



Australian Government

AUSTRALIA'S CHIEF SCIENTIST

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**PUBLIC LECTURE: *SCIENCE AND THE FUTURE OF
AUSTRALIA***

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

Good evening

It is a pleasure to be here in Hobart.

It is always interesting doing public lectures, because you can never be certain of the composition of the audience.

I imagine some of you are scientists, perhaps there are a few science teachers, even some science students.

But I always hope there are at least a few who have no formal ties to science at all.

But let me jump in at the deep end and start with a simple statement: Science and the application of scientific principles can be found everywhere. Our nourishment, our safety, our homes and neighbourhoods, our relationships with family and friends, our health, our jobs, our leisure are all profoundly shaped by technological innovation and the discoveries of science.

Yet there are many in our community who do not realise the ubiquity of science; indeed there are many who have been turned off science very early in their lives.

Consequently, there is little (certainly not widespread) understanding that it is research and development which underpins every mode of transport, every medicine, every meal, every live streamed Ashes wicket- and imagine how much less we would know about every wicket (and some would say the character of every cricketer) if we didn't have hotspot, hawk-eye and snicko.

As Carl Sagan once said (of the US, I presume) ***We live in a society exquisitely dependent on science and technology, in which hardly anyone knows anything about science.***

I hope you agree that this lack of understanding is a problem, and that you can agree with me when I say that it is something that must be reversed. Something that we have to do something about.

Historically, the impact of Australian science has been substantial – although we contribute around 3% of the world's research output.

For example, there have been 12 Australian winners of Nobel Prizes in science.

And we know that there is good science being done all over Australia.

Some of that 'good science' emanates from Tasmania, and Hobart in particular, and I am referring to the renowned focus on marine and Antarctic science – although I am happy to concede that it is not all that is done in Tasmania.

But still, the Australian Antarctic Division leads and delivers a top quality science program.

Given that we claim 42% of Antarctica – an area roughly the size of Australia minus Queensland - it is probably a good thing that we focus some of our effort on Antarctica and the oceans in our south.

In terms of research publications and citations, Australia performs well in veterinary science, energy, engineering, earth and planetary science and medicine.

In all of these, we contribute research papers that are on average cited more times than the (largely western) European average – one that we might aspire to.

All the result of hard-working Australian scientists.

But continued success is not guaranteed.

As a country, indeed as a planet, we face great challenges:

Environmental change, an aging population, food and water shortages, cyber security, dwindling energy resources to name a few.

The solutions to these challenges all depend on sustained investment in science, and a steady supply of researchers working towards answers. To paraphrase Jane Lubchenco from the National Oceanic and Atmospheric Administration in the U.S: We need to *manage the unavoidable and avoid the unmanageable*. To do that, we need science.

While we need science, it is fair to say that no one scientist, laboratory or even country can solve any of these challenges on their own.

They rely on collaboration: between disciplines, between scientists, industry, governments and between countries.

And it is crucial that Australia contribute to such collaborations.

We cannot afford to rely on other countries' innovations, constantly trying to play catch up but without the technical skill and know-how to adapt them to our own environment.

And we cannot afford to import knowledge and skills – to rely on importing the engineers, statisticians and mathematicians from other countries in the numbers we need. Because I can guarantee you, every other country will be doing the same.

We need to preserve our scientific knowledge and capacity, and our scientific integrity and importantly, ensure that at least some of it is directed to the areas most pressing to our country.

That is why, a fortnight ago, the former Prime Minister and I launched 15 Strategic Research Priorities.

These priorities map out a path for Australian research. A path that leads to a more nimble, socially-inclined research system for our country.

They ensure that, from 2014, a proportion of government investment in research will be directed to challenges like the ones I mentioned earlier.

These priorities were not developed in isolation in the frosty confines of a Canberra office.

The consultations were substantial.

The evidence supporting the approach is comprehensive.

In preparing these priorities, my office conducted a study into the funding approaches taken by countries that have similar science systems to us, and that largely, perform better than us.

The study found that all but two countries had strategic research priorities to guide their government investment in research.

The following common attributes emerged:

- Many countries identify priorities to guide public research funding.
- Several countries that we collaborate with most frequently, such as the US, and countries within the EU, begin with identifying high level societal challenges, and then select research priorities within those challenges
- All have mechanisms to ensure that curiosity-driven research is also supported.

- All acknowledge that research leading to innovation is of critical importance.
- The means by which challenges and research priorities are identified and adopted varies, but not greatly.

The process to develop our fifteen new priorities was aligned with what is happening in these countries.

We began by identifying the five most important societal challenges facing Australia.

These are:

- Living in a Changing Environment
- Promoting Population Health and Wellbeing
- Managing our Food and Water Assets
- Securing Australia's place in a Changing World
- Lifting Productivity and Economic Growth.

Then, after consultation with 100 or so leaders from research sectors, we developed three research priorities for each challenge, to be reviewed every two years.

They may not be perfect –indeed some have argued that they are too broad and some have argued they are too specific.

Whatever people might think they are, I know what they are. They are the areas where we must be sure that we support research. We did not go looking for what we **did not do** – we went looking for what we had to ensure **that we did do**.

Setting priorities for research means that the government is supporting science in the areas most pressing to the nations' citizens.

It means that Australian dollars are being spent on Australian science to address Australian concerns.

And it reflects the fact that science is a community endeavour.

Because science is at its most effective when it operates with what we might call a 'social licence'.

In effect that means that there is a form of compact with the community that makes clear the responsibilities of each side to the other.

The responsibility of the scientists is that they conduct their work in a manner that is consistent with community needs and our ethical standards. To quote Jane Lubchenco again:

Scientific integrity is at the core of producing and using good science. By being open and honest about our science, we build understanding and trust.

She went on: *Strong science is essential to democracy. We must do everything possible to strengthen and protect the scientific enterprise, and to ensure that science is not misused, distorted or altered in making policy...citizens need to feel confident in science, support it, and use it. That means engaging them in science, having science be responsive to societal interests. It also means have citizens who can use the scientific information provided to make smart choices.*

And Tony Blair then Prime Minister of the UK said to the Royal Society: *"Science doesn't replace moral judgement. It just extends the context of knowledge within which moral judgements are made. It allows us to do more, but it doesn't tell us whether doing more is right or wrong."*

He also said in the same speech, *"the benefits of science will only be exploited through a renewed compact between science*

and society, based on a proper understanding of what science is trying to achieve. Personally, I can't think of a better way of expressing the need for a 'compact'. One that articulates the responsibilities and obligations that governments, STEM practitioners and the community have to each other. And in a sense, it is about confidence – the confidence that each has that the others will live up to their side of the bargain.

It also makes it clear, that no matter how 'good' the science, if the community is reluctant to accept, or even easily persuaded by those with another motive altogether, that the science is somehow 'bad' then it won't have the impact or the effect that it should. Given that many of the big questions ahead will involve science- our community will be better placed, our democracy more robust, if our citizens are able to make more informed decisions.

This means at the very least a passing knowledge of how science works, of statistics and probabilities and how to look for the evidence behind the assertions that bombard us on a seemingly hour-by-hour basis

I am heartened that here in Tasmania, there is a strong community of people conducting 'citizen science'.

These are individuals and organisations who may not be experts, but who are engaged in collecting and analysing data; following the scientific process.

One of the best Australian examples of citizen science started here in Tasmania.

Redmap "taps into the knowledge - and eyes - of thousands of fishers, divers and swimmers to track changes in fish distributions in Australia's vast coastal waters."

The project encourages citizens to share photos online of marine life they find, then a network of marine scientists around the country review each photo to verify the species' identity.

The project is more than an ocean monitoring program. With some coastal waters warming at three to four times the global average, it engages Australians with serious scientific issues and demonstrates the role science plays in understanding and finding solutions to global problems.

When I began speaking, I mentioned that science underpins every aspect of our lives today.

What I didn't mention then is that it will also determine what sort of Australia we will be in the future.

We need to be a country that prepares for a future that will be more dependent on science and technology than ever before. At the moment, I argue we are not.

In education, we spend less than 5% of primary school teaching time on science. The western European average is 9%.

Twenty years ago, 94 per cent of year 11 and 12 students were enrolled in science subjects, but in 2010, it was only 51 per cent.

And our enrolments in IT bachelor degrees have nearly halved between 2002 and 2010.

And although Australia aspires to be in the top 5 performers internationally in science and maths, school student scores are falling.

The latest Trends in International Mathematics and Science Study showed that Australia is a top 20 rather than a top 10 performer.

In our commercial landscape, only 30% of Australian researchers work in the business sector, compared to 80% in the US, 64% in Switzerland and 70% in Japan.

We have only 9 doctorates per thousand in the workforce, when Switzerland has 28.

And only 4% of our businesses work towards innovations new to international markets.

And in our community, surveys have found less than 1% of high school students who doesn't study science think science is almost always relevant to their everyday lives and that less than half of university students "totally agree" that science is central to maintaining and enhancing quality of life.

They answered those surveys on an iPhone or computer by the way.

So in my eyes, we have two options.

One is to continue to coast as we are.

Let our primary schools continue to teach less science.

Let enrolments in science and mathematics at senior high school and university levels continue to drift.

Let our businesses neglect the role science and technology can play in improving their innovation.

Let some in our community continue to shout down experts, or accuse them without any evidence that I have seen of having

base motives. Let the community passively ride the wave without critically engaging in the argument.

Or, we can make a change.

I envisage an Australia where science sits alongside citizenship and literacy in the curricula of Australian schools.

An Australia where our students rank among the best of their international peers in global testing.

An Australia whose researchers and industries work in unison to create new solutions, even new industries, based on our capacity to innovate.

An Australia with enough community engagement with science to critically analyse scientific issues, and the value of the opinions of those commenting on them.

Getting to this point will not be easy.

But we need to start somewhere.

In only a few weeks, I will be launching Science, Technology, Engineering and Mathematics Strategy for Australia.

It will present a map of ways to improve our education, innovation, knowledge and collaboration systems.

And it will include the need for a refreshed social compact – a compact that accords scientists a social licence to operate. It has to be meaningful for both the scientists of Australia, and the citizens they work for.

It will argue for a vision, and a path, for a better Australia.

I assume that many of us in this room are already strong supporters of science – why else would you give up your Tuesday evening to come and listen to me?

I ask you to be vocal in your support for science.

The reality is, that if we don't tell people about the importance of science and what it means to them, how will they ever really know?

We need to provide the public with the opportunity to understand the issues: the message scientists and researchers are attempting to get across – to explain who, how, what, where, when and why.

The public has to trust science. But that trust should not be taken as a given; and winning it, earning it, should not be taken as an easy ride.

Just like the challenges that face our planet, nor can the challenge facing Australia be solved by one group or discipline.

Our education, innovation, research and community systems need to work together.

As a country, we need to aim to do better.

Thank you.

Questions?