Australian Government

AUSTRALIA'S CHIEF SCIENTIST

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25-MINUTE SPEECH PLUS Q & A

NITMILUK LOUNGE, PARLIAMENT HOUSE, DARWIN

OCTOBER 15, 2013

Good evening

I always enjoy visiting Darwin. Although I have been told that there are better times of the year than this one, it is always exciting to visit a place that changes so much, so quickly.

I first came here close to 25 years ago when the 'Dawkins reforms' were at their peak (I should add that in the eyes of some people they have never dropped off their peak). We talked then to people at DIT and others about the future of post-secondary education in the Territory. Once they got over their suspicion, they just wanted it to work. Some of the fruits of those labours you can see when you visit the now CDU.

Then a bit less than 20 years ago I made a series of visits here to negotiate the establishment of the link between the health system of the NT and the Flinders Medical School. I remember the discussions well - if not the names of all the key players - and I was struck then about how the people in the Territory, once they'd got over their suspicion, just wanted it to work. It was a good and fruitful negotiation. I am advised by most people that it works pretty well - and it is certainly a bigger presence than it was.

After Flinders, I went to ANU as Vice-Chancellor. It is true, I should tell you, that when new Vice-Chancellors take up their

position, there is a virtually instant but long line of people at their door all with the aim of being helpful and telling the new person what is wrong - and of course - how to fix it. Vested interests are unknown - and suspicion unwarranted of course. But you can learn a lot about the institution and some of its people.

So there I was, new to ANU, and half way down the queue, I was told about the Northern Australia Research Unit. I heard about it, learnt about it, visited it and eventually came to know what an important part of the ANU it had been. And how important it had been to Darwin and the NT - especially during its early years. Indeed, so central was it to one of its strongest supporters (HC 'Nugget' Coombs) that one half of his ashes are at NARU, with the other half at University House in the ANU. He is still joining together two of his favourite institutions - at least in spirit.

After that, one of my old mentors, Ken McKinnon, took up a short-term position as VC at what was NTU. Now, I should tell you that I regard him as one of the best Vice-Chancellors I have ever seen, *ever seen* - and I was fortunate to be, as we put it, 'one of his.' But he did seem to make it part of his continuing life's work - long after I ceased to be his Deputy - to tell me how to do properly whatever job it was that I happened

to be doing when we met. Anyway, we got together and worked out how to connect ANU and the then CDU better.

I heard today that the link persists and is getting stronger.

So although I have never lived here, and could never be classed as a 'territorian' and will always be a southerner, I have learnt to respect this place and to admire the get up and go spirit which I saw, and still see, present in abundance

But tonight, I am to talk about science - or more correctly all the disciplines embraced by the term STEM - science, technology, engineering and mathematics. So when I say 'science' please hear STEM. And when I say STEM, I include science.

The STEM disciplines and the applications flowing from them can be found everywhere.

Our food, our safety, our homes and neighbourhoods, our health, our jobs, our leisure, are all profoundly shaped by technological innovation and the discoveries of science, indeed the whole of STEM.

Not only is STEM pervasive in our society, but our reliance on science and technology is increasing. The largest problems that our world faces today will only be solved, or managed, or mitigated or adapted with contributions from STEM.

Yet there are many in our community who do not realise their ubiquity or the usefulness of the STEM disciplines to our lives.

As the American astronomer Carl Sagan once said: *"We live in a society exquisitely dependent on science and technology, in which hardly anyone knows anything about science"*

A survey conducted by my office earlier this year sought to find out what issues people were concerned about and what role they thought science might play in offering solutions.

For example when asked whether they were concerned about cybercrime, 68 per cent of respondents said they were very concerned.[1]

Yet only 3 per cent of those surveyed suggested technology was an important issue for science to address.

Similarly, (when asked) more than half the respondents said they were concerned about extreme weather events and the climate.

Yet only a third suggested climate as an important issue for science to address.

Snapshots like these indicate a disconnect. It would appear that the general public is not fully aware of the role science plays and can play in our society.

[1] There were 1186 respondents to the survey

Maybe it starts early: of year 12 students NOT studying science (roughly 1/3 of all year 12 students) just 1% thought science was 'almost always' relevant or important to their future, just 4% thought it useful in everyday life and 42% thought never useful.

Unfortunately, of those studying at least one science subject, only 1/3 thought it would be 'almost always' relevant to their future although 47% thought it 'almost always' relevant to Australia's future. Just 19% thought it 'almost always' useful in everyday life.

But the key message is this: if most of the public is unaware of the role science plays generally, it is unlikely to know **how** science works, how it benefits the national interest and how it connects us with the rest of the world.

And for us in science it means at least two things: we have to get better at explaining the role and importance of science (STEM) to the entire community, taking the community with us; and we have to make sure that our science (STEM) is out of the top drawer.

Let me focus first on the latter. How good are we - overall?

If we are to be honest about our overall performance, the best description would be adequate. Not outstanding, but okay.

This is not to say that our best aren't great, they are. But our average puts us around 11th or 12th in the world on research performance, and we hover around the same for innovation.

Neither ranking is fantastic, and neither is showing great growth or improvement. But other countries are:

- China's publication output has grown by 673% since 2002, moving them from 6th in total publications to 2nd in 2012.
- Likewise India's has grown by 368%, moving from 12th to 7th.
- In the same period Australia has moved from 11th….

  ...to 12th[2].

Of course total number of publications is no indication of the quality of such publications and measuring quality is a trick in and of itself.

However, If you look at a simple measure over a ten year period: citations per research publication - and set ourselves a reasonable bar, say the average of western European countries, we fall under that bar in all but five fields of research

[2] SCImago. (2007). SJR — SCImago Journal & Country Rank. Retrieved October 16, 2013, from http://www.scimagojr.com

- countries like the UK, Sweden and Switzerland fall under in one or two. Eighteen or so above the bar and one or two under.

Of course, we could do what we usually do, talk about world average. In other words, find a denominator, grow the denominator without too much impact on the numerator: then we find that we are above the bar in nearly but not all fields. But is this a self-delusion?

It is noteworthy also that when it comes to innovation, almost all other OECD countries are much more likely than Australia to develop innovations that are new to international markets[3]. Should we be content with that?

I am a great fan of honest introspection. I think we can do better overall and I will come back to how we might do that in a moment.

But I hasten to add, **to repeat**, that there is much good work happening within Australia's STEM enterprise. We have excellent researchers doing first rate work all over Australia.

Our best are very good indeed. But let's face it: we do have a long tail.

On top of that, our research support is rationed, projects are ranked on so-called merit, and budgets invariably cut. The

[3] Department of Innovation, Industry, Science and Research (2012) Australian Innovation System Report 2011, Australian Government, Canberra.

consequence is that the average participant has about a 1 in 5 chance of a grant with about 65% of the budget requested.

We presently have some 79 budget lines in the federal budget supporting R&D; and they are spread over some 14 portfolios.

So my question is a simple one: When we look at Australia and our place in the world, do we do the best we can? How do all of our projects and programs (current and projected) piece together?

Surely it is time to think differently. What used to be may well have been good enough - but is it good enough now in a much more competitive world in which many countries are strategic, focussed and their efforts using at least some of their public funding, aligned to national interests.

In my view it is time for us to be holistically strategic when it comes to our STEM enterprise. What are we good at? Where do we have competitive advantage? Where do we have gaps? What do we need? What should we do in order to get what we need?

There is no doubt, in my view, that the Australian STEM enterprise is the means to a better end.

Yet over the years, we've supported the enterprise in a diverse but diffuse manner.

It is true that this approach has worked adequately over time. We have managed to remain roughly around the middle of the pack. But the middle of the pack is not where we should aspire to be.

As I said, we support multiple programs through multiple portfolios. So do many of the countries we collaborate with.

Yet several of those countries have developed over-arching or even whole-of-government strategies to ensure that their STEM enterprise is coordinated.

They want to be sure to that they build the capacity they need to support their communities – and they want to minimise the risk of falling behind.

We need to be certain that multiple arrangements do not inadvertently reduce Australia's capacity to look after itself, nor reduce our capacity to contribute our knowledge and skills to global efforts.

I have been proposing for some time that we should commit to developing a long-term and cohesive national strategy for STEM in Australia.

Such a strategy would result in the coordination of our support for STEM by ensuring that we consciously deploy our

resources for maximum benefit, and that gaps in the pipeline anywhere from early education to strategic international alliances are known and accepted – or rectified.

I've long been an admirer of the way America organises itself, not least the National Science and Technology Council (NSTC) which was established 20 years ago.

It is a Cabinet-level Council and it is the principal means within the executive branch to coordinate science and technology policy across the diverse entities that make up the U.S. Federal research and development enterprise.

Chaired by the President, membership also includes the Vice President, the Director of the Office of Science and Technology Policy, Cabinet Secretaries and Agency Heads with significant science and technology responsibilities, and other White House officials.

A primary objective of the NSTC is the establishment of clear national goals for Federal science and technology investments in a broad array of areas spanning virtually all the mission areas of the executive branch. And they develop funding packages to achieve their aims.

It is this model, operating in this way and with this kind of authority, that makes sense for us to adopt here in Australia.

I believe one option could be for the Prime Minister’s Science,

Engineering and Innovation Council (PMSEIC) to take on a role similar to the NTSC, in order for us to oversee an agreed strategic and whole-of-government approach to STEM.

And while government no doubt belongs in this space and in this sort of way, we need a much broader change than this.

We need to change our culture.

Our STEM must work for and with society if we are to address coming challenges and provide benefit to our nation.

Over the years, there has been a tacit compact between the practitioners of STEM and the beneficiaries.

The time has come to renew a social compact which articulates

the responsibilities of the three key parties – government,

STEM practitioners and the community.

If we are to recognise the opportunities that STEM provides and take full advantage of them, we need more of our community to be STEM-literate.

That heightened general scientific literacy would then complement and support the expertise held by STEM practitioners.

No matter how ‘good’ scientific research is, if the community is reluctant to accept it, or is 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.

In a speech to the Royal Society in 2006, then British Prime Minister Tony Blair said: (and I read a lengthy quote because I can't find better words):

Science cannot any longer be detached from the society that houses it. Its influence is too pervasive for that. Every area of policy today has a scientific aspect. Think of the big questions of our time - climate change, the spread of infectious diseases, water supply, biodiversity, terrorism. We will need to consult the scientists over every one.

Government must show leadership and courage in standing up for science and rejecting an irrational public debate around it... Standing up [to this] is harder than it sounds. But it is a classic example of the struggle between short term politics and long term public good.

We need scientists willing and able to explain, to reason, to give the scientific facts not by arrogant assertion but by

patience and also accurately reflecting where science is fact and where it is still conjecture. Britain as a whole must become a scientifically literate society. This is not simply to grow the next generation of scientists but also to condition all of us to a reasoned understanding of what science can do for us; to dispel the myths; calm the scares; let us make our moral judgements, at least partially, on the facts. The anti-science brigade threatens our progress and our prosperity. We need political and science leadership that stands up to them.

This is Britain's path to the future, lit by the brilliant light of science.

And so it is for Australia's.

But we, like them, have a lot of work to do.

Ultimately we, and they, must decide if we are bold enough, and have the will, to do things differently. For the better.

Thank you.