



Australian Government

Chief Scientist

PROFESSOR IAN CHUBB

30-MINUTE PUBLIC LECTURE PLUS 30-MINUTE Q&A

***THE IMPORTANCE OF SCIENCE TO AUSTRALIA'S
FUTURE***

7 PM

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**SOUTH AUSTRALIAN HEALTH AND MEDICAL RESEARCH
INSTITUTE (SAHMRI) AUDITORIUM**

NORTH TERRACE, ADELAIDE

It is good to be back in Adelaide. I remember my time here very fondly. I particularly remember a piece in The Advertiser one Saturday when I was Vice-Chancellor of Flinders. It was describing what a 'with it' place Adelaide was at the time. Amongst all the things it listed, it described with great pride and flourish that all three Vice-Chancellors were women.

Now I know that appearances can be deceiving, but only two of us were. I guess I've been suspicious of journalists ever since.

In recent weeks we have all been urged to think about the destiny of our country. To think not about ourselves but our country; about what we do, or don't do, that is fair, or unfair, on future generations.

So I would like to share some insights from my part of the world with you today, the science part of my world – and more importantly, ask you to think about what we need to do to win our children the future that we would want for them.

And I would suggest to you that most of us would subscribe to the view that we want the world we hand on to be better than the one we ourselves inherited. It should be, it can be – but it is up to us.

I subscribe to Shakespeare's understanding of destiny:

"Men at some time are masters of their fates.

The fault lies not in our stars, but in ourselves..."

In other words, it is up to us to work out what we want to do – what sort of Australia (or world) we want to build - and set our path appropriately.

In recent years, I think that we have taken the other way.

Policies are introduced, changed or rescinded according to the politics of the moment.

Any or all may have been good in themselves, but the real question is what do they all add up to?

Isn't the important thing the role that each one plays when it comes together with the others in establishing the very nature of the country we are building?

We wouldn't buy a truck load of bricks and just presume that we had a house. We would know what sort of house we wanted and buy the bricks accordingly. And use them to build it.

Yes, we do hear from various sectors that we must get the budget under control because it wouldn't be fair on our children and grandchildren.

I agree that presenting our future generations with a debt-free country is a good objective; yet I am intrigued that we do not put out there what the country should look like and then get all the pieces in place to get us there.

Naturally, I am also intrigued at how we selectively use the argument about intergenerational equity.

We don't pursue the same argument, for example, when it comes to other important matters - like climate change for example. In the latter case, some of us seem to think that if we ignore the evidence then it can't be happening. Or because we can't project a single temperature point out of all the models then they are all wrong, every one. And we're encouraged to ignore them, every one.

Why use evidence, why try to get more and better evidence we seem to ask, when talk back radio has all the answers?

Fortunately, not everybody thinks like that.

Lloyds of London, the well-known insurance market, recently released a report called *Catastrophe Modelling and Climate Changes* says:

*The Earth's global climate system is warming. This conclusion is supported by a large body of evidence which is presented in the scientific literature ... Increasing greenhouse gas concentrations in the atmosphere, largely due to human activity such as combustion of fossil fuels and land use change, result in an enhancement of the planet's natural greenhouse effect and in increased surface warming.*¹

Business is also taking action. Paul Polman, CEO of Unilever, said recently: *Left unchecked, climate change has the potential to become a significant barrier to our growth strategy, and that of just about every other company.*

Are we dealing with a bunch of alarmist lefties trying to destroy the free enterprise system? Probably not! More likely they are evaluators of evidence and prudent risk assessors and managers.

So while insurers are preparing for the changing climate's impact on extreme weather events, and business is factoring climate change into forward planning, we don't have even a sensible debate about the prudent steps we could take to ensure that we leave our children and grandchildren a flourishing planet, as well as a debt free in Australia.

And yes, I am one of those who thinks that science, technology, engineering and mathematics will be central to how we respond to these challenges and how we take the opportunities to secure a better future.

¹ Lloyds - *Catastrophe Modelling and Climate Change 2014*

The good news is that we have good science, good potential and many opportunities – plus a need.

The less good news is that we do not have a strategy for science. So science is the victim of on-again, off-again policies, too often short term, too often based on terminating programs; and when they are on, they are not necessarily connected to all the other elements that will make and keep science strong.

What is the point, for example, in having a view about where we can take research, or innovation, or about how we might get the maximum 'bang for our buck' from our research investments, if we don't worry about our education system and its capacity to provide the talents and skills that we need to deliver on our expectations.

We have trade agreements, for example, that commit to increasing agricultural exports to our partners, at the same time as our researcher population ages and our undergraduate numbers in agricultural science fall.

A good science policy will be a comprehensive science policy. It will start with education, progress through research, cover international engagement and lead to an adaptive knowledge based economy that we will need when the resource boom fades.

And Science could do it.

Let me begin with some positive news – which I hope will come as some relief after the week we have just endured.

What have scientists imagined about the way the world might be, based on what they know is possible today?

I can give you some examples from *Australia 2025*, a series run by my office in collaboration with *The Conversation*.

The authors of the series are senior scientists from each discipline, who were asked to outline what they could contribute to Australia's future.

Michelle Simmons (physics) *... we are just beginning now to tap into new technologies that are based upon the mysterious wonders of quantum physics. The ability to manipulate individual atoms, molecules, and photons of light – and to exploit quantum effects that are imperceptible in the macroscopic universe – foreshadows a future where the communication and processing of information is radically enhanced from where we are today.*

Andrew Holmes (chemistry) *It is not too fanciful to imagine a new class of antibiotic using a delivery system that enters bacterial cells carrying a built-in warhead that explodes and shatters the cell wall, destroying the bacterium. And we need it as we face a world in which our present antibiotics are less effective.*

Peter Doherty (medical science) *By 2025, the advances that emerge from broad screening programs such as the Australian-initiated and led Human Variome Project will have likely led to greatly improved diagnostics and will hopefully be enabling the transition to more precisely targeted therapies for, say, particular subsets of cancers.*

Nalini Joshi (mathematics) *How does genomic information lead to development and better health in early life? How can the resolution of medical images be improved while reducing their file size? How can mathematics be used to create a safer regulatory framework for financial markets? The more technologically sophisticated a society becomes, the more critical its need for mathematical thinking. The pathways*

towards economic diversity and opportunity are paved with mathematics

So some of us, at least, are positive about what science can do to influence our future.

Now to some less good news.

Analysis done by my office compared the citation rate of Australia's 91 STEM sub-fields – or more specialised areas - against the top group of European countries and the US.

(The EU11 is: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Norway, Sweden, Switzerland, UK)

In 16 sub-fields, we perform better than both the EU11 and the US.

The sub-fields include:-

- Statistics
- Geology
- Civil engineering
- Medical biochemistry and metabolomics (study of chemical processes involving metabolites which might have applications in personalised medicine)

But I would argue that being best of the best in 16 out of 91 sub-fields is not enough. Especially when some are in the 'other' category and are very small.

And our overall research performance is not strong either – we sit above the world average, but below the benchmark set by the EU11. But our share of the top one per cent of cited papers has increased over the past few years.

If you were to use a cricketing analogy, you might say we've got a few great players but the team is average. (I wonder how

long the public or the media would accept that without biting the selectors or the captain?)

So we need to think about what our ambition is when it comes to science, or what it should be?

We also need to consider where Australia has distinct national needs.

The Australian landscape means that we have a continued need to address the challenges of distance, climate and environment. Along with the rest of the world, we are facing a future where food and water security, climate change, and energy requirements will need to be addressed. And it is science that will provide the means to manage, mitigate and adapt to these challenges - maybe even solve them.

So, as a nation, we have a strong history, clear areas of advantage and distinct national needs – needs that can only be met by science.

Currently, Australian science is disconnected and fragmented. It is difficult to know, with any detail, what other parts of the scientific community are doing, or how that might impact on the next step, or the adjacent space, in the scientific ecosystem.

Researchers themselves face uncertainty as funding schemes and priorities change with regrettable regularity.

Most recently we have seen this play out in the Federal Budget. There were plusses and minuses - as we all now know.

The extension of the National Collaborative Research Infrastructure Strategy is obviously a plus. And after a review it might be extended and may be no longer a 'terminating program' given the Minister's scathing comments about the previous government's use of that approach.

The extension of funding to the Australian Research Council for the Future Fellowships program for mid-career researchers is another plus, although it is set against cuts to ARC.

Funding for the research vessel managed by CSIRO is a plus, but it is set against cuts to the CSIRO budget.

We see the Cooperative Research Centres (CRCs) funding cut back, thereby halting the current funding round, as we lament the state of industry-research collaboration in this country.

We see changes to higher education which could have profound impact on the study profiles of students – hence staff, hence staffing and hence the research profile in the university sector where more than 60% of our nation's researchers are employed.

There is the Medical Research Future Fund; good in principle, but until we know the rules, we won't have any idea how will it affect the rest of the research system on which medical research depends.

Margaret Shiel, provost of the University of Melbourne where presumably a fair bit of Medical Research Future Fund money will be spent was quoted as saying: *there are so many issues around research in the budget, it's hard to be celebrating this one bit.*²

It is how all the bits fit together that is important for us to know.

Discoveries made in virtually every discipline have made our lives better today. And there is no way we can predict with any certainty where the next world-changing discovery is coming from.

Put simply, science is the platform to build sustained growth.

² Inquirer - The Australian Pg 18 17 May 2014

As the UK Chancellor of the Exchequer George Osborne said in a speech recently:

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.

I know that certainty is absolutely vital if you want to attract investment from businesses and charities. If you want to attract world-class researchers and research projects – and global businesses - to Britain. And if you want to embark on the most ambitious, long-term projects that might previously have seemed unreachable.

I fully endorse Mr Osborne's view, and I hope that his intuitive understanding of the role science plays in any developed nation's economic future will be better understood here.

And I see that we still have an opportunity. We can take these changes in science funding and work them in to a whole-of-government strategy for reinvestment.

And it is possible to do things differently. Not easily I might add, but possible. We can "shape the destiny of our nation" and achieve sustained economic growth, but to do that we need a plan

A plan to underpin our investment in science.

A plan to identify what our national needs are, what our research priorities are, and where we have advantages that we can use.

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

The United Kingdom, the EU, Canada, the United States, China, South Korea, and many, many other countries around the globe, have all prioritised science funding as an important foundation for future sustained growth.

And I am not alone at arriving at this conclusion.

Many, like the Business Council of Australia, say such a strategy is critical to growth.

Others, like Professor Roy Green (Head of the Business School at UTS) warn of dire consequences if we choose to not take the action needed to transform our economy.

Last week he wrote:

This is the rub. Without world competitive knowledge intensive industries, including advanced and specialised manufacturing, which can capture value from global markets, we face the prospect of our very own "Argentina moment".

This is when a first world lifestyle, dependent on the import of high value consumer goods, can no longer be supported by a third world economic structure, based on the export of unprocessed raw materials. Surely we cannot allow it to come to that.

If we want to shape our destiny for a more positive future, are we prepared to change in order to achieve it?

I truly hope we are. Thank you.