

The Ralph Slatyer Address on Science and Society
CRC Association Australia 2040
BAE Systems Theatre – The Australian War Memorial
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25 May 2015

**Science and Industry – Partners and helpers in building an exciting,
safe, equal and sustainable world.**

INTRODUCTION

Acknowledgements including Traditional Owners

Hello and thank you for inviting me here today.

I would like to thank Aunty Agnes Shea and acknowledge that we are meeting on the traditional country of the **Ngunnawal** people and show my respects for their spiritual relationship with their country. I would also like to pay respect to the Elders both past and present of the **Ngunnawal** Nation and extend that respect to other Aboriginal people present here today.

Ralph Slatyer

It is a privilege to be giving the 2015 Ralph Slatyer address. He is remembered not only as one of Australia's most distinguished scientists but also for his commitment to ecologically sustainable use of the natural environment and his determination to ensure Australian science should be as good as any in the world. He was dedicated to the benefits of cooperation in research.

As Australia's first chief scientist, Ralph Slatyer was instrumental in the establishment of Cooperative Research Centres, and the catalyst for us all being here today. He had a distinguished career at CSIRO, at ANU and as Australia's Ambassador to UNESCO.

He was not the only pioneer in the family. His sister, my friend, Lady Jean Brodie-Hall was years ahead of her time when she helped design the town of Kambalda.

It is wonderful to see some of Ralph's family here today: June Slatyer and her daughter Beth.

I would also like to acknowledge Tony Peacock for his leadership of the CRC's.

Australia 2040 theme and outline

It is therefore timely that as we consider Australia in 2040, that we honour Ralph Slatyer. Tonight I wanted to take a good hard look at what science and industry must do, if we are

both to be partners and helpers in building the kind of world that we want to inherit in the future. A fascinating, exciting safe, equal and sustainable world.

WHERE ARE WE NOW?

It is a really fascinating, exciting and connected world. The pace of change is accelerating.

The cost of sequencing the genome keeps falling faster than Moore's Law and now we're not only understanding our own genetics but now the millions of microbes that live within and on us work. We are starting to unravel the wicked cleverness of viruses and bacteria.

In astronomy, we have in Australia the new Square Kilometre Array Pathfinder project that will use 36 antennae to listen to the faint whispers of radio waves coming from our Universe. It will detect galaxies even before they started to shine in light. We'll be able to tell they're there by the way they tear at the fabric of space and the gas around them.

Do you remember when you lay on your back looking at the stars on a blanket ...and it was wondrous but it also made you feel small and humble. Well what we learn from these new antennae will change our picture of our history right back to the formation of the first galaxies. Perhaps we need as a species to feel small and humble again.

Both these areas of genetics and astronomy are data-rich and are heralding the way we will collect, use and analyse data in the decades to come. In particular in data driven areas of science we see that the pace of change IS accelerating.

It is accelerating because of we are connected at the speed of light, it is accelerating because of the way we work globally and it is being underpinned by Moore's Law and data driven science.

This accelerating pace of change is exciting but also disruptive for business.

The market cap of US tech and biotech companies now exceeds that of all the companies in emerging markets and all the companies in the Eurozone¹.

The number of industrial robots in the US is up 72% in the last 10 years and this has been accompanied by a 16% fall in the number of US manufacturing jobs¹.

I was recently in the Pilbara and to see all the control rooms for every part of the operation from the mines to the processing, to the port all controlled out of the Control Centre in Perth. It is extraordinary. To see the driver-less trucks in action was like a dream come true.

And next year the first autonomous haul trucks in Western Australia will be the largest robots on earth.

Technology has allowed a hyper-connected world. As Stefan Hajkovicz² and his team point out research in 2012 examining Facebook showed that the degrees of separation of any two people on earth has dropped from 6 to 3.7. Think about that.....

According to Cisco³, over half of all mobile traffic is now video. Over half of internet traffic will originate from non-PC devices by 2018, some of which will be driven by Internet of Things, machine to machine (M2M) devices¹.

It is a **frustrating world, because for all the opportunity and excitement there's a lot of inequality.**

- 2.2 Billion or just under a third of the world's people still live on less than two dollars a day⁴.
- 870 million people will go to bed hungry tonight as we dine⁵.
- We see in our region people trying to escape conflict in their homelands by whatever means available to them and a new horrific market emerging in the trade of people.

And it's an uncertain, insecure time because we're all vulnerable to terror and to global pandemics like avian influenza.

- We saw the terror attacks on 18,000 people in the refugee camp in Yamouk, Damascus and now we fear for Bagdad. This violence and terror makes us feel insecure because it could touch any one at any time.
- We see the light of the digital world but also its shadows. The World Economic Forum listed cyber security as one of the greatest risks in 2015⁶. We see the internet used by ISIL to recruit.
- We know that 70% of new viruses that can kills us will come from animals. Like SARS, Swine Flu and Ebola.
- Our plants also have threats- just talk with Kylie Ireland from the Plant Biosecurity CRC on Sudden Oak Death or consider the impact of Eucalyptus rust in Australia

And it's also an unsustainable world. Because we need more resources, for more people for less cost. Because what we are adding to the very thin fragile skin of just 80 km of atmosphere above us is changing our climate and the air we breathe.

- We know that when and where our rain is falling is changing⁷.
- A billion people won't get a clean glass of fresh water tomorrow and soon another billion people will live in areas where fresh water will be at risk.

WHAT WILL SCIENCE AND INDUSTRY NEED TO DO IF WE ARE TO BE PARTNERS AND HELPERS IN BUILDING AN EXCITING, SAFER and SUSTAINABLE WORLD AS WE LOOK TO 2040

Well the fascinating and exciting bit, I think we have well covered and the CRC's will be very much a part of this.

I am really excited about the new opportunities for manufacturing and look forward to hearing of the success of Dr Sherry Kothari's team at the CRC for Cell Therapy Manufacturing in treatments for diabetes patients.

I am excited about new materials and composites but I also have some scars. I know it can take 20 years for a new material to get to the big markets even when it is clearly better. So we see the sporting market take up carbon fibre and titanium when the big markets are still slow to adopt these.

I have to say we've had some disappointments – ... buckyballswhat a let-down. Let's hope graphene has a better run.

But polymers have a long way to run and I am very intrigued by the Matthew Hill's work in metal organic frameworks for gas storage. Just look at Bastian Stoer's work in the AutoCRC on making surfaces that won't smudge with finger prints or Kelly Tsang's work on light sensitive gels in the CRC for Polymers.

I love the fact that we are understanding our own genome and that of our animals and fish but more importantly we will get to understand the microbial world and how it keeps us and other animals healthy or not. We will unravel how microbes can organise themselves into biofilms. Pryanika Reddy is in the Dairy CRC is looking at toxins produced from fungi on grass eaten by dairy cows.

But we desperately need a battery breakthrough. The attention that the Telsa battery got when it is simply a bunch of lithium ion batteries tells us that if we can really get a functional battery for renewable energy storage - there is pent up demand. We are decades behind on this.

And robotics – Bring it on. I look forward to every bike having a sensor and every car door having a sensor so that no cyclists ever gets doored again. Can you guys in the Auto-CRC see to that?

But this is not enough – we need to work on the really big problems that require global collaboration.

One of my favourite examples of this is The Global Carbon Project which Pep Canadell from CSIRO is one of the executive directors. This project started in 2001 to look at the carbon cycle in the earth and do the hard work of stocktaking the sources and sinks so that today we know:

- In 2013 9.9 +/- 0.5 Billion tonnes of carbon were emitted from fossil fuels burning and cement manufacture into the atmosphere and at the same time the ocean and land sinks removed 50% of the total CO₂ leaving 50% of emissions into the atmosphere⁸.

- We know how our earth or oceans and our forests are breathing from this work.

I can tell you from personal experience as part of the World Economic Forum Global Risks 2015 team and teams such as the Commission on Sustainable Agriculture and Climate Change it means 3 am phone calls, it means lots of frustration as a virtual global team takes time to gel and it takes time to speak the same language.

However it is also hugely satisfying and I urge all the young people in the audience never to pass up an opportunity to work with colleagues around the globe on these big complex issues. Our generation connected the work-your generation has to figure out how to use it!

But a word of caution for this country. -

Australia must not get left behind and must invest in R&D at a rate greater than GDP growth. Right now we risk being one of the few developed and developing countries to fall below this key benchmark.

You can tweak all you like around the edges but nothing can help you if you let that fundamental investment level drop.

Industry knows this. In slow growth environments like we are in now capital investment is often cut but you cannot do that for too long or your long term growth pipeline.

We know this as parents. Every family invests R&D capital or development capital - it's called your kids' education and you know it's risky and it for the long term and you know that however tough it is to make ends meet that month, you still have to invest in the long term for your kids future.

Will we build a safer and more equal world? Not if our differences are more important than our common humanity.

The way we think of each other must change. Bill Clinton urged us and Nelson Mandela showed us how - to put our common humanity ahead of our differences. Clinton said:

“The world is awash today in political, religious, almost psychological conflicts, which require us to divide up and demonize people who aren't us. And every one of them in one way or the other is premised on a very simple idea. That our differences are more important than our common humanity.⁹”

Nelson Mandela said – We are all “joined in an inescapable web of mutuality”.

And so science and industry, as part of society, are in this inescapable web together. How do we become partners and helpers in building the society that we want? We must see our common humanity is more important than our differences.

I look at Australia and how often despair when I hear people talk about indigenous history and Australian history as separate things. Until we see all our 40-60,000 years of human history in Australia as our own joined history how on earth are we going to move forward into a common future?

My ancestors walked the hot sands of the Australian desert and my aboriginal friends' ancestors, ancestors walked those hot sands. I want to understand their experiences and culture and language.

I believe we cannot grow up as a nation or move forward together until we see the whole of our nation's history and human culture as one and each of us as a proud Australian seek to understand it.

So it's going to be a roller coaster of excitement. It will be hard to build a safer and more secure world, but I think the biggest changes and opportunities to 2040 for science and industry will be societies' demand of us to build a more equal and sustainable world?

There are some very powerful forces that are putting a rocket under this issue for industry.

Firstly society now expects the role of the corporation to move from being a vehicle for financial return on our savings to a moral agent for change in our society.

What does this mean? It means the role of corporations as just to deliver shareholder return is being challenged and corporations are being challenged to deliver on the real issues of sustainable development of the planet.

Secondly, internet is allowing a strong voice to community and this communication is happening at the speed of light for industry and science. Responding and being proactive in communication requires cultural shifts. For business it requires a serious upgrade to the operating system.

A recent example of the how powerfully and quickly a message can get out is Paulo de Souza's work on putting sensors on bees reached over a half a billion people in less than two weeks¹⁰.

And finally the risk profile is changing for corporations. Corporations were set up to alleviate risk. In the past these risks were confined to their industry or sector but now there are real risks that operate on a global scale. These risks extend to the climate, supply chains, water etc. So even if corporations act to address risks for their shareholders they can no longer ignore these broader risks.

E.g. Just a few weeks ago the BoA announced that globally it would reduce its credit exposure to coal due to shifting market dynamics and increase its investment exposure to renewables.

Unilever one of the biggest users of palm oil in its products has committed to zero deforestation in its value chain.

Not only is the basis upon which corporations were established being challenged, this basis is no longer sufficient to protect them against risk and it is insufficient to achieve a sustainable global environment.

Those same drivers are playing out in the world of science.

Science and technology created the internet which has connected us.

The irony is that we are now the most connected generation ever and yet our capacity to work together at a global level has never been so low.

Like industry we see that the internet gives a strong voice to the community and that voice is used to challenge science in a way that have not seen before. I strongly believe that this challenge to science on so many issues will mean we will be more transparent and better communicators.

We cannot expect change in our societies on these big issues without challenge and debate.

Science is also being asked to extend its role. There are now real risks that we will not be able to set sustainable limits to the growth of our species. These risks extend globally and science is being asked to come out of our comfortable bunkers and address them.

But they are complex, interconnected issues like sustainable water resources, understanding and mitigating the risks of climate change, setting up energy supply for the future, stable food supply and healthy living.

Just ask Christoph Brodnik from the CRC for Water Sensitive Cities about just how hard it is to develop strategies for urban water.

So if we are to be partners and helpers in building an exciting, safe and sustainable world we must tackle the hardest problems together. These problems have an enormity that seems daunting but they are fixable.

So for any young scientists in the audience, whatever your expertise, look for ways to contribute on these complex global issues. And a word of advice – be clear about what you can contribute and do so. You will find amazing insights and the world needs you to develop these skills more than any generation before you.

CONCLUSIONS

So science and industry must step up and be partners and helpers in building an exciting, safer sustainable world.

Well, I have no doubt that it will be fascinating and exciting partnership and that the CRC programme will be part of that partnership.

However more will be asked of both science and industry. Society awareness and demands on science and industry for answers for a sustainable world will increase

Our roles will extend to be moral agents of change in our society and we will be both asked to tackle the biggest challenges we face in complex, interconnected issues like sustainable water resources, understanding and mitigating the risks of climate change, setting up energy supply for the future, stable food supply and healthy living. You will be asked to step up and be a moral agent for your society. Ralph Slatyer our first Chief Scientist understood this and urged us to step up.

We will both need to communicate and operate at the speed of light. For business the power of the highly involved will change consumer dynamics.

Science will need to get used to more transparency and having its views challenged.

This will require cultural shifts and innovation.

Collaboration will be turbo charged and if you cannot play in the global game you will fall behind. As our current Chief Scientist is clear Australia risks falling behind and mathematics and science should be part of all Australians education not just a few if we are to have the society we need in 2040.

Thank you

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