



Australian Government

Chief Scientist

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**Women In Mining Network of Victoria and Australasian
Institute of Mining and Metallurgy (AusIMM) Annual Lunch**

Wednesday 25th July 2018

**Park Hyatt
MELBOURNE**

It is a great pleasure to join you in this 125th anniversary year of the Australian Institute of Mining and Metallurgy.

There's a word for 125th birthdays. You'd think it was conceived by a historian, but in fact it was commissioned by an American engineer back in the 1960s.

He was organising a 125th celebration and thought it deserved a name.

But being an engineer, he wanted to do it properly.

So he got in touch with the publishers of his favourite dictionary, Funk and Wagnalls, and asked for one.

They came back with "*quasquicentennial*".

So Happy Quasquicentennial to you all.

And what better way to look forward to the 150th anniversary – the sesquicentennial – than by reflecting on where we are today.

Whenever I think about mining I think back to one of my first official site visits as Australia's Chief Scientist.

I was invited to tour Rio Tinto's remote operations control centre in Perth.

I could almost imagine that I'd been transported inside the Starship Enterprise.

I'm not talking about the early years with the terrible cardboard sets.

I mean the impression you get when you move into a space where highly trained humans and highly advanced technologies are working seamlessly together.

It had to be seamless – because what was happening far out in the Pilbara, 1500 kilometres away, was extraordinary.

16 mines. 1000 miles of rail. Three ports. Three power stations. Trucks the size of double-story buildings, weighing 250 tonnes, fully autonomous, meeting at intersections and waiting politely for other trucks to pass.

And every minute, 2.4 terabytes of data from thousands of sensors flowing in to the control room in Perth.

Overseeing all of it was Kellie Parker, managing director at Rio Tinto Iron Ore.

I thought at the time that her breadth of expertise was extraordinary, and made a note to use her story in my next speech. Which I did.

And what do you know, here she is again, in the latest edition of Forbes, with the headline: “Australia’s Iron Ladies are Rocking the World’s Mining Industry With Tech”.

Despite the blatant pun in the headline, I read the article and learned that Kellie’s latest project is the design and delivery of the Koodaiderie mine.

What I saw in 2016 was the Mine of the Future. Two years later, that’s the old model. The new horizon is intelligent mining.

That means moving beyond the automation of tasks to decision-making by machines: artificial intelligence, integrated pit to port.

A genuine world first, Australian made.

A few weeks ago, I had a flashback to what I’d seen at Rio Tinto.

This time I was sitting in Parliament House. Which, for the record, is very nice but nothing like the Starship Enterprise.

I was launching Australia’s first national Robotics Roadmap.

The driving force behind the project was Sue Keay – another extraordinary woman, very well-known in mining, with a PhD in Earth Sciences, and now running the Centre of Excellence for Robotic Vision.

As part of the launch, Sue had organised a panel of experts from different industries, including several leaders from mining.

Their message was clear: we lead the world in robotics in mining and we intend to stay there.

It wasn’t said boastfully – it was simply a statement of fact.

And it was said with the assurance of industry veterans who had gone to global management, many times, and persuaded them to locate their R&D in Australia.

Look at the skills. Look at the capability in industry. Look at the culture of getting things done.

That's what our global management sees in Australia. And that's why they give us the resources to build jobs and opportunities, for Australians, here at home.

I looked around the room, and you could almost see the potential lighting up the eyes.

So I came away from that event with a lot of business cards, and the three messages I want to give you today. Two are for the country, and one is for the mining sector.

So let's begin with the messages for the country.

Message One: We have to stop treating mining like dirt.

Because we do treat mining like dirt.

You only have to look at the way we measure and score innovation.

One of the most common metrics used to rank countries is the ratio of high-tech to low-tech exports.

Silicon chips are high-tech.

Iron ore is considered low-tech.

So if you are brilliantly successful at getting iron ore out of the ground safely, efficiently and with minimal impact on the environment... then what happens?

Your total exports, the bottom line of the ratio, balloons.

Your high-tech exports, the top line of the ratio, stays flat.

So the better you are at mining, the worse you score.

But the technology in a world-first intelligent mine is clearly far more advanced than the processes in your standard silicon chip factory.

I raise this partly because I value metrics, and flawed metrics are like fingernails on the chalkboard.

But more importantly, I raise it because treating mining like dirt in public policy would be a terrible mistake.

We have to think of it as high-technology industry, requiring skills in high demand.

And the pipeline is a problem.

We know it's a problem because the Chamber of Minerals has formed an emergency taskforce to address it, and CEO after CEO has gone on the record with their concerns.

It's not just the sharp drop in interest in mining engineering.

It's the intense demand for people with skills in statistics, analytics, robotics, and AI.

Take that last skillset: AI. Globally, there are thought to be about 22,000 researchers, with PhDs, who are capable of working in AI research and applications.

For the absolute stars, Google's rule is "break the salary scale". Pay them whatever they ask. And that might work... for Google.

But wouldn't it be better for Australia if we equipped more of our students for those sort of jobs?

We could start by stopping the obvious leaks in the pipeline.

I have two in mind.

One, at the end of Year 10, when students get the message that the best way to boost their ATAR is to drop out of maths.

And two, at the start of first-year university, when students who acted on that message, and got the ATAR for engineering, find they don't have the maths to pass the first year course.

We could fix it today: bring back the maths prerequisites on all the courses that really do need maths, to make sure the students entering the course enter with the preparation they need to excel.

That would be a great start.

Beyond the people, we need research facilities and digital infrastructure.

Good luck building an intelligent mine in a data black hole.

That was recognised in the last federal Budget.

The Government has committed \$225 million to satellite navigation, promising comprehensive position, navigation and timing data to an accuracy of 10 centimetres across all of Australia, and three centimetres in areas with mobile phone coverage.

So clearly, people in government get it.

But in schools, in universities, in media outlets and in every corporate boardroom, we need to bust once and for all the myth that mining is dumb luck, not serious smarts.

So Message One: stop treating mining like dirt.

Message Two: Acknowledge that when we're digging a hole we're building high-tech capacity.

There's a perception in some quarters that mining is a one-off.

You dig a hole, you sell the dirt, it's gone.

So invest in people who make things, not people who mine them.

It bothers me because it is a false dichotomy.

Who invests in technology development in Australia?

Who hires programmers and data analysts and coders?

A lot of the heavy lifting is done by mining and mining service companies.

Take a tech company that's thriving in Canberra, called Seeing Machines.

They use eye tracking and facial recognition to monitor the concentration levels of drivers.

It grew from a project in the robotics laboratory at the Australian National University.

And some of its earliest investors were mining companies, like BHP, which trialled the technology in the Pilbara and then rolled it out across the fleet.

Today the company employs more than 200 people and sells its products in Europe, North America, the Middle East and the Asia Pacific.

They could not have grown to scale without the big companies, including the big miners, who both invested in the technology and gave the products a test-bed.

And that busts another myth that bothers me.

It's the belief that we can't do anything that's genuinely innovative in Australia because we don't have scale.

But in mining we do have scale – and global supply chains.

The big miners and the start-ups work together.

The start-ups gain access to global markets, and they grow.

And their success strengthens the argument for further investment in Australia from the big global players in turn.

So Message Two: acknowledge when we're digging a hole we're building high-tech capacity.

And now to Message Three: Where are the women?

In the course of preparing this speech I had a look at the data on the employment trends.

I discovered that women were banned from working underground in Queensland and Western Australia until 1986.

Thankfully, that rule is gone.

But we've been sitting at a gender divide of about 85% men, 15% women, for decades.

It seems to me that if we can be the best in the world at integrating artificial intelligence into mining, then we ought to be the best at capitalising on human intelligence as well.

I know this sector is capable of reinventing itself.

I also have it on good authority from Gabriela Love, the eighth female mining engineer to graduate in Australia, that the work itself is fabulous.

No one could argue that women can't compete for that work on merit.

Think of the women I've mentioned today: Kellie Parker, Sue Keay, Gabriela Love.

But you all know more.

Diane Jurgens, Chief Technology Officer, BHP.

Elizabeth Gaines, CEO, Fortescue.

Julie Shuttleworth, Deputy CEO, Fortescue.

Denise Goldsworthy, guru, who sits with me on the judging committee for the Prime Minister's Prize for Science. She supplies the hard-nosed technology smarts – better than I do.

And of course, Megan Clark, first an earth scientist, now our first ever national space commander.

Women have served this industry with distinction at every level.

And that's with overall representation stuck below 20%.

My challenge to you: work out what it would take to optimise mining to attract the best talent, irrespective of gender.

Then do it.

So there are my three messages in honour of this quasiquicentennial event.

- 1) Stop treating mining like dirt.
- 2) Acknowledge that when we're digging a hole we're building tech capacity.
- 3) And optimise for talent, full stop.

If we want to continue to be lucky, then we have to stay smart.

THANK YOU

1. Introduction

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