

Australian Government

Chief Scientist

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15 MINUTE SPEECH

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Connecting the Science Pipeline

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ADELAIDE CONVENTION CENTRE

Your Excellency, distinguished members and colleagues. It gives me great pleasure to speak at the opening of this Congress.

In 2006, the Royal Institution of Great Britain declared chemist Primo Levi's autobiography, *The Periodic Table*, the best science book written.¹ In it, Levi writes:

The nobility of Man, acquired in a hundred centuries of trial and error, lay in making himself the conqueror of matter, and I had enrolled in chemistry because I wanted to remain faithful to this nobility.

And a noble cause it is. In our Australia 2025 series of articles published by The Conversation, The University of Melbourne's Andrew Holmes, now President of the Australian Academy of Science, observed:

Chemistry is the most central of scientific disciplines and underpins the physical, material and biological world... Most major advances take place at the interface of two or more disciplines and chemistry sits at the core of trans-disciplinary research.

¹ <u>http://www.theguardian.com/science/2006/oct/21/uk.books</u>

Chemistry has been fundamental to the development of the modern world and a modern economy, from pharmaceutical drugs, to herbicides, pesticides and fertilisers in agriculture to the polymer banknotes we all use every day.

Of course chemistry benefits from knowledge gained in other disciplines as well. One could scarcely imagine chemistry without an appreciation of physics or mathematics, for example.

But it is true of all the sciences: they complement each other and that to neglect one is to diminish the rest.

This is particularly true in our time, when we face complex challenges such as an ageing population, climate change, pandemics, epidemics and food security. Not one of these will <u>not</u> need the sciences at the core of the knowledge we seek or solutions we find.

Yet when the time comes to think and invest in science, we often think of the sciences as silos – even though we know that most of the big problems that confront humanity, our planet and all its living systems will often require work across the discipline boundaries.

The notion that a given science is relevant only to its own field is an old way of thinking – and even a dangerous way of thinking. It gives rise to the idea that science graduates must either find a research job in their field or work in a field that uses their discipline content, knowledge or the system has failed!

That is certainly the view of some economists.

They would no doubt be surprised to learn that school education and public administration were two of the top five career paths for chemistry graduates and again that a high percentage of those graduates find themselves in business, HR and marketing roles². I think it would take most people by surprise – even some in this room.

But it is not unusual. In fact, it's the norm. In 2012, a report found only 40 per cent of science graduates ended up as working scientists.³

Yet 97 per cent of respondents, regardless of where they were working, said their science knowledge or skills were useful in their work.⁴

It is not surprising because despite the common portrayal, science is preparation for an array of job possibilities. It is an approach, a way of thinking. It is a process and a skillset that can be applied to almost any problem.

² ABS, Census of Population and Housing 2011

³ A Background in Science: What science means for Australian Society by Dr Kerri Lee Harris ⁴ Ibid

And it is deep knowledge of a discipline which, at its best, will also illuminate the big questions at the interfaces between disciplines. It will show how they connect – how they have to.

It is a process of education that our industries, whether science-focused or not, can build on.

Provided, of course, that the foundation is strong.

For the moment, the connections between school and university which provide that foundation are not in great health – an issue we share with much of the developed world.

And the Relevance of Science Education (ROSE) Project indicates that the more developed the country, the less the inclination of students to study or pursue careers in the STEM disciplines.

In Australia, for example, in 2012 there were 30,800 more students in year 12 than in 1992 but:

- 8000 fewer physics students
- 4000 fewer chemistry students
- 12,000 fewer biology students than two decades previously.⁵

⁵ Kennedy, Lyons and Quinn, *The continuing decline of mathematics and science in Australian high schools*, Teaching Science, Volume 60, Number 2, June 2014.

If the interest is there, however, it can lead to an incredible journey.

Take Dr Elizabeth Blackburn, Australia's first female Nobel Prize laureate.

According to her biographer Catherine Brady, the young Elizabeth's interest was *further sparked by a likeable <u>chemistry</u> teacher at Launceston's Broadland school.*

There the young Elizabeth used the new chemistry lab to try to make touch powder fireworks, an early example of what the older Elizabeth called "curiosity-based science."

Elizabeth is not alone. Curiosity is something children have in spades and science thrives on it, because it provides answers at the same time as offers new puzzles. Science rewards and challenges students in a constant cycle which builds critical thinking skills.

Those skills enable them to perform at high school, give them the grounding to perform at university, and set them up to achieve in research, industry, government, any career. The flow-on effect is a more resourceful workforce with a greater capacity to innovate and compete on a global scale.

It is all there for us to do. The challenges are great, the need profound. And the world needs what we do.

And we have responsibilities.

As scientists, it is for us to remember that our contribution will be important means by which we achieve the end game – a better world.

It will require us to work across boundaries; it will require us to work across national borders; to learn and think in different ways. It will require us to work within the social licence we are given by our communities.

And we will have that because they trust us, because we conduct ourselves in ways to achieve the highest standards; because they understand our ethics; and because we take time to explain it to them.

Congresses like this help with the message.