Vice Chancellor's Speech

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<th>Australian Council of Deans of Science Annual General Meeting – Keynote Address</th>
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<td>Length of Speech</td>
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<td>Date</td>
<td>Monday, 21 October 2013</td>
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<td>Time</td>
<td>9.45am</td>
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<td>Venue</td>
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(note: VC to introduced by Professor Russell Crawford, President of the Australian Council of Deans of Science)

Thank you, Russell, for your kind welcome, and for the opportunity to take part in the Council’s 2013 annual general meeting here at Glenelg.

At the outset, it might be prudent to warn you that it’s barely 12 hours since I arrived back in Adelaide following a long-haul flight from London.

So if I drift off mid-sentence or openly lament science’s failure to successfully deliver us the tele-porter, that is my excuse.

It’s also part and parcel of the glamorous, globe-trotting life that accompanies a vice chancellor in today’s global education market.

But when I’m not being a vice-chancellor, I am essentially a scientist.
It’s in my DNA. The fabric of my being.

For as long as I can remember, and while growing up in Dublin, I wanted to be a scientist.

I didn’t attend a particularly outstanding secondary school, and my career guidance counsellor called me ‘the mad scientist’ in deference to the fact that I was studying chemistry, physics and biology for my leaving certificate.

Apparently, that hadn’t been attempted previously at my school.

When it came to making my choice of university – and I was the first in my family to attend – I was driven by the end game, which was studying science.

I was wholly ignorant of the pros and cons of the various institutions that offered the degree programmes.
In fact, the key determinant when it came to making my choice of university was the proximity of the campus to my house, and my corresponding ability to walk home for my lunch.

In my eyes, saving on bus fare and meal expenses was more relevant than the quality of the degree.

In spite of myself, I succeeded in attaining a Bachelor of Science (with Honours) – and we could talk at length about the merit of honours – and later, a PhD.

I then succeeded in my career ambition to become a modestly successful researcher.

And now, by some strange quirk of fate, I stand here this morning before this Council of Science Deans as a vice chancellor.

Of the largest university in Adelaide, South Australia.
And as if moving my family to the opposite end of the globe
at the height of an Australian summer wasn’t sufficiently
daunting, the topic I’ve been asked to address today is ‘The
Future of Science in Australian Universities’.

I have to admit, in the interests of disclosure, that I
thoroughly dislike futurology.

Particularly as it relates to scientific research.

Invariably, you end up predicting the advent of the flying car.

Or the tele-porter.

Or the iPad.

No, wait. **Nobody** saw that coming.

Einstein is said to have once famously remarked that “if we
knew what it was we were doing, it wouldn’t be called
research, would it?”
Which raises a valid question.

Do we, as scientists and researchers, know what we are doing?

With that in mind, there’s an interesting policy backdrop to our meeting here today.

We, as a nation, have no Minister for Science.

It makes us one of only a handful of developed nations on the planet that doesn’t have one.

Perhaps we don’t need one?

Or perhaps science has lost its identity in Australia?

Indeed, given this as a starting point maybe we should have broadened today’s topic to simply ‘what is science?’
I found myself part of a very intriguing discussion in recent days that probed this very issue.

It raised, but failed to deliver a definitive judgement on, the question of whether science actually carries a singular identity.

It’s comparatively easy to argue the case that disciplines do.

But is science simply the umbrella concept beneath which all the various sub-component parts safely cluster and operate?

I subscribe to the belief that there is certainly a distinct entity that is scientific method – the importance of which I will address shortly.

But what exactly is science, and why is it that it should be identified and celebrated in its own right?

Perhaps that’s a topic for discussion if there’s sufficient available time at the conclusion of this session.
Because science, as evidenced by the absence of current Cabinet representation in Australia, no longer seems to stand alone.

It’s more often part of a four letter word - STEM.


I seem to recall that mathematics is a science.

And I admit I’m unsure of where science and technology diverge.

Engineering maybe? But that’s yet another discussion.

And what is the difference between an electronic engineer and a computer scientist, when then chips are down and the degree is in informational technology?
So science, for so long the domain of the boffin, is not as distinctly identifiable in the 21st Century as it may have been in the first half of the 20th Century.

Certainly, the need to lift the level of STEM skills among Australia’s school leavers has been identified – by the nation’s Chief Scientist and one of its pre-eminent employers’ groups among others – as an economic and social priority.

That’s easy to understand when you consider that, in 2002, Australia had 22 per cent of its graduating first degree students in STEM subjects, which compared to 64 per cent in Japan and 52 per cent in China.

A decade later, that proportion in Australia had dropped to just 18 per cent.

And a report released by the Australian Industry Group earlier this year found evidence that employers in this country simply cannot find the STEM skills they require.
Of course, this is not only an issue for Australia.

In the UK, the number of jobs vacancies that require degree-level qualifications in science and technology subjects is expected to exceed **100,000 per year**.

Which means, in order to meet its job market demands, Britain would have to **double** its current output of STEM graduates.

I know there are many Australian programs and initiatives that are tackling this issue, and making significant progress.

I can only speak from a UniSA perspective, and thereby highlight a couple of the approaches that we are employing to try and increase the level of engagement in STEM learning among secondary students.
For example, our UniSA College – which was established in 2011 – continues to record impressive results in creating pathways to tertiary education for students who might otherwise not had the opportunity to fulfil their science-based academic potential.

We have introduced our UniSA Connect program, which allows senior secondary students to directly engage with our academics and researchers, as well as have access to specialised equipment and facilities.

This, in turn, allows them to explore career options and pathways in areas such as chemistry, physics, mathematics and – as I will highlight a little later – engineering.

We are also working directly with around 10 secondary schools in Adelaide’s northern metropolitan area – an area of rapid growth but also significant socio-economic disadvantage – to provide further opportunities to students with capabilities and interest in STEM-related careers.
This is being achieved through our SMS@UniSA collaborative venture with schools, which is designed so that SACE Stage 2 chemistry, physics and specialist mathematics subjects are closely aligned with pathways to university.

This is just one of the initiatives that we’re undertaking that reflect our philosophy to work holistically with schools, and with a range of other vital community partners such as our Indigenous communities to try and raise the level of STEM engagement among Aboriginal and Torres Strait Islander students.

Indeed, the role that we are playing in actually teaching science at second level could very easily characterise the future of science in Australian universities.

Maybe I’ve just answered this morning’s question.

But is the recognition and pursuit of science in its own right a part of the solution?
I think it is fair to say that science has always encompassed a collection of disciplines.

Physical Sciences, Earth Sciences, Biological Sciences.

So what about Medical Sciences, Health Sciences, and Information Sciences?

My University - the University of South Australia – does not have a dedicated Science Faculty.

We do offer a Bachelor of Science degree, but it is drawn from a number of schools and across two of our structural divisions.

I’m not sure if this is a good or a bad thing.

My observation is that UniSA still produces highly skilled, job-ready scientists, albeit without a Science Faculty.
And under this structure, there are more and earlier specialisations in the degree offering.

Students are choosing to stream into discrete areas of what I would call ‘science’ perhaps sooner than they would if they were to progress through a more traditional science course, which affords specialisation in later years.

This does enable the institution scope and flexibility to directly market and target offerings that are differentiated and linked to existing and future skills needs in the employment market.

But it also means that choosing a broad ‘science’ degree has become the path less travelled by our students.

Classically, we’ve been educating scientists through an inverted funnel model – a broad range of subjects in the early years that funnel down to specialisation in later years.
Perhaps even to a narrower honors specialisation and, if truth be told, hopefully onto an HDR.

That’s what we, as universities, are set up to do.

But my experience has been that - particularly on the thin end of that funnel, at the HDR end – we run the risk of producing PhD students who are decoupled from the needs of industry.

Or from life outside of academic research.

And we must be honest – we are not, not ever, going to retain all of our science PhDs in the academy.

It seems the world outside is interdisciplinary.

As, increasingly, are our institutions.

This, in turn, will challenge the identity of the discipline.
And if science’s own identity is already a little confused, what does that challenge mean for the classical structure of the science faculty of the future?

This might be an opportune moment to take a slight turn for the tangential, if you’ll indulge me.

A brief sidetrack into the policy world, and the world of research.

And even in the absence of a Minister for Science, I believe there is relevance here for science.

Science, in addition to being aligned with TEM, is frequently coupled to T and I.

The I, of course, stands for innovation.

Policies, throughout the world, link science with innovation.
And the trend, in my view, is towards an increased expectation – perhaps a wholly unrealistic expectation – of a return on investment.

Often, researchers believe that ideas carry a monetary value – and, from my experience, many technology transfer negotiations are founded on the fraught premise of not letting ‘valuable’ ideas escape without securing suitable up-front payment.

However, it’s very difficult to put a meaningful valuation on an idea, and insufficient consideration is often given to the fact that commercialisation of intellectual property requires significant effort.

Which is where universities and industry need to meaningfully communicate and collaborate in order to innovate.

As I mentioned earlier, I genuinely dislike futurology – it ranks up there with homeopathy as far as I’m concerned.
Although I think I dislike pigeon-holing or sub-classification of research even more.

What I’m alluding to there, of course, is those wonderful research terms – basic and applied (which makes applied sound more important).

Or fundamental and applied (which makes basic sound more important).

Or near market, and so it goes on.

For me, there is simply research.

And there is development.

That’s a distinction I understand.

It’s a distinction that I think we, as a sector, would do well to better embrace.
For we, as universities, are intrinsically in the research business.

The creation and transfer of new knowledge.

Industry, by and large, is in the development business.

It’s at the interface between research and development where you get innovation.

Innovation that has the potential to drive economies forward.

Okay, you’re asking ‘so where’s the link to science here?’

Well, it goes back to the concept of preserving the purity of the discipline.

Of positioning science as separate from technology or innovation.
And I believe that has the potential to reinforce pigeon-holing, and therefore to **diminish** the perceived value of science.

My favourite wandering anecdote on this subject involves a mathematician.

But let’s, for the sake of today’s gathering, call him a scientist – because essentially he was.

Remember, maths **is** a science.

His name was William Rowan Hamilton.

A genius.

Andrews Professor of Astronomy in Trinity College Dublin.

Appointed as a Chair before he graduated.
Interesting personal life to boot, but that would be a tangent too far.

Hamilton was working on what my friends in DSTO would call ‘wicked hard problems’.

DSTO – Defence Science – perhaps we need to add that to our list as well?

Anyway, Hamilton went out for a walk one fine Monday in Dublin.

He was passing Broom Bridge - a railway bridge over the Royal Canal in the city’s northern suburbs - on his way to his observatory when he was struck by a flash of inspiration.

And in those pre-iPad, pre-smart phone days he had no option but to urgently write it down – he couldn’t afford to wait 150 years until he could email himself.

But he was not carrying a writing implement.
Even the ballpoint pen was still half a century down the track.

So he took out his pocketknife, and he calmly etched the solution to an equation that had suddenly resolved itself in his subconscious mind into the **stonework** of the bridge.

And it was there, on that site on October 16, 1843 – 170 years ago last Wednesday – that Hamilton solved the equation that underpinned quaternions.

A ‘wicked hard’ concept in mathematical sciences.

Today, his research output – ie, an etching on the edifice of a public structure - would be difficult to get through the ERA scrutineers.

And I have no doubt that his area of specialisation – mathematical theory – probably falls into the ‘not near market’ end of the aforementioned research continuum.
I guess the nice outcome to this conundrum is that Hamilton could always have written a really neat impact statement – had he been able to access a time machine.

Or a tele-porter.

Because if he had, he might also have learned that - 126 years after he scratched his way into scientific immortality - Buzz and Neil set foot on the moon.

Thanks to the application of quarternion mathematics.

He might also have seen - another three decades on from the lunar landing - Buzz and Woody walk across our movie screens.

At which point life ostensibly changed again.

Also thanks to quarternion mathematics.
The message contained here is fairly straightforward – it takes time for research to deliver revolution.

Policy – which, invariably, will drive behaviour – is all too often composed on the basis of a three-year cycle.

But we are playing a long-term, deep-pockets game.

I therefore don’t think it matters whether historical science faculty structures endure, or whether they evolve.

However, what I do think is vital is that science educators and scientific researchers fully appreciate the importance of the work they are undertaking.

And perhaps even more crucially, that they understand the value in communicating what they are doing along with the notion that good research has clear applications.

That’s because the time horizon for application is not always clear cut.
So my view is, let’s work on educating students in the **scientific method** rather than focusing on the manner in which science as a discipline is portrayed or perceived.

A mastery of scientific method – which I mentioned earlier is certainly an entity in its own right - has great application **beyond** the laboratory.

It helps you make life decisions.

To rationally and practically tackle problems.

Consequently, it’s in our collective **best interest** to ensure that teaching and research are as closely coupled as they can possibly be.

Because, as I’ve already discussed, we are going to address the close coupling of research and development.
This means we will have a continuum from development back through to education.

And that is certainly important.

We cannot take our eye off the danger that lurks in divorcing research from education, specifically through the potentially damaging by-product of silo creation.

But also in terms of creating an inspiration divide.

As the real world increasingly delivers challenges that research must rise to overcome, it is incumbent on researchers to effectively and readily communicate how these issues are being addressed through the creation and application of knowledge.

That applies to knowledge that has been learned in the classroom and which, in turn, was informed by the success of research that was conducted and communicated years before.
I figure I’m probably preaching to the choir on this point.

So I’ll conclude by making a few observations, not as a scientist but back in my role as a vice chancellor.

I do not think the structure, or indeed the hierarchical nature of university organisation should have a bearing on the quality of offering of education or the nature of the research conducted.

Universities exist primarily to generate knowledge, and then to transfer it for the community’s benefit.

We generate it through our research, and transfer it in myriad ways – to our graduates via our research-informed curricula, through publications and public discourse, through patents and through collaboration.
Whether the next generation of science leaders, or ‘mad scientists’ as my former career guidance counsellor might be want to say, learn their skills and seek their answers under the badge of a dedicated Science Faculty risks missing the point.

As publicly-funded institutions, universities must heed the messages and reflect the needs of the societies they are built to serve.

That does not mean slavishly bowing to every whim or taking on board the full excess of popular opinion.

Critical, independent thought is also a defining feature of any credible centre of higher learning.

But the research that we undertake, and the graduates that we educate must be informed by, and remain responsive to, the world around us.
Whether that outcome would be aided by the re-establishment of a dedicated Science Faculty at UniSA that offers a stand-alone Bachelor of Science, I’m happy to receive representations on.

However, what I do recognise as vital to the future of science as a discipline is the sort of initiative that took place at our Mawson Lakes campus earlier this month.

As part of our UniSA Connect program, that I spoke about a little earlier.

That was when a number of Year 10 students from schools throughout South Australia took part in our inaugural ‘Connect to Engineering’ week.

Students with an acumen for science who might not ordinarily consider employment in science-based fields.
Students from as far afield as Whyalla, in South Australia’s Iron Triangle region – the heart of the State’s heavily STEM-reliant mining industry.

Whether these students could isolate and interpret the ‘S’ in STEM subjects, or had studied in detail the full list of science-related degree programmes on offer was not up for discussion.

But what was undoubtedly uplifting and reassuring was the sight of a diminutive teenager, clad in oversized Iron Maiden T-shirt and Axl Rose-style bandana, working furiously to construct a wind turbine that was capable of pumping water, and was fashioned from a rudimentary collection of available materials.

When we consider, as the Australian Industry Group tells us, that the current number of Australian engineering graduates provide less than 40 per cent of the engineers employed each year in this country, then we need to employ any measures at our disposal to try and address that shortfall.
To get students interested and engaged in any element of the STEM equation.

And that, to my eyes at least, provides a telling snapshot of – if not the definitive answer to - the future of science at Australian universities.

Thank you

(ends)