



# Science & Technology AUSTRALIA

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## 2022–23 Pre-Budget Submission

21 January 2022

## EXECUTIVE SUMMARY

In the past two years, **science has shielded Australia's economy.**

Without the nation's expert science workforce and world-class science capabilities, the loss of lives, livelihoods and economic activity would have been stratospheric.

As we enter the pandemic's third year, Australia continues to need the deep expertise of scientists to navigate the complexities of this historic challenge – and so many others.

Without science, the powerful tools we have deployed to fight this threat – vaccines, treatments, masks, diagnostic testing, respirators, medical equipment and vast epidemiological expertise – would simply not exist.

And without scientists, the modern world would not have mRNA vaccines: a game-changing technology that has not only saved millions of lives amid COVID-19, but could open the door to a host of potential new vaccines against cancers. This technology also holds the potential for vast job creation in Australia.

In the next few years, we should anticipate new complex threats and challenges.

Dramatic changes in the climate will start to threaten the viability of crops, water sources and Australia's iconic farming sector. More frequent and intense bushfires, droughts and cyclones will threaten lives, homes and the economy.

Another vast risk looms large with the threat of antimicrobial resistance. When we can no longer use antibiotics to fight infections, the risks of severe infection and deaths will be immense.

**The lessons of the past few years are clear.**

**We must invest deeply in science and scientists. Their success is crucial to our safety.**

**And we should fund science like our lives and our economy depend on it – because they do.**

In its 2022–23 Pre-Budget submission, Science & Technology Australia makes the case for Australia to **heed the lessons of the pandemic and 'double down' on our investments in science to see off major threats and seize new economic opportunities for Australia.**

**Now is the time to safeguard the future of our science talent, institutions, and infrastructure. And now is the time to secure the next-generation science capabilities we need to face the next set of complex challenges that will confront our country.**

The first stride towards that goal would be a \$2.4 billion Research Translation Fund to secure Australia's science future and generate strong returns on investment.

Recent CSIRO research shows every \$1 invested in research and development generates \$3.50 of returns to the economy. It models a 10% annual return on outlays.

**The deeper investments we propose in science and technology in this Budget would be made with a clear-eyed expectation of strong returns on investment.**

Science & Technology Australia urges the Australian Government to craft the 2022–23 Budget with a deep investment in science as its centrepiece. This would be a powerful legacy for this Government and the nation.

**Guided by principles of strong fiscal responsibility, these Budget proposals have been designed to deliver strong returns both to tax revenue and the economy.**

Science & Technology Australia is the peak body for the nation’s science and technology sectors, representing 94 organisations and more than 90,000 scientists and technologists. We connect science and technology with Governments, business and the community to advance science’s role to solve some of humanity’s greatest challenges.

We commend these proposals to you for the March 2022 Budget.

Professor Mark Hutchinson  
President, Science & Technology Australia

Misha Schubert  
CEO, Science & Technology Australia

## SUMMARY OF RECOMMENDATIONS

Science & Technology Australia proposes the next Budget include initiatives to:

1. Boost direct R&D investment to shift Australia closer towards the investment levels of the top ten OECD countries.
2. As a first major stride towards that goal, create a new \$2.4 billion Research Translation Fund to turn more Australian science into rapid applications and generate strong returns on investment.
3. Safeguard the next wave of Australian science and research breakthroughs – the next set of discoveries after mRNA vaccines – by lifting the ARC and NHMRC annual research grants budgets to \$1 billion for each agency.
4. Secure the future of Australia’s science and research infrastructure with long-term funding certainty for the National Collaborative Research Infrastructure Strategy.
5. Deepen investment in climate science research and low-emission technologies to safeguard Australia against the hazards of climate change, including extending the Patent Box initiative to include clean energy technologies.
6. Avert the grave risk of a disastrous exodus of Australian science talent stuck in repeat cycles of short-term research contracts by:
  - shifting more research grants to longer-term cycles (5–7 years);
  - enabling grant recipients to employ researchers on longer-term contracts;
  - adopting fixed timelines for grant announcements; and
  - slashing red tape for both business and researchers by curbing duplication and redundancies in grant applications.
7. Invest \$3 million over 4 years in a Bench to Boardroom program delivered by Science & Technology Australia to deliver bespoke commercialisation training for scientists to take more science from the lab bench to the boardroom.
8. Harness the full diversity of Australia’s talent and nurture equity and inclusion across the STEM sector through secure support for:
  - a. the STA Superstars of STEM Program – \$2.3 million to tackle the under-representation of women in STEM by extending STA’s proven success with the game-changing Superstars of STEM program; and
  - b. an Indigenous STEM Network – \$4 million over four years to support First Nations STEM talent in an Indigenous-led, Indigenous-run STEM network.
9. Formalise a long-term commitment to forge invaluable connections between Parliamentarians, policymakers and Australia’s leading STEM professionals through a \$2.3 million endowment for Science meets Parliament.
10. Resource the promised review of the Job-Ready Graduates legislation and top up funding for STEM degrees if enrolments have fallen.

## INTRODUCTION

Over the past two years, science has played a crucial role to save Australia’s economy.

Without the nation’s science expertise and institutions, the loss of lives, livelihoods and economic activity would have been stratospheric.

In the face of the threat of the COVID-19 pandemic, record numbers of Australians seized the opportunity to be vaccinated against the virus.

The science that delivered those vaccines was the product of decades of science investment and infrastructure – in Australia and around the world.

Investments in people – highly-skilled scientists, lab technicians, support staff.

Investments in foundational work on vaccines, genetics, virology and immunology – the building blocks we assembled to design vaccines.

Investments in science infrastructure – the laboratories, advanced equipment and super computers that crunch vast datasets in an instant to speed breakthroughs.

And investments in the technologies that enable medical manufacturing and vaccine production.

All of these came together to produce billions of doses of life-saving vaccines.

It’s just one powerful example among many of how science, technology and science infrastructure safeguard Australia’s economy.

**As Australia looks to the next vast challenges on the horizon, and plans how to create new jobs and grow our economy, the lessons of this pandemic are clear.**

**We must ‘double down’ on our investments in science.**

**Not only will such investments shield our economy from major threats, they also hold the keys to new job creation, new income generation and new industries onshore.**

Now is the time to make the deeper investments that will secure Australia’s science capabilities to face the next major challenges – climate change, antibiotic resistance, and so many more.

The 2022 Budget should make those investments – in our science capabilities, our science talent and our science infrastructure.

## DOUBLING DOWN ON AUSTRALIA'S INVESTMENTS IN SCIENCE

### 1. BOOST R&D INVESTMENT TO CHASE LEADING OECD COUNTRIES

Currently, Australia's level of investment in research and development (R&D) is 1.79% of GDP. World leaders such as Israel invest 4.93% of GDP and the Republic of Korea 4.64%. The average invested by OECD countries is 2.48% of GDP<sup>1</sup>.

In the past decade, the Commonwealth Government's share of R&D investment has fallen. Universities have stepped up increasingly to fill the gap through international student fees to fund Australia's research capabilities. The Government should lift direct investment in R&D to boost our research success, and bring Australia into the top ten OECD countries for R&D investment.

This would see our R&D investment approach 3% of GDP – enabling Australia to secure strong economic returns from a stronger research sector.

Towards that goal, the first major strides should be:

- a new \$2.4 billion Research Translation Fund (see recommendation 2);
- deeper investment in research breakthroughs and discoveries (recommendation 3);
- securing the nation's science and research infrastructure (recommendation 4); and
- accelerating climate science research and the development of clean energy technologies (recommendation 5).

**Recommendation 1: Boost direct R&D investment to shift Australia closer towards the investment levels of the top ten OECD countries.**

### 2. CREATE A NEW RESEARCH TRANSLATION FUND

The COVID-19 pandemic has highlighted an urgent need to bolster Australia's sovereign capability and supply chains. Without the ability to source and manufacture onshore, we will be at the mercy of other countries. To keep pace with global competitors, we need to strengthen Australia's advanced manufacturing capability, underpinned by high quality Australian research and a scientifically and technologically literate workforce.

Establishing a new research translation fund would support this goal – enabling more of Australia's 'almost there' breakthroughs to be developed and manufactured here in Australia. This would create new industries, new jobs, and generate new markets as well as enable 'billion dollar unicorns' to boost Australia's economic recovery. All of these would drive our national strategy to bolster our sovereign capability in science, technology and manufacturing.

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<sup>1</sup><https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>

The Medical Research Future Fund (MRFF) is an excellent example of how this type of sound investment has accelerated local medical research translation, with huge benefits to the nation already being realised. The MRFF provides long-term funding stability, as well as the capacity to rapidly address national emergencies like the COVID-19 pandemic and health research needed amid the Black Summer 2019–20 bushfires. Investment of this sort across the entire science and technology sector would improve Australia’s sovereign capability and boost the nation’s economic recovery.

**Recommendation 2: Create a new \$2.4 billion Research Translation Fund to turn more Australian science into rapid applications and generate strong returns on investment.**

### **3. DEEPEN INVESTMENT IN BREAKTHROUGH DISCOVERY RESEARCH**

The public investment national research institutions receive from the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC) enables them to undertake both discovery and applied research. Long-term investment in the ARC and NHMRC is key. These are the agencies that support the curiosity-driven, fundamental research we need for major breakthroughs and new discoveries.

Investing in applied research is also important, and brings many shorter-term benefits, but research translation relies on a pipeline of breakthrough or discovery research to have something to commercialise. Science & Technology Australia strongly supports research–industry engagement, supported through specific and targeted funding streams – including a new research translation fund. However, it is also crucial that we do not diminish our investment in discovery research. This is especially critical in the ARC Discovery program which has a dedicated focus on blue-sky research.

Science & Technology Australia advocates for an investment boost to bring each agency’s annual grants budget to \$1 billion. This strategy is a sound investment as it will synergise with the MRFF and the new translation fund to foster a complete pipeline of research and development that will be repaid many times over in the years to come. A 2021 CSIRO report illustrates the benefits of R&D investment – even the most conservative estimates indicated that every \$1 invested in R&D resulted in \$3.50 of benefit across the economy, with a 10% annual average rate of return<sup>2</sup>. This is an extremely solid investment return that few others will rival, and none as urgently needed to safeguard our nation.

**Recommendation 3: Safeguard the next wave of Australian science and research breakthroughs – the next set of discoveries after mRNA vaccines – by lifting the ARC and NHMRC annual research grants budgets to \$1 billion for each agency.**

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<sup>2</sup><https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/futures-reports/quantifying-australias-returns-to-innovation>

#### 4. SECURE AUSTRALIA'S CRITICAL SCIENCE & RESEARCH INFRASTRUCTURE

Australia hosts a wide array of crucial science and research infrastructure. This includes mission-critical facilities funded through the centrepiece *National Collaborative Research Infrastructure Strategy* (NCRIS) and other major infrastructure facilities. This infrastructure underpins our national research capability, and is essential for the research breakthroughs that will make or break income-generating opportunities for Australia.

Long-term certainty is crucial. The forward Budget allocations must ensure NCRIS Investment Plans support the breadth of research infrastructure critical to our national research success. Maintenance and procurement for infrastructure facilities on this scale require long-term planning and budget security to ensure world-class capabilities can be sustained and keep Australia globally competitive. This planning extends to workforce capability – without long-term job security, Australia runs the risk of losing highly-trained and specialised personnel critical to running our national infrastructure facilities.

Security of investment is also key to secure industry co-investment. Industry partners and co-investors work on long-term investment cycles. They need assurance and security to make their own long-term investments in research infrastructure.

To address immediate pressures on research infrastructure, this Budget could bring forward some of the existing NCRIS investment allocations from the out years of the forward estimates into the coming Budget year. Many current NCRIS facilities have an urgent need for upgrades or maintenance, and disruptions to global supply chains have caused challenges. Certainty of investment is needed for facilities to plan and procure essential equipment and components in the current highly-constrained global market.

**Recommendation 4: Secure the future of Australia's science and research infrastructure with long-term funding certainty for the National Collaborative Research Infrastructure Strategy.**

#### 5. SPEED AND SMOOTH AUSTRALIA'S TRANSITION TO NET-ZERO EMISSIONS

The 2021 Intergovernmental Panel on Climate Change report outlined the stark and urgent challenges amid the accelerating pace of climate change. Even with strong action, global warming is set to continue until at least mid-century<sup>3</sup>. As with the pandemic, preparedness will be key to our ability to deal with this challenge, and our science and technology capability will be critical.

Australia will need to deepen our climate research capabilities to ensure national preparedness for more frequent and dangerous extreme weather and environmental hazards. We need to enhance our ability to predict and be resilient to escalating storms, heat waves, floods, bushfires – our unique biodiversity, our agricultural industries and the wellbeing of all Australians depends on it. To this end, we need to invest more deeply in

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<sup>3</sup>[https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC\\_AR6\\_WGI\\_SPM\\_final.pdf](https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf)



our climate scientists. We need to constantly improve our understanding of how climate has changed in the past, as well as our ability to model the future changes.

Science & Technology Australia urges the Australian Government to invest further in clean energy technologies to speed the transition to a net zero emissions economy and harness renewable energy resources at scale. The Australian Government's *The Plan to Deliver Net Zero: The Australian Way*<sup>4</sup>, hinges on the innovations our STEM sector will develop over the coming years. The Prime Minister directly acknowledged this in his address to COP 26: "It will be our scientists, our technologists, our engineers, our entrepreneurs, our industrialists and our financiers that will actually chart the path to net zero. And it is up to us as leaders of governments to back them in."<sup>5</sup>

This Budget is the time to comprehensively 'back them in'. Australia has been a world leader in developing low emissions technologies – including solar and batteries – for decades. However, we have yet to capitalise on opportunities to manufacture more of these technologies onshore. We need a concerted investment plan to support the development of these clean energy technologies.

One simple measure would be to extend the Patent Box scheme to include clean technologies. This would be a powerful driver of growth and enable Australia to capitalise on the ideas and innovation that comes from our research sector. Improving the incentives for clean energy technologies to be fully developed and manufactured in Australia and boosting investment in research commercialisation would support our manufacturing sector and the broader economy.

**Recommendation 5: Deepen investment in climate science research and clean energy technologies to safeguard Australia against the hazards of climate change, including extending the announced Patent Box initiative to include clean energy technologies.**

## INVESTING IN OUR PEOPLE

### 6. TACKLE JOB INSECURITY IN SCIENCE SO SCIENTISTS CAN DO THEIR BEST WORK

A deep capacity for STEM research and innovation depends on more than funding – it depends upon our people. To do great science, scientists need job security. Short-term funding contracts do not provide the solid and certain base researchers need to progress truly ground-breaking discoveries and turn those discoveries into benefit for the nation.

The Australian science workforce is at breaking point. Over the past year, we've seen more of our highly skilled researchers leaving STEM, or moving overseas for more secure jobs. A move to longer term program funding, enabling grant recipients to offer longer-term contracts to scientists and researchers, would create the conditions for science to thrive. It

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<sup>4</sup><https://www.industry.gov.au/sites/default/files/October%202021/document/the-plan-to-deliver-net-zero-the-australian-way.pdf>

<sup>5</sup> <https://www.pm.gov.au/media/address-national-statement-cop26>

would secure Australia’s research talent and provide incentives to attract the best talent from overseas.

Implementing set funding announcement dates and improving application turnaround times on grants would also help our researchers to plan their own careers and futures. This is especially crucial for early career post-doctoral researchers and PhD students – the future of Australian science. It would also deliver certainty and confidence to industry partners who do not operate on 12-month application to funding timescales. Industry needs certainty to plan for business continuity. This simple adjustment to process would complement other government initiatives to enhance industry engagement and research commercialisation.

**Recommendation 6: Avert the grave risk of a disastrous exodus of Australian science talent stuck in repeat cycles of short-term research contracts by:**

- **shifting more research grants to longer-term cycles (5–7 years);**
- **enabling grant recipients to employ researchers on longer-term contracts;**
- **adopting fixed timelines for grant announcements; and**
- **slashing red tape for both business and researchers by curbing duplication and redundancies in grant applications.**

## **7. SKILLING SCIENTISTS TO TAKE MORE SCIENCE FROM ‘BENCH TO BOARDROOM’**

To boost our capacity to turn more great Australian research into life-changing products and applications, and support the Government’s research commercialisation goals, we need to develop our researchers’ skills in research translation and commercialisation.

That said, not every researcher or scientist needs to become a commercialisation expert. We should focus on equipping up to 2000 leading researchers with the skills to champion research translation into technologies and products. This would require training just a small proportion of the research workforce, with the potential for vast social and economic impact. Importantly, this would create a critical mass of bench-to-boardroom scientists that would capitalise on investment in the MRFF and an accompanying new research translation fund.

Science & Technology Australia can play a pivotal role in training this skilled workforce. As the peak body for the nation’s science and technology sectors, we have a uniquely deep reach into the worlds of both research and industry. Our membership includes start-up incubators and scientists based in industry as well as researchers with a strong successful track record of commercialising. This positions us to play a powerful role to broker expertise, deliver commercialisation skills, transfer and draw on proven track records of strong commercialisation success from our own leadership, membership and networks.

We currently deliver highly-regarded bespoke skills training to the STEM sector in specialist fields including communications, media, policy, and government engagement. We can take what our most successful commercialisation expert members know and deploy it to create more bench-to-boardroom successes for the nation.

**Recommendation 7: Invest \$3 million over 4 years in a Bench to Boardroom program delivered by Science & Technology Australia to deliver bespoke commercialisation training for scientists to take more science from the lab bench to the boardroom.**

## **8. DRAWING ON AUSTRALIA'S FULL TALENT TO DELIVER THE VERY BEST SCIENCE**

A strong STEM talent pipeline that draws on Australia's full talent pool is key to scientific excellence. The best science and engineering happens when teams draw on a diverse range of ideas, perspectives and knowledge. Women currently make up just 28% of our total STEM workforce – we are clearly not harnessing the entirety of our potential talent pool.

Advancing equity and inclusion will not only nurture our existing STEM workforce, but help meet skills shortages and recruitment gaps, and grow the talent pipeline.

Science & Technology Australia's game-changing Superstars of STEM program tackles the challenge that 'you can't be what you can't see'. By promoting diverse women role models in STEM and turbo-charging their media and public profiles as experts, this game-changing program is addressing the lack of visible role models of women and girls in STEM. It showcases to girls (and everyone else) that women can be successful scientists – and encourages girls to consider a STEM career.

Through a government-supported pilot in 2017 followed by a four-year funding program, the program has supercharged the careers of 150 women in STEM. There is vast unmet demand for the program: in 2020, there were 360 applicants for the 60 places available.

The STA Superstars of STEM program contributes to progress against all action areas in the Government's *Advancing Women in STEM strategy*<sup>6</sup>:

- *Enabling STEM potential through education*: Superstar visits to schools inspire girls to pursue STEM careers;
- *Supporting women in STEM careers*: the program boosts the career progress of the Superstars; and
- *Making women in STEM visible*: more women speaking in the media and public to shift public perceptions about what a scientist looks like.

STA urges the Government to continue supporting this proven program with a secure funding commitment of \$2.3 million over 4 years. This is a shrewd investment that delivers returns many times over. The program has had extraordinary reach, with Superstars achieving more than 6100 media mentions, 237 school visits, and reaching 33,000 school children.

Program evaluations show:

- 96% of Superstars had vastly stronger communication skills;
- 91% of Superstars had much deeper confidence in themselves and their career;
- 61% of Superstars said the program opened doors to unexpected collaborations;
- 100% of employers recommend the program;

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<sup>6</sup><https://www.industry.gov.au/data-and-publications/advancing-women-in-stem-strategy>

- 94% of teachers said a visit from a Superstar of STEM influenced their students' choice of subjects; and
- 3 in 4 employers said their employee's career advanced thanks to the program.

In 2016, only 26% of media coverage of STEM in Australia featured women experts. By 2019, this had grown to 33%. Superstars of STEM is a powerful initiative making a difference to the diversity in the Australian media landscape.

**Recommendation 8A: Invest \$2.3 million over four years to tackle the under-representation of women in STEM through an extension of STA's proven success with the game-changing Superstars of STEM program.**

## **8B. DRAWING ON THE DEEP EXPERTISE OF INDIGENOUS SCIENCE**

There is deep STEM expertise in the Aboriginal and Torres Strait Islander knowledge systems of this continent. Australia hasn't yet drawn on this expertise deeply, particularly in our policy approaches and methodologies in fire, land, water, and ecology.

Despite this expertise, Aboriginal and Torres Strait Islander people remain seriously under-represented in formal STEM study and STEM professional careers. As a nation, we would benefit strongly from deepening Indigenous participation in STEM and drawing more deeply on Indigenous knowledge.

Over the past two years, Science & Technology Australia has worked closely with our Indigenous member societies – Deadly Science and the Aboriginal and Torres Strait Islander Mathematics Alliance (ATSIMA) – along with Kamilaroi water scientist Associate Professor Bradley Moggridge, and the Australian Academy of Science and the Academy of Technology and Engineering to support conversations to establish an Indigenous-led and Indigenous-run Aboriginal and Torres Strait Islander STEM professionals network. STA and the academies have provided some administrative support and funds to the network's interim leadership group. The network's ambitions are now at the stage where funding is required to properly resource this groundbreaking and timely initiative.

The network must be Indigenous-led and Indigenous-run. STA would be pleased to play a supporting administrative role to the network by auspicing funding and staff employment via a grant agreement with the Australian Government.

**Recommendation 8B: Invest \$4 million over four years to support Indigenous STEM talent in an Indigenous-led, Indigenous-run STEM professional network.**

## **9. LONG-TERM SUPPORT FOR SCIENCE CONNECTIONS TO PARLIAMENT**

Science meets Parliament is a world-leading Australian initiative that has run for more than two decades. This annual event is the biggest single vehicle for deep engagement between our science community and the nation's policymakers, bringing our best STEM talent to Parliamentarians to share the latest knowledge and expertise in science and technology. It is a crucial tool to help Australian decision-makers to draw on science expertise and shape policy and legislation informed by the best evidence.

This knowledge exchange is not just one way. Science meets Parliament also equips our STEM professionals with skills and a deeper understanding of policy that help them engage more effectively with the nation’s decision-makers.

Since its inception, the Australian Government has been a strong backer of this outstanding event, with the Department of Industry as foundation sponsor.

Science meets Parliament has delivered major benefits during the past two decades. It has led to enduring relationships between politicians and science and technology leaders; sparked valuable policy change to the benefit of STEM business; catalysed vital skills for a range of Australia’s STEM leadership; and helped to jump start funding and support for important fields of research.

An event this valuable should not depend on year-to-year grants and sponsorships. STA urges the Government to provide long-term support to Science meets Parliament in the form of sustained funding for the next decade.

**Recommendation 9:** Formalise a long-term commitment to forge invaluable connections between Parliamentarians, policymakers and Australia’s leading STEM professionals through a \$2.3 million endowment for Science meets Parliament.

## **10. SECURE THE NEXT GENERATION OF STEM TALENT**

The Jobs-Ready Graduates legislation, implemented in 2021, set out an ambition to encourage students to study in areas of national priority. However, the new model lowered the level of overall funding for each student undertaking a STEM degree. Science & Technology Australia remains concerned that this may set back the nation’s ability to nurture the next generation of STEM talent. Real-time data on the impact of the first year of the new funding model (2021) has not yet been published by the Government. It is imperative to ensure Commonwealth Government funding for STEM courses is sufficient to educate high quality STEM graduates who will go on to power our STEM sector. STA urges the Australian Government to resource the promised review, and make the data public swiftly to assess the impact on STEM disciplines. Top-up funding for STEM degrees should be considered as part of this review.

**Recommendation 10: Resource the promised review of the Job-Ready Graduates legislation and top up funding for STEM degrees if enrolments have fallen.**