not something that can be turned on or off when we feel like it.

And it isn't like a tooth brush: something you can buy when you get there because you forgot to pack one.

If we are to build both capacity and capability we need strategic investment supported by good planning and long-term commitment.

We need to build the capability to take up whatever legacy of progress we leave behind – so that the next generations know more about the world than we do today; and learn to shape it in ways that we cannot.

There is actually a science to science.

To give one example: ensuring we develop enough scientists and science-trained workers, in a competitive world where talent is increasingly mobile. A sort of ***talent security*** along with all the other securities we talk about: like food, water, cyber and so on.

The Prime Minister summed it up in New York recently: *science is at the heart of a country's competitiveness and it is important that we do not neglect science as we look at the general educational and training schemes.*¹⁰

We need to be mindful of the fact that decisions made today in schools will start to have their impact on the workforce profile in five, six, seven or more years from now. That is where we should be thinking. The 'market' there and beyond.

It is not easy – but it is possible.

The Royal Society of London, for one, has recently released a report¹¹ laying down the imperative for science education.

As the Chair of the Committee said: *Science and mathematics are at the absolute heart of modern life. They are essential to our understanding of the world ... [and] provide the foundations for the UK's future economic prosperity.*

The Vice-Chair of the Committee commented *“Our Vision takes the long view but recognises that there is both urgency and great opportunity for Government to act now. Estimates suggest that one million new science, technology and engineering professionals will be required in the UK by 2020 and yet there is a persistent dearth of young people taking these qualifications after the age of 16. If the UK is to remain globally competitive and if we are to develop a more equitable and informed society, Government and the wider education community must take the Royal Society's recommendations seriously.”*

¹⁰ Abbott, T. (2014) Doorstop Interview, P-TECH, Brooklyn, 11 June; available: <http://www.pm.gov.au/media/2014-06-11/doorstop-interview-p-tech-brooklyn>

¹¹ Royal Society Policy Centre (2014) *Vision for science and mathematics education*; available: <https://royalsociety.org/~media/education/policy/vision/reports/vision-full-report-20140625.pdf>.

When we try to begin a conversation here about Australia's future needs, we get told that starting salaries for science graduates are (apparently) low, therefore there is no market pull, so pull your head in.

The implication is that we shouldn't be like nearly every other developed economy on the planet and think ahead. Too hard for us. Keep it short-term – focus on what happened last year. *She'll be right.*

Personally, I think that attitude is a bit like saying that we can get rid of all Australia's cows because we've got milk in the 'fridge.

Whatever the logic behind it, we will see the consequences in lost opportunities for our people and our economy.

As the Managing Director of BASF Australia Ross Pilling wrote in the Financial Review: *Australia's business community is looking on with concern at the sharply declining participation rates in the so-called STEM disciplines of science, technology, engineering and mathematics... Fewer year 12 students, especially girls, have any interest in studying maths and science. For business, this is a source of profound frustration.*¹²

We need a conversation now in which we talk about how we support science to do all the things we need it to do. And how we make sure that we have the right science – and that we ask the right questions.

We need science that:

¹² Pilling, R. (2014) From the op ed *Decline in science students a danger to the economy* - Australian Financial Review, 1 July 2014

- gives us the knowledge to understand the challenges we face
- expands the toolkit we can bring to confront those challenges
- connects Australia to global science – to give and receive
- gives us a shared vocabulary, in which hard things can be talked about and tackled.

As the then Prime Minister of Great Britain, Tony Blair said to the Royal Society in 2002 when talking about moral judgment: *science ... allows us to do more, but it doesn't tell us whether doing more is right or wrong.*¹³

We need the science to inform the judgment and we need the conversation to get the action.

More than a year has now passed since I released a position paper outlining the case for a national strategy for science, technology, engineering and mathematics.

I've spent that year doing dozens of media interviews and delivering speeches right across the country advocating a strategy. Not one individual or organisation has said it is a bad idea. Not one has said it is not needed.

The Business Council of Australia on July 31st last year endorsed such an approach and listed a science strategy as critical to Australia's economic growth.

Their current President, Catherine Livingstone, was more recently quoted as saying: *We have been bemoaning the poor*

¹³ Blair, T. (2002) Speech on scientific research to the Royal Society.
<http://www.guardian.co.uk/politics/2002/may/23/speeches.tonyblair>

state of STEM skills ... in schools and universities for over 15 years.

So I can only echo her question:

*If we are all agreed that this is an issue why isn't enough happening?*¹⁴

Other countries are doing it – and they're investing strategically in science – for the long haul.

These other countries have found the right way to get leadership from government – learnt how to get government in the way - in the right way, in the right place for the right period of time.

We can, too.

I note in passing that our 'competitors' have also moved past using the expression 'picking winners' as the standard pejorative to stop any thinking about needs and advantages and focus and scale.

Instead of being stuck in the old ways, our competitors have moved on..

They have identified national priorities and set out to fund them appropriately – areas where they have advantage, or need, or capacity to grow to scale, or to take new products to market.

The United Kingdom, the EU, Canada, the United States, China, South Korea, and many, many other countries around

¹⁴ Livingstone, C. (2014) From *Sydney Morning Herald* article "Business Council calls for urgent education overhaul" by Heath Gilmore and Nicky Phillips, July 26, 2014
<http://www.smh.com.au/national/education/business-council-calls-for-urgent-education-overhaul-20140725-zvnqh.html>

the globe, have prioritised science funding as an important foundation for future sustained growth.

Amongst others, the UK's Chancellor of the Exchequer George Osborne said in April: *We've had to make difficult choices to cut public spending. The easy route would have been to cut science spending. But it would have been painful for the economy and the wrong answer for Britain. It would have completely undermined our long term economic prospects.*¹⁵

The key players understand that to have the scientific capacity to meet the greatest challenges, they need to be strategic about the entire pipeline, from education, to research to industry. And they act now.

Surely we in Australia can, too..

And I do sense that the calls for action are increasing. I sense that *she'll be right* might be challenged – and importantly, from those directly impacted by inaction.

It is also my view that we can't just continue to tinker at the margins. That's what we **have** done and it is clear that it isn't good enough.

I do believe that we need to be bold – with well thought through but bold initiatives that position us for the future.

So let me put my version of a strategy to you tonight. Incidentally, I will be releasing the full document on 2nd September in Parliament House.

It would be underpinned by four main objectives.

¹⁵ Osborne, G. (2014) Chancellor of the Exchequer's speech on science in Cambridge
<https://www.gov.uk/government/speeches/chancellor-of-the-exchequers-speech-on-science-in-cambridge>

- o First, **Competitiveness** – *science must underpin a differentiated and readily adaptable economy, one that is globally competitive and one that will enable all Australians to benefit from the opportunities that will follow.*

We can learn from what has been done in the UK and the US, in particular. There they have introduced structural arrangements that support innovation and ensure that at least a proportion of public money going to private companies is focused on areas where there is need, advantage and outcomes which can be taken to market. They encourage linkages between researchers and the business sector. They encourage the flow of ideas and knowledge into new products and services.

- o Second, **Education & training** – *we prepare a skilled and dynamic science-qualified workforce, and lay the foundations for lifelong science literacy in the community.*

There is a national interest and we would do well to remember it. Action in this area will require appropriate co-ordination and cooperation between different levels of government. We can learn from others, including federations, about how to support teachers both in-service and pre-service, and how to use curricula and assessment to enhance learning through inspirational teaching.

- o Third, **Research** – *Australian science will contribute knowledge to a world that relies on a continuous flow of new ideas and their application.*

Like many other countries, we can develop strategic research priority areas – not using all available funding

support, and not neglecting basic research that is the foundation of so much knowledge that we can apply. But we can and should align, focus and scale.

- o Fourth, **International engagement** – *Australian science will position Australia as a respected, important and able partner in a changing world, for both domestic and global benefit.*

We should develop strategic government-to-government partnerships that are funded. We should also look to using better the Australian science base and work within our region to establish an Asian Area Research Zone that facilitates work on shared priorities as well as building infrastructure.

What would such a strategy cost us? **Only** effort, commitment and willpower.

What are the costs of inaction? The deficit we would leave behind. I hope our children will not find out.

The choice is ours to make.

That is why we should take inspiration from people like Jack Beale – people who thought deeply and acted boldly.

He was that rarest of combinations, a politician with a background in (and passion for) science.

He was rare then, he would still be rare. Eleven of the current 150 House of Representatives Members and 11 of the 76

Senators have a science qualification, and a handful more have worked in related fields.¹⁶

Which raises an important question, do you have to have studied science, technology, engineering or mathematics to understand the role they play in a nation's fate?

In answering that, I'm reminded of a quote from a lawyer who said:

I suppose that if we were to ask ourselves what in the last 20 years, up to 50 years, had been the great distinguishing feature of this century apart from wars and political confusions, the answer would be the flowering of science and the growing application of science through technology to the problems, the practical workaday problems of the world.

The lawyer was Prime Minister Robert Menzies.¹⁷ The year was 1962. The occasion was the opening of a major piece of research infrastructure at CSIRO.

He understood then, as we must now, that if science **is** to flower **and be** applied to our *practical workaday problems*; if it is to be central to our future, we must be mindful of what it needs to be able to do for us what we want it to do. And provide it.

Thank you.

¹⁶ OCS analysis of Parliament of Australia Members and Senators' biographies; available: http://www.aph.gov.au/Senators_and_Members.

¹⁷ Menzies, R. (1962) Speech at the Opening of the Phytotron at CSIRO, Canberra; available: <http://pmtranscripts.dpmc.gov.au/browse.php?did=598>.