How to take more great Australian science from 'bench to boardroom'

Professor Mark Hutchinson

National Press Club of Australia Speech

2 March 2022

Thank you, Julie.

Yuma!

I greet you in the language of the long story of this place.

For the Ngunnawal and Ngambri people have lived this country – and loved this country – through the vastness of time.

I begin today by honouring your skilled scientific stewardship.

And by paying my respects to your Elders and Ancestors.

For your leadership has kept the deep knowledge of this country strong to this day.

Thank you for having me in your home.

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Thank you to the other greats of Australian science who honour us with your presence here today.

- Australia's Chief Scientist Dr Cathy Foley.
- Nobel Laureate, ANU Vice-Chancellor and astrophysicist Professor Brian Schmidt.
- Former Australian Chief Scientist Professor Ian Chubb.
- The Chair of the medtech powerhouse MTPConnect – Dr Sue MacLeman.
- The brilliant scientific colleagues who serve with me on the Board of Science & Technology Australia.
- And the champions of science across the Parliament, and across the Australian public service.

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As we gather today, we've seen unfolding scenes of devastation, fear, heartbreak and the loss of lives.

I know the hearts of everyone in this room are with the people of northern NSW and Queensland as they face this threat.

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Journalists know the thrill of a huge scoop.

As you close in to confirm a big story, there's elation and adrenalin.

Perhaps also a mounting fear.

Despite getting so close, you might discover at the last minute that the story doesn't quite stack up.

So near and yet so far.

But if your story does check out, it could change the course of history.

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A career in science bears more than a passing resemblance to those high-stakes minutes.

So, too, the long apprenticeship to be ready in that moment.

As the adage goes: "It took me decades to become an overnight success".

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Perhaps what these two callings have most in common is a relentless pursuit of knowledge.

A drive to discover.

A need to work out how things *really* work.

And to share that knowledge with the world.

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In science, we get an extra dimension to that chase.

Sometimes we get to make discoveries that can save lives.

Or reinvent whole industries and transform our economy.

Or save a majestic world heritage site like the Great Barrier Reef.

Or avert devastating disasters for humanity.

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And that lure – the thrill of the pursuit?

It's why a career in science, despite all its challenges, is one of the most exciting, awe-inspiring, mind-blowing, world-changing callings anyone could ever choose to pursue.

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One of the great myths of STEM is that you have to be a genius.

In fact, at school, I was a terrible student. I had a form of reading difficulty that meant I couldn't follow one line to another. I skipped words. Everything seemed to move on the page.

And that was not very helpful given the career I chose - pharmacology.

Dealing with all those crazy long drug names, I still find it hard to get the new ones right the *first* few times.

So I probably wouldn't be the ideal public frontman to launch a new life-saving drug.

But maybe I am available if your ad starts: 'This man is a scientist, so we can't show you his face on television.'

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Despite that rocky early start with literacy, I found my passion and my talent in science.

And today I'm an entrepreneur, innovator and neuroscientist who has had a golden global career.

I now lead a team of 200 brilliant scientists who have created 16 startup companies - and counting.

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So I know, from first-hand experience, that if we can turn more of our great Australian science into startups in the years ahead, it will generate vast returns for our nation.

We can shape a new era of economic opportunity to create jobs for our kids and grandkids.

And we can make Australia one of the world's rising science and technology superpowers.

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Today I want to explain why we need a research commercialisation fund in Australia.

And why we need to train a much bigger community of what we at Science & Technology Australia call 'bench-to-boardroom scientists'.

They're going to be the 'connectors of commercialisation' who can really 'shift the dial' on our economic returns from research.

And if we make these strategic investments, the returns will be impressive.

Indeed, new analysis by Science & Technology Australia - which we release today - shows the scale of the returns we think are possible.

Last month, the Australian Government announced a $2.2 billion new investment in university research commercialisation.

$1.6 billion of that would create a new research commercialisation fund.

Its role will be to deliver kickstarter capital to spur more promising Australian science and research across the 'valley of death' in commercialisation.

It would propel more of our innovations to a point when the private capital markets get interested.

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At my own research centre, we had an initial Australian Government investment of $23 million.

We used it to leverage further investment from industry, State Governments and philanthropy.

And, over the past seven years, we've turned the initial $23 million investment into 16 startups with a combined market capitalisation and market value of $519 million.

That's nearly a 22.5 fold return on the initial investment which we've generated for Australia's economy.

And we're only just getting started.

Extrapolating from my own centre's investment and returns, even if we said conservatively that only half of the outlay in the new fund - $800 million - delivered a similar rate of return, that would generate an *$17.6 billion* return on investment.

This is the scale of the returns that Australia can expect to reap from investing more heavily in taking more of our great science from the lab bench to the boardroom.

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But to get there, we need to '*scale* up' and '*skill* up'.

Scale up our investments in Australian science - as a new research commercialisation fund will do.

And skill up a bigger community of home-grown 'bench-to-boardroom scientists'.

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There's a strong bipartisan understanding of this exciting opportunity.

In his speech right here last month, Prime Minister Scott Morrison noted Australia underperforms on commercialising research compared to our global economic rivals.

He urged: "We need to develop a new breed of research entrepreneurs here in Australia so they can create the new products and new companies and most importantly, the new jobs."

And in his speech at this podium last March, Opposition Deputy Leader Richard Marles said we "need to be much better at turning science into jobs".

He noted: "It's critical that Australia dramatically improves our capacity to commercialise our public research and make our economy more complex".

That strong cross-party understanding of the possibilities *for* Australia from stronger research commercialisation is crucial.

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The legislation to create this new research commercialisation fund has entered the Parliament.

So it's perhaps timely for me to explain why Science & Technology Australia has consistently championed such a concept over many years.

Despite our small population, Australia is a star performer in global science and research.

That is a *powerful* asset for the nation.

As our Chief Scientist Dr Cathy Foley often observes: "Research and science are our superpowers".

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But while we're *great* at making breakthroughs, we're *less* great at converting them into fully commercialised products and technologies.

Too often, Australia has been first to a breakthrough - only to not be able to commercialise it.

In part, that's due to the size of our venture capital markets, and the small share of global companies headquartered here.

It also has a bit to do with our economy being so strongly made up of small businesses.

Understandably, many small business owners are just flat out finding and training staff, paying the bills and keeping the lights on – and they have limited time and cash to do R&D.

But, as a result of all these factors, and an even bigger one that I'll get to next, we're missing out on huge potential job creation and income generation opportunities for Australia.

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Too often, Australian researchers have made a world-first discovery that could turn into a job-creating success story – only to hit a wall of disinterest from potential financiers.

They just can't get the finance to take it to 'proof-of-concept' and 'proof-of-market' stages.

And so countless promising Australian breakthroughs have been left to languish in the lab, or our IP has been snapped up abroad by researchers and investors in other countries.

And the jobs that come from commercialising research? You guessed it – they go overseas too.

Right now, Australia is missing out on reaping the rewards more fully from our great research.

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So how do we fix that?

Having a new research commercialisation fund will be a game-changer for Australia.

It can bridge the investment gap before the private venture capital markets are willing to step in.

And it can help to turn more great Australian science and technology into new jobs and companies.

I know it can spur more large-scale new Australian startup companies like Tritium, Atlassian and Canva.

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If we don't reap the full rewards from our great research, the risk is that other nations will swoop.

One of the biggest causes of that 'research raiding' in the past has been a lack of a dedicated investment vehicle here in Australia to propel more great science and technology safely through the 'valley of death' in commercialisation.

Which is why we've consistently urged Australia to create such an investment vehicle.

Indeed, it's been STA's top policy proposal in every pre-Budget submission and our conversations in Canberra for the past few years.

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To get more successful at research commercialisation, Australia needs to go beyond what we call 'bench-to-bookshelf' science.

We need to take the next steps after doing great research at the lab bench and publishing it in top global journals.

To do that, we need to train a much bigger community of 'bench-to-boardroom' scientists.

Scientists who can take exciting lab bench discoveries into startups, industry partnerships and to venture capital investors.

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For Australia to 'level up' on research commercialisation, we don't need *every* researcher to become a commercialisation expert.

But we *do* need to build a much bigger community of scientists with skills like this.

That's where we come in.

At Science & Technology Australia, we want to take the proven success of our acclaimed Superstars of STEM program - and apply a similar approach to help supercharge research commercialisation.

In coming years, we want to identify hundreds of scientists and researchers Australia-wide with the aptitude and passion to become commercialisation stars.

And we want to train them for specialist roles to propel the translation of promising discoveries into technologies and become linchpins liaising between industry and university research.

We want to create the first *generation* of 'bench-to-boardroom' scientists.

We have a vision, and a proven model of success - all we now need is the startup capital!

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With financial backing, we know we can equip a diverse and talented cohort of experts with specialist commercialisation skills.

And we can *give* them skills and support to create new businesses based on brilliant science.

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How do I know this can be done?

Because we've already proven the model by training *individual* stars of commercialisation.

STA is a unique organisation with unparalleled reach across Australia's STEM sector.

We have a membership that is incredibly broad and diverse.

We represent people in the publicly-funded research sector - *and* in the private sector.

And - this next bit is key - we also represent the people who connect those two worlds.

So in the STEM sector, whether you've just started your first day of a science degree at uni,

or you're doing a PhD;

whether you are an early or mid-career researcher,

or a technology transfer expert;

or whether you're one of our eminent Nobel Laureates,

STA is your voice,

and your community.

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We pride ourselves on having the very best attributes of a startup culture.

Our small team is fast and nimble. It's a community of driven, big-picture thinkers, who make things happen with modest resources.

And the research commercialisation expertise we can tap through this network is profound.

People like our Policy Chair Professor Sharath Sriram, who is here with us today - a quintessential connector of commercialisation.

Sharath forges great relationships with industry partners.

Then he works to deeply understand the business challenges they're trying to crack.

And he matches their needs with the clever science, engineering and nanotechnology teams that he jointly leads at RMIT University.

These teams have designed revolutionary smart sensor mattresses for use in aged care.

And wearable devices to monitor your health, to cite just two of their recent successes.

And - in the past few years - they've generated $6 million in industry investment.

That has fast-tracked the development of technology and products for Australian industry partners.

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Then there's the story of the centre I lead.

And how our extraordinary team of scientists forged its stellar record of commercialisation success.

My day job is as Director of the Centre for Nanoscale BioPhotonics, an ARC Centre of Excellence, based at the University of Adelaide.

And what exactly *is* nanoscale biophotonics? I'm so glad you asked.

We use light to measure and understand what is happening in cells in the body.

And our team of engineers, physicists, chemists and biologists are building next generation technologies to track how our cells behave as health turns into disease.

And we're creating tiny devices - probes and cameras smaller than a human hair - to help us to see what's happening inside cells at that tiny scale.

The potential applications of our research and new technologies are mind-blowing.

Our teams revolutionised brain surgery techniques, and the management of burns.

And we are unlocking new ways to measure and treat pain - the number one reason why Australians visit the doctor.

We're working with Defence to make our troops safer in warzones and at home.

And we're working with pastoral companies to improve livestock health and wellbeing.

Finally, we're making world-first technology to give Australian beef and sheep farmers new tools to command higher prices for Aussie meat exports in global markets.

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Our centre began - as is often the way - because a small group of clever and determined scientists wanted to eclipse the boundaries of what was believed possible in science at the time.

As I set out on my own research career, I knew I wanted to span three very separate worlds.

Neuroscience - understand how our brains work.

Immunology - understanding how our body's immune responses work.

And pharmacology - the drugs we use to treat illness and disease.

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I wanted to work on new breakthroughs to treat pain, addiction and depression.

But first I had to bust some silos to be allowed to do my PhD across these disciplines - which sat in very different faculties in our university.

Eventually, I prevailed.

And so my PhD examined the way opioids work in the human body.

With a PhD under my belt, it was time to go abroad.

With my brilliant partner Assoc/Prof Amanda Hutchinson - a rising star in clinical psychology who's watching this broadcast from home in SA today - we started our research careers at the University of Colorado.

And when I arrived back in Australia in 2008, after four years doing post-doctoral work in the United States, I wanted to focus on the role of brain function in immunity.

But I was five years too early.

The orthodox view at the time was that there was no such thing as immunity in the brain.

To do the work I wanted to do, I needed to look at the immune cells working in situ, in the brain and spinal column.

But that would require super-sensitive, super-specific instruments that didn't yet exist.

Eventually I heard about the leading work being done by the great physicist Tanya Monro.

I cold-called Tanya - and then we met.

It was a meeting of minds - and big ideas.

Tanya wanted to put together a bid for a new Centre of Excellence.

It would work at the intersection of physics and biology.

These are two very different cultures.

It would develop powerful new tools to view, monitor and image the workings of the body.

Including the brain and spinal cord.

Right down to the cellular level.

Here was the potential to understand the molecular origins of health and disease.

With huge implications.

We won the bid and Tanya became Director.

But then she was swiftly appointed Deputy Vice Chancellor at the University of South Australia.

And that's how I wound up as Director of a national research centre leading 200 scientists, at age 36.

We had a mission to bring together some of Australia's top minds.

Across widely diverse spheres.

To eclipse the frontiers of the possible.

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From day one, we didn't just set out to have great papers.

We also set our sights on commercial success.

And we set out to solve the big problems that we knew Australian industry needed to solve.

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We set out to develop new technologies with Tesla level innovation.

But with a Datsun 500 price tag.

Our goal in 2014 was to have 20 successes in 20 commercial ventures by 2020.

That seemed laughably ambitious at the time.

Yet by 2020, we'd had 76 pieces of our work translated into industry use from the centre.

And today? We have 16 start-ups and have created more than 70 new jobs across Australia.

We've equipped our scientists with the skills and support they need to found their own startups.

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We've built a cancer probe and flipped it for use as a meat quality probe.

We created clip-on microscopes for mobile phones that can automatically grade wool microns.

We're helped Australian farmers produce the cleanest, greenest, most ethically-treated meat products.

And give Australia the world's most marketable premium brand of meat.

And so we've taken our technology from 'bench-to-brains' to save lives in brain surgery.

And from 'bench-to-butchers' – enabling lamb to be graded for eating quality for the first time.

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Ultimately this work is also advancing our understanding of how to treat human pain.

We're working on a blood test for chronic pain that will one day be part of every doctor's toolkit.

And we're working on clever ways to create next-generation painkillers.

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The path to research commercialisation is seldom a linear one.

But we map it on a technology readiness scale from 1 to 9.

At the very start of the scale, we're doing what we call 'discovery' or 'pure' research.

This is where researchers set out to understand something deeply with no immediate direct use or application in mind.

No future commercial venture in sight.

Testing out experimental or theoretical ideas.

Or looking at the properties of something to try to make new discoveries.

Perhaps you're trying to answer an abstract question.

Like … how do aerosolised particles behave?

But then a pandemic like COVID-19 comes along.

And the science quickly confirms COVID is airborne.

And - what do you know?

Suddenly discovery research isn't so abstract anymore!

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Let me give you another powerful example.

The story of Katalin Karikó and the origins of messenger RNA technology.

mRNA is, of course, the groundbreaking new technology behind several of the COVID-19 vaccines.

And it's the technology that Moderna is about to bring to Australia.

They plan to build the first manufacturing facility of mRNA vaccines in the southern hemisphere - based in Victoria.

This development will powerfully transform Australian sovereign capability and create new local jobs.

And there is vast excitement in the science world that this technology could eventually be used elsewhere.

To make game changing new vaccines and treatments for other killer diseases like cancer.

But mRNA technology has its origins – as do all great science success stories – in discovery research.

Karikó's story is one of persistence amid countless grant rejections, career demotions and doubts.

Karikó worked with her longtime collaborator at the University of Pennsylvania Drew Weissman.

After a decade of trial and error, they finally found a way to conquer the challenge of how to modify synthetic RNA to get it safely into our bodies.

From 2005, a series of papers in peer-reviewed journals brought this potential capability to the world.

Scientist-entrepreneurs in both the US and Germany got interested.

And over the next 15 years, two major companies - Bio-N-Tech in Germany and Moderna in the US - set about building mRNA capability for use in new vaccines.

In 2020, the global COVID-19 pandemic hit.

Australia's Professor Eddie Holmes was working with colleagues at Fudan University in Shanghai, sequenced the entire genome of the COVID-19 virus for the first time.

And he shared it freely with the world.

By posting it on Twitter.

Such a 2020 story, right?

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This enabled vaccine teams the world over to take the sequenced genome information.

And use it to tailor many vaccine technologies to swiftly make and trial new vaccines for COVID-19.

And so a powerful global success story based in discovery science was born.

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Now, for those who love the fine print in a policy document – it's okay, you're among friends here – you'll have noted the most important word in the university research commercialisation action plan.

Down the bottom of page six.

"The action plan will see $2.276 billion of *new* Australian Government funding over 11 years."

Why is *new* investment important?

Because, crucially, our ambitions for Australia to 'level up' our research commercialisation performance can't be achieved by raiding our investments in 'discovery' research.

We *must* always safeguard our investments in this type of fundamental research.

And we need to pursue research that is chosen by the very top experts in Australia in each field.

Because discovery research is where the biggest seismic breakthroughs in history have come from.

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We must never diminish either our investments or our resolute focus on discovery research.

Even as we scale up investment in applying and commercialising more of our great work.

For without discoveries, we have nothing to apply, translate or commercialise.

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This week, we're in the thick of Science Meets Parliament.

The flagship event of Science & Technology Australia.

It's now in its 22nd year.

Internationally, it's the single deepest vehicle for engagement between the worlds of science and technology - and policy.

And I'm delighted that Emeritus Professor Ken Baldwin – who created the first of these events in 1999 – is here with us at this special event today.

This year, 587 scientists, technologists, engineers and mathematicians are deepening their knowledge of policymaking and the Parliament.

It will be our *biggest* and most successful Science Meets Parliament ever.

And next week, we'll virtually crowd the corridors of power in Canberra.

And we'll hold meetings for scientists to brief decision-makers on exciting advances in Australian science.

The strong interest from MPs and Senators tells us they value science more than ever.

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Thinking back over the past two years, I think it's fair to say that science is having a moment.

Can you imagine how the world would have fared, if we'd had to navigate this set of complex challenges without science?

No tests.

No vaccines.

No life-saving treatments.

And no science-informed medical care.

Let's speak plainly.

Science has saved us.

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The pandemic has driven an even deeper appreciation for why we in Australia must always ensure we have a strong and wide-ranging strategic sovereign capability in science.

And it throws into stark relief why we *must* invest more deeply in it.

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Because if you think *this* pandemic has thrown everything but the kitchen sink at us, brace yourselves.

Because there are *other* hugely formidable threats to our health and safety on the near horizon.

In coming years, our ability to use antibiotics to fight off life-threatening infections will hit a wall.

That will make even *minor* infections risky - and complex surgeries and chemotherapy even riskier.

A next pandemic is also a real prospect.

As our cities crowd closer to animal habitats.

And in an era when the movement of people around the globe helps new viruses to spread swiftly.

Then there's the starkest of looming challenges.

The grave safety risks driven by climate change.

More floods, bushfires, cyclones, storms and droughts. On a scale we've never witnessed before.

And our hearts are with the people of Queensland and northern NSW as they race to save lives and livelihoods in the face of the devastating floods we've witnessed over the past week.

Science will be our *lifeline* as we face all of these threats.

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If we can nail this opportunity to turn more great Australian science into startups, we can shape a new era of opportunity for Australia.

A new chapter of scientific and technological progress the likes of which we can barely imagine.

One that will secure Australia's prosperity.

And create exciting opportunities for our children, our communities and our economy.

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So we should fund science like our lives and our economy depend on it.

Because they do.

Thank you.

[ENDS]