RALPH SLATYER ADDRESS ON
SCIENCE AND SOCIETY

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Opening

I would like to respectfully acknowledge the Ngunnawal people, the traditional owners and custodians of the land on which we meet today, and pay my respects to their elders, past and present. I would also like to extend that respect to other Aboriginal and Torres Strait Islander peoples who are present. And thank you to Roslyn Brown for the welcome to Country.

Thanks for your introduction, Tony (Peacock), I'm honoured to have been invited to deliver the 2017 Ralph Slatyer Address on Science and Society this afternoon.

Ralph Slatyer's legacy

I have a number of acknowledgements to make, first to the Slatyer family, Ralph's wife, June Slatyer, here tonight with their two children, Tony and Beth, and I understand some of their families may be in the audience.

My warm wishes to you all.

The legacy of Emeritus Professor Ralph Slatyer is extraordinary, as a research scientist, as a public policy leader and as Australia's first Chief Scientist.

He was able to harness all the ingredients which go to making and influencing good public policy. He had a vision, he had good ideas, he harnessed the science to present the evidence and he was able to bring people together.

While these are essential ingredients of good public policy making, they are also the requirements that make a great chief scientist for government.

The wonderful Cooperative Research Centres were borne out of the vision of Ralph Slatyer to bring research and industry to work together on otherwise intractable issues – a most enduring legacy.

The first CRC was focused on the structure of the research system, notably that there was a lack of critical mass of scientific and technological resources, that is, they were geographically and institutionally dispersed, as well as a pattern of siloed research which prevented large integrated research teams to be built.

CRCs have been a wonderful gift to Australia. They are a model for modern problem-solving and have enjoyed bipartisan support.

Successive reviews of the program have underscored this. They've shown the value that the investment by government, research institutions and businesses and, indeed, the individual scientists, researchers and businesspeople involved, has made to Australia over 27 years.

For example, an independent review[1], done in 2012, estimated that, by this year, CRCs will have delivered an estimated $14.4 billion in gross direct economic benefits, through new products, processes, technologies, and services, since the program began in 1990, representing a three to one return on investment.

And there are of course other unquantified benefits including environmental, social, health and cultural outcomes. The CRC Program illustrates the success of a partnership business model, the importance of collaboration and the educational and business opportunities afforded our PhD cohort.

Tony Staley and CRCs

I'd also like to congratulate the Honourable Tony Staley AO on his 23 years of leadership of the CRC Association. Sir, your commitment to CRCs, the CRC ethos and your advocacy on behalf of CRCs over more than two decades is a remarkable example of public service.

As you all know well, the CRC Programme has fostered leading edge research between industry, universities and research organisations. It's a model of how we want our R&D and innovation system to work.

In practical terms, CRCs have developed important new technologies, products and services to solve industry problems and improve the competitiveness, productivity and sustainability of Australian industries.

[1] http://www.acilallen.com.au/cms_files/acgcrcprogramreview2012.pdf

Role of CRCs

Since 1990, the government has supported over 200 CRCs through a commitment of more than $4 billion to the program.

The government has confirmed the importance of CRCs by allocating a total of $710 million to the program over the next four years.

The program has 31 operating CRCs, with further CRCs from the 18th selection round soon to commence operating.

I also want to acknowledge the work that CRCs do in developing industry ready researchers.

CRCs make a valuable contribution to developing a highly skilled workforce because of the science they undertake but also by providing exposure to collaboration and hands-on industry experience.

We've seen the excellence of the work done by five finalists selected from 41 entrants in this afternoon's showcase of Early Career Researchers, sponsored by CSIRO. Each of the five projects has created important links to generating benefits to society and to industry.

They show how researchers can work with industry and show just how effectively industry can leverage the work of researchers for their own and the public good.

Setting policy

This afternoon I will give you some insights into how science has impacted on evidence based policy, especially with emphasis on my department.

In the resources area, the scientists are doing some great work to look at the next wave of resource exploration and development and what it might bring in the future, as well as other work on coal seam gas.

Science and research and development are more important now than ever in shaping government policy.

Australia now part of the global economy which has required us to look at how we improve our competitiveness and productivity – how we grow, increase jobs and improve our standard of living.

Evidence and data availability are becoming more important. It's a challenge for decision makers and the community more broadly, with access to so much information, and in many cases, misinformation.

Science expertise and evidence and the integrity of our science institutions plays an essential role in sorting through this information.

The pace of change in the global economy, driven in part by digital disruption, and the exponential growth in data means that we will be relying more and more on STEM expertise.

We know that growth in jobs and improving our standard of living will rely on innovation and the translation of science and research and development into outcomes.

This is underscored by the Organisation for Economic Co-operation and Development (OECD) estimates. They suggest that as much as 50 per cent of long-term economic growth in OECD member countries can be attributed to innovation, and this contribution is expected to grow. [2]

Innovation comes primarily from the application and development of new ideas including through research discoveries illustrating the importance of science to our economic, social and environmental narrative.

Research in the economy

In terms of discovery, Innovation and Science Australia's *Performance review of the Australian innovation, science and research system* confirmed our research and knowledge production as a strength.

[2] Australian Innovation Systems Report (2016)

We are eighth amongst OECD economies, plus China, Taiwan and Singapore, in terms of our share of the world's top one per cent of natural science and engineering publications.

We have a strong appetite for creating knowledge and pursuing ideas, if IP Australia applications are any indicator. Australian residents continued to build on impressive 2015 patent application figures, with a 15 per cent increase in filings in 2016. This increase came despite a one per cent drop in overseas patent applications filed in Australia last year, showing the strength of home grown growth.

And many of Australia's 39 universities are well placed in global league tables for excellence of education and research.

The performance review showed that despite our research excellence, Australia has room for improvement compared with other OECD countries when it comes to translating publicly funded research into impact and commercial outcomes.

In fact researcher-to-business collaboration has been identified as a weakness. While 22.8 per cent of Australian businesses collaborate with competitors and other businesses, only 4.8 per cent collaborate with a university or publicly funded research institutions[3].

STEM in schools

The government is also working to turn around the declining rate of participation in science, technology, engineering and mathematics subjects in Australian schools.

The slip in our performance in school-level scientific literacy and mathematics in absolute terms and relative to other participating countries[4] is of concern and unless it's turned around, we will lack the skills required for strengthening our future workforce.

The Innovation and Science Australia review also found that that there were "cultural barriers to engaged participation in all aspects of science, from education through to innovation."

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[3] Australian Bureau of Statistics, 8167.0 – Selected Characteristics of Australian Business, 2014–15.

[4] Australian Centre for Education Research *PISA 2015: A first look at Australia's results*

While we have cutting edge skills among a world-class research workforce, Australia may be held back by capability gaps and mismatches between skills taught in schools, the VET system and universities, and the needs of industries.

In response, the government is working to address these gaps through our education system, through recent budget announcements such as the Skilling Australia Fund and the Rural and Regional Enterprise Scholarships which support regional and remote students to undertake STEM studies.

Part of this is about fostering a culture of risk taking, of learning from failure, but also a culture of entrepreneurism.

The CRCs also demonstrate that an innovative and entrepreneurial mindset will help us create the jobs and industries of the future and an economy that is strong, dynamic and digitally sophisticated.

One of the particular strengths of the CRC Programme has been the way it galvanises resources to build collaborative links on a larger scale but also works one-on-one with businesses. The CRCs exhibit a range of different partnerships.

Often new partnerships can require some 'outside the box' thinking and historically CRCs have shown they're very good at this.

For example, two current CRCs, Data to Decisions and the CRC for Sheep Industry Innovation, have taken collaboration to the next level with some cross-fertilisation – pun intended – working with each other.

The two CRCs have combined on an app that incorporates weather forecasts and details of individual sheep flocks to predict future risks to sheep wellbeing and production.

This new app, ASKBILL, is set to change the way that sheep producers cope with the challenges of ever-changing weather patterns, risks of parasites and changing pasture conditions before the wellbeing of their livestock is compromised. The new ASKBILL app, shows how two CRCs have combined to maximise practical outcomes.

And since you will no doubt be curious about how the app's name, ASKBILL, came about, I can reveal that it was named for Dr Gordon Lee McClymont, the founding Dean of the University of New England's Faculty of Rural Science.[5]

Probably the only person to call Dr McClymont, Gordon, was his mother, because to everyone else he was known as 'Bill.' His research described the conceptual model of the agricultural ecosystem to provide a framework for analysing the complex interactions of the components that make up grazing systems.

Today's computer models build on that understanding to predict future events and analyse 'what if' scenarios.

ASKBILL follows the Sheep CRC's development of the innovative RamSelect app that has had around 34,000 rams listed by over 200 breeders since it launched in July 2015.

Rams are crucial to herd improvement and sheep producers like to breed for specific traits. RamSelect has been a valuable aid to help breeders to search sale listings for rams matching their breeding needs.

The CRC for Spatial Information is also taking an innovative approach, this time to SME engagement.

It's fair to say that SMEs might be deterred from accessing the CRC Programme by the upfront cost, so reducing the upfront costs is important to enabling their participation.

The CRC for Spatial Information formed 43pl Pty Ltd, is a consortium of small and medium enterprises, originally 43 of them. It's a unit trust designed to allow SMEs in the spatial information sector to buy units and access CRC activities and share the CRC's intellectual property at a significant saving. 43pl shows how the CRC Programme can open doors to businesses.

[5] http://www.sheepcrc.org.au/publications/websites-to-assist-you/askbill.php

The Government has recently introduced the CRC Projects stream – CRC-Ps as they're referred to – providing smaller, more focused, shorter term CRC projects which improves access for SMEs.

Our first three calls for applications were enthusiastically received and some of the industry challenges include using graphene to clean waste water, reducing the time to market for the Australian tea tree industry and a new navigational modelling system to improve maritime safety and Australian economic benefits.

I anticipate some very exciting research outcomes as several projects from the first round head towards completion.

Science and future policies

So to the future.

Addressing the National Press Club in March, Minister Sinodinos acknowledged that 'the scientific method has been essential to the evolution of Western society.'

All the evidence - from Innovation and Science Australia, from the Office of the Chief Scientist, from our departmental economists and from the CRC experience - points to the need for science to be an important part of the government's agenda to secure our nation's long-term prosperity and wellbeing.

We now talk about science and innovation as key elements of our Minister's economic and productivity narrative.

But the science is just the start. As I have mentioned, knowledge transfer and the translation of science and good ideas into commercial outcomes are all important ingredients in making our economy grow and thrive.

My department is working in partnership with other departments, assisting businesses, academia and others to transition to address the challenges of the future – that is, growing productivity and global competitiveness through innovation.

The National Innovation and Science Agenda, launched in December 2015, demonstrates the importance accorded by government to science. It identified 4 streams of work with a focus on culture & capital, collaboration, talent and skills and government as an exemplar. A significant proportion - over half - of the $1.1 billion

in funding initiatives is directly devoted to investment in science and science capability.

For example, the biggest initiative was to support science infrastructure, including the Synchrotron, SKA and science capabilities.

The National Science Statement, delivered by Minister Sinodinos earlier this year confirmed that science is core to the mission of government. It sets out the government's vision for science in Australia, creates clarity on our objectives and provides a framework for future decision making in science.

The department is working with other portfolios to continue implementing this major initiative and support further work coming out of the announcement, such as the development of an investment plan for the provision of science infrastructure over the long term (based on Dr Finkel's Science Infrastructure Roadmap) and ISA's 2030 strategy, which will be put to government later this year.

We promote the importance of science through programmes such as CRCs – one of our flagship programs, Questacon and other science agencies, and through initiatives such as the Global Innovation Strategy, Innovation Connections and Inspiring Australia.

Again, in this context, the leadership of CRCs in forging international partnerships is a key element of strengthening government to government relationships.

Science driving policy

Over the years, Australian science has contributed to some significant shifts in government policy.

And the National Science Statement commits the government to continuing to seeking advice from experts in setting science policy.

For example, pioneering work by Professor Fiona Stanley in epidemiology and public health, in particular looking at brain development in children.

Coming out of the science of brain development in early childhood, I saw firsthand the influence science had on government, and indeed on Cabinet Ministers.

This science influenced all levels of government in the importance of parenting, nurturing and access to early childhood programs – all of which contribute to long-term impact on an individual's health, wellbeing and brain development.

It in fact shaped some of the early childhood programs of government at that time.

Scientific evidence has been crucial to a range of policy domains whether it be agriculture, transport, space, mining, heath, etc.

On health for example, vaccination policies (the merits of which are **still** questioned by some from time to time) have been implemented by governments which have relied on the science.

The importance of science to policy is also reflected in a number of mechanisms put in place to assist government decision making.

The appointment of Professor Slatyer as the inaugural Chief Scientist – this position has continued and followed by seven successors, most recently Dr Alan Finkel.

We have excellent publically funded research agencies like CSIRO, AIMS, ANSTO, Geoscience Australia, IP Australia, Questacon, NMI and AAO all of which are in my portfolio.

There are many other publically funded research agencies, including the ARC, the National Health and Medical Research Council, the Rural Industries Research and Development Corporation and the Great Barrier Reef Marine Park Authority across government focusing on science and the application of science to business and industry.

The Commonwealth Science Council, which is chaired by the Prime Minister, is important in looking forward at how science can be harnessed to shape a positive future for Australians. Some of the issues being considered include energy storage technologies, synthetic biology and precision medicine.

In addition to the Commonwealth Science Council, the government has established the Innovation and Science Australia Board, acknowledging the important role science has in our innovation system.

Innovation and Science Australia is developing its 2030 plan, to be submitted to government later this year, which will help inform future innovation and science priorities.

Science will continue to play a critical role in policy making and Australia's research sector is a potential gold mine of ideas and innovation.

Bringing researchers and businesses together is a central task of the Industry, Innovation and Science portfolio.

But it isn't ours alone. It is only by working together, with a shared vision, that we will address what I see as a systemic challenge and what will make a difference to our future.

Conclusion

I want to tie the threads together by returning to where I began.

Ralph Slatyer was the first in a line of eight distinguished scientists to have been appointed Australia's Chief Scientist. He set the bar for his successors – including Professor Chubb and Dr Finkel who I have closely worked with in recent times - high.

In addition to giving the government high-level independent advice on science, the Chief Scientist has a wider, pivotal function: to champion science, research and the role of evidence in the community and government.

At a government level, chief scientists have been an important part of the policy development process.

It's interesting to note that Professor Slatyer was asked to do work on radioactive waste disposal. Today, my portfolio continues to work with scientists and communities to identify a suitable site for national low to medium level radioactive waste.

Our chief scientists have also helped to raise awareness of declining rates of participation in science, technology, engineering and mathematics disciplines.

Addressing the National Press Club, Minister Sinodinos lamented the scepticism of some people, inside and outside politics, who don't get the innovation and science message.

And that there are growing pockets of people lacking respect for science and the scientific method. He said he wanted "to see science, research and empiricism at the core of the mission of government." He went on "I want to see it integrated in policies across the whole of government."

There is now much information and data available. Our chief scientist and government institutions supporting scientists provide the integrity and authority to get the right messages to our community.

Preaching to the converted here today, I think we all have a role to play in ensuring we communicate science discovery and evidence effectively in a way that resonates with all parts of the community.

The CRC programme does this and the model of collaboration between researchers and business is its strength.

Professor Slatyer has left us a legacy – his vision for the CRC programme and the example of working together – across industry, universities, research institutions and businesses is being realised.

If we work together and tell the story collectively by drawing on the science and the evidence it provides, we will influence decision makers and improve the health and wellbeing of our community now and in the future.