



Australian Government

Chief Scientist

PROFESSOR IAN CHUBB AC

OPENING OF THE SCIENCES TEACHING FACILITY

20 MIN ADDRESS

Building a better future in STEM

9:15am to 9:50am

5 MAY 2015

**Sciences Teaching Facility
University of Wollongong**

Chancellor, Vice Chancellor, distinguished guests, ladies and gentlemen.

I always enjoy coming back, partly because it's one of those places in Australia where I get lost each time, because it's different.

I do remember back three or four years ago when I couldn't find the administration building – which I'm sure many of you hope is lost forever. But I did find it; it is still there.

I arrived here for the first time at the end of 1985 and started work in 1986, as a relatively inexperienced – completely inexperienced – Deputy Vice Chancellor.

But I was eager to learn. And it was important for me to come here at that time because I wanted to learn from Ken MacKinnon; and also because I wanted to join an institution that was going to grow, and going to change, and carve out its place in what is not always the friendly world of higher education.

It wasn't easy at the time. It wasn't easy emerging from the shadow of the University of New South Wales.

I remember some things that happened in my early days when there was a metaphorical queue of people lining up to tell you what was wrong with the place. (That happens in every university, I've since learned, so you're not unique in that respect).

I heard about how the University of New South Wales had sent trucks along the highway to take back everything that wasn't nailed down or had a core body temperature of 37 degrees; everything else was vulnerable.

I was looking one day for an overhead projector – for the young ones in the audience, that’s a thing that projects – “oh, it’s gone back to UNSW.”

So we started work from quite humble beginnings.

But what it did was help to build a culture. That was a can-do culture, and it was important for me personally to be part of it.

I like challenges. I like thinking that what we are trying to achieve is just a little too hard to get to, just a little out of reach, but if you stretch and strain, and you’re committed, you achieve it – and then you repeat the process.

But it was a university that had that culture, that set challenges for itself, and took very little – nothing – for granted.

It wasn’t born with riches; it was born to build up from humble beginnings.

It was an institution built on aspiration, high aspiration, from its earliest days.

And I remember a lot from those early days. I remember no buildings, very few trees, and a lot of coal wash carparks. It wasn’t the prettiest campus in the world.

Now it probably ranks very highly amongst the beautiful campuses of the world. But at that time it did not.

I remember that we had a serious, indeed a very deliberate problem, that we would now call a serious over-enrolment. And that was a strategy of the university to enrol people particularly from southern suburbs of Sydney who could easily come down in the morning and go home at night. But it meant the facilities were strained.

I think the first year chemistry course could only hold one fifteenth of the first year chemistry class enrolment – so that we had to repeat the same practical fifteen times in a week, including through Saturday mornings.

Ken's strategy, of course, was that if you got the students in, sooner or later someone would fund them.

And I say, lucky for him, but he would say, part of a grand design, that John Dawkins came along and funded all the students who were currently enrolled, so from one year to another Wollongong's budget took a step function upwards and Ken worked his magic with that money.

So I do remember we went pitching to students in southern Sydney. I remember that we collectively went out and tried to establish very real links with the local community.

Those of you who remember that time will remember that BHP was cutting back on its staff, quite substantially; you will remember that the coal mines were substantially downsizing; so all of a sudden the university was going to play a much more prominent role in the community. And it felt it had to earn the respect of the local community in order to play the role it could play.

I remember the staff – the staff who wanted to build something. They were energetic, they were tired by Saturday afternoon – having run fifteen practical classes, or the same one fifteen times – but they were committed.

And there were students of course who were eager, because they had invested their future in this institution and what they could learn from those staff.

So I enjoyed being part of it, as I enjoyed being Deputy Vice Chancellor to a man who must take a good deal of credit, Vice Chancellor Ken MacKinnon, and I can say two things about it because he's not here.

One is that he still rings me up to tell me how to do my present job.

The other is that he was the best Vice Chancellor I've ever seen and ever worked with. I've never known anyone to have the strategic skills and the tactical nous of our Ken.

So here we are today in another new, fantastic, purpose-built building on what is now a magnificent campus. And it is a testament to all those people I've mentioned not by name, but in spirit.

Australia's progress in tertiary STEM education

In 1975, the University of Wollongong gained its autonomy as an independent institution of higher learning.

When the Bill establishing this institution was before the Parliament, less than **three per cent** of the Australian population had a tertiary or a technical qualification in either technology or the physical sciences.¹

When the Australian Bureau of Statistics last analysed the workforce - including categories of employment that didn't exist in the 1970s - that proportion had **grown more than five times**.

¹Australian Bureau of Statistics, *1301.0 - Year Book Australia, 1975-76*.

Of our working age population, **15 per cent** have a Certificate III or above in a STEM field.²

It's an enormous, and profound, and important growth.

Economists would probably attribute that growth to 'market pull': demand, therefore supply.

But Australia made choices that put many more STEM graduates into the workforce – and *those* graduates, of course, built industries that needed even more STEM skills.

And that cycle recurs. It's still happening.

And so through universities like Wollongong, we chose to build the nation we are today.

But it doesn't stop. The world changes and we must too, to get better and better and better at what we do.

It is interesting now to look back on the first generation of students who benefited from the policy directions of the 1970s.

In 1975, we had 6500 commencing students in engineering and the natural and physical sciences: **more than twice** the intake for economics, and **five times** the number of law students.

Now we can add together all the commencing students in engineering, the natural and physical sciences and information technology – and we still fall about 30,000 short of the commencing students in management and commerce.³

Has the world changed in a way that requires so many more of us to be economists? I suspect not. We do, as a nation, need to make things. We need to invent things. We need not just to

² Australian Bureau of Statistics, [Perspectives on education and training: Australians with qualifications in science, technology, engineering and mathematics \(STEM\), 2010-11](#) (cat. no. 4250.0.55.005).

³ Department of Education and Training, Selected Higher Education Statistics – 2014 Student Data. <http://www.education.gov.au/selected-higher-education-statistics-2014-student-data>.

count things or even worse, just speculate about what we could be if people's behaviour followed the theory.

So what we have to do is think about the importance of science in our lives.

Whether it is our climate, our health, our ageing population, our food supply, our economy or our security, it will be scientific discovery and the use of STEM skills that will form the core of our ability to respond.

They won't do it on their own. We do need the humanities and social sciences. We may even need economists from time to time. We do need these disciplines, and we need them to be powerful and strong too.

But they can't operate effectively if the core knowledge is not available to address some of those issues, and those problems, and those circumstances that we know will happen, but we don't know enough to avoid them. We don't know how to adapt or to mitigate or to change our path yet. We're learning all the time, and we'll get better at it through facilities like this, staff like this and students like this.

But I know that we will need to develop and maintain research capability in a broad range of areas.

We need research that will enable us to access and benefit from the global stock of knowledge – the 97 per cent or so done elsewhere.

We need research that answers to our unique needs as a nation. There are things that only we can do for ourselves. We can't expect people anywhere else to worry about the flows of the Murray Darling River System, or the use of the Great

Artesian Basin, or the impact of fracking on our aquifers. We will have to do that for ourselves.

And we need research that makes something of our competitive strengths and comparative advantages.

But above all we need people: we need talented people, we need skilled people and we need adaptable people. We need people who can adjust what they do and how they do it to the unpredictability of the future.

The only certainty about the future is that it will be unpredictable. And people who are educated through a proper educational process, through a proper scientific process based on method and ethics, scepticism, critical thinking, curiosity, collaboration, teamwork - all of those things that come out of a high quality science education - will give us people who are adaptable enough to change when the circumstances and our needs change.

And we need more of those people to teach and explain to others – so that all of us are prepared for the challenges ahead.

It was interesting to read late last week of a report that's come out of the National Science Foundation in the US on a STEM-capable workforce. And they ask themselves why, when you've got 5.4 million workers who have jobs classified as science and engineering presently in the US, you'd also have 16.5 million workers reporting that their job required at least bachelor-level expertise in science and engineering.

They're seeing a mismatch, we're seeing a mismatch; we've got to do something about it.

In the US, they went on to ask a serious question – and that is whether *all* individuals have access to a high quality education that includes STEM.

Not that everyone who studies STEM should be a scientist and put on lab-coat every morning, but they should understand STEM well enough to be contributors to the debates that society must have as we work out what benefits that we can draw from science.

As Tony Blair once said “science lets us do more, but it doesn’t tell us whether doing more is right or wrong” you have to have a community discussion to work out how, what, where and in what circumstances. And you need people with science literacy to do that.

In the US, they are getting better at producing STEM graduates as they think STEM is a national priority.

For example, they have committed to producing one million more graduates in STEM within a decade - that is from 2010 to 2020. Over and above the current number projected to graduate on current trends. They have put federal money behind it, \$100million to improve STEM teaching in schools in order to be able to get students to a level of achievement where they can take high quality STEM programmes in universities and in TAFE and trade schools.⁴

Over here Australian industry is already reporting serious deficiencies in the STEM literacy of the general workforce; and

⁴ White House, ‘One Decade, One Million STEM Graduates’.
<https://www.whitehouse.gov/blog/2012/12/18/one-decade-one-million-more-stem-graduates>.

difficulty in recruiting in STEM roles.⁵ And we have to do something.

If we don't we get let behind. If you get left behind, the gap becomes so big that we can't possibly fill it. Then we become a mendicant motion and the University of Wollongong that I know, would not put up with that for a minute. It is us up to us to do something about it.

Our pipeline - if we do nothing - is not promising.

- Participation rates in science subjects at Year 11 and 12 are now at the lowest they have been in 20 years.
- In 2012 there were 30,800 more students in year 12 than in 1992 but:
 - 8000 fewer physics students;
 - 4000 fewer chemistry students; and
 - 12,000 fewer biology students than two decades previously.⁶

We have plenty of economists to tell us this is all as it should be. No-one is worried about a shortage of economists.

But nations at all levels of development *are* worried about a shortage of STEM graduates.

If we, like those nations, thought about what we might want in the future, and what we currently are on track to have, we too might be concerned.

A system that generates three economists for every two scientists and engineers is not necessarily the right one.

⁵ Australian Industry Group, *Progressing STEM Skills in Australia*, March 2015.

http://www.aigroup.com.au/portal/binary/com.epicentric.contentmanagement.servlet.ContentDeliveryServlet/LIVE_CONTENT/Publications/Reports/2015/14571_STEM%2520Skills%2520Report%2520Final%2520-.pdf

⁶ Kennedy, Lyons and Quinn, *The continuing decline of mathematics and science in Australian high schools*, Teaching Science, Volume 60, Number 2, June 2014.

And a country that thinks scientists and engineers are only useful for science and engineering jobs is selling people short.

We have a pressing need for more STEM students because we have – or we should have – a great aspiration for Australia.

And we also have a responsibility to young Australians.

We cannot compel them to study or to enjoy STEM – but we shouldn't have to.

STEM should be so fantastically and wonderfully taught that students are queueing up to enroll in these subjects. Then, students could understand how awesome science can be when they are taught by people who love science and take their passion for science into the classroom and present science as wonderful and compelling stuff to do.

It is a choice that enriches the individual as much as it benefits the society around them.

And when it is taught with inspiration students will see how utterly awesome it is.

The Sciences Teaching Facility: a building to match our ambition

So it is fitting that Wollongong, in its fortieth year, should open this new facility.

It is a statement about the sort of society we want to be – and the sort of opportunities we want our children to enjoy.

- It is a commitment to high quality teaching and research.
- It opens training and careers in STEM to many more students.

- It encourages collaboration across disciplines.
- It takes advantage of new technologies.
- It aims to prepare students for industry as well as research roles.

It is a measure of real ambition for Wollongong as well as Australian STEM. It is aspirational. It aims high. And the history of Wollongong tells you that, that is how it began – and this tells you that the flow continues. It is great for the university, the region and the country.

It is now my pleasure to officially open the Sciences Teaching Facility and I am delighted to be joined by the Chancellor and Vice-Chancellor to unveil the plaque.