



Science & Technology AUSTRALIA

2018-19 Pre-Budget Submission

15 December 2017

Science & Technology Australia's mission is to bring together scientists, governments, industry and the broader community to advance the role, reputation and impact of science and technology across the nation.

As the peak body representing Australia's scientists and those working in technology, Science & Technology Australia (STA) appreciates the opportunity to contribute to planning for Australia's future through the Federal Budget.

As the economy recovers from the end of the mining boom and the global financial crisis, it is time to prioritise strong and sustainable investment in Australian research, the people and infrastructure that makes it possible, and the mechanisms for translating it for the benefit of all Australians.

STA also believes in the importance of ensuring that all Australians are aware of, understand, and can access the benefits of cutting-edge science and technology. Programs such as Inspiring Australia underpin and facilitate key engagement and outreach initiatives, and we strongly support their continuance.

STA is advocating for the following budgetary measures:

- **Commit to increasing public investment in scientific research to 3% of GDP by 2030.**
- **Invest an extra 4% per year over the next 4 years in Australia's government science funding bodies and scientific research agencies, to maintain investment in line with inflation and regain investment lost due to budget repair measures. These bodies and agencies include, but are not limited to: ARC; NHMRC; CSIRO; AIMS; GA; and BoM.**
- **Strengthen the future of the STEM workforce through:**
 - **Maintaining public investment in Higher Education (including the withdrawal of the efficiency dividend proposed in the 2017 Higher Education Reform Package)**
 - **Encourage enrolment in STEM education by reintroducing the HECS-HELP Benefit for mathematics or science graduates**
 - **Increase the Higher Education Participation Partnerships Program by \$49 million to return the program to its 2013 peak level.**
- **Allocate appropriate investment for the projects outlined in the National Research Infrastructure Roadmap.**
- **Establish a research infrastructure investment fund of \$4 billion to direct investment through a panel of independent experts.**
- **Commit \$45 million over the next 4 years for science engagement to expand the National Science Engagement Strategy and continue to invest in effective programs that have shown a proven benefit to science engagement in the Australian community and in public policy.**

Yours Sincerely,

Kylie Walker
Chief Executive Officer
Science & Technology Australia

Professor Emma Johnston
President
Science & Technology Australia

Overview

Our world has been, and will increasingly be, shaped by science and technology. Developments in digital technologies, machine learning, open access data, new opportunities for collaboration, and novel approaches to research support are transforming the landscape of our sector. Given adequate and strategic support, they represent an enormous opportunity for Australia to shape a successful knowledge-based economy.

An investment in science and technology is an investment in our nation's future.

Science and technology must be seen as investments rather than expenditure. Internationally it has been shown that investment in science and technology in the US has yielded a \$2.21 return for every \$1 invested¹, while in Europe research has shown a huge 250% return on investment². Even more significantly in the UK, every pound spent by government in science and innovation yields a return of between 20 to 50 pence every year, in perpetuity³.

In Australia, past investment in visionary projects and productive agencies such as the Square Kilometre Array, the Australian Space Agency, CSIRO and many others, has produced thousands of jobs for Australians, and countless economic, health, and social benefits for our society. As our nation shifts to address challenges across a number of landscapes – political, ethical, national security, health and environmental – investing in science and technology in the 2018/19 Federal Budget will yield benefits for Australia in all of these areas for many years to come.

For example, the 2016 Defence White Paper⁴ reflects on how the investment in science and technology initiatives should be considered as a key aspect in all governmental department funding.

The international environment is also shifting, and with the right support and strategic oversight, Australia can and should become an international leader in science and technology.

It is no secret that Australia's research citation rate is much higher than our population or resources might suggest we are capable of achieving⁵. However, without strategic and stable support from Government we cannot assume this will always be the case. Investment in science, technology, engineering and mathematics (STEM) in Australia must be secured into the future to support

¹ [Science economics: What science is really worth](#), Colin Macilwain, Nature, 2010

² [The Impact of Science: how research can be measured and spending maximized](#), Iris Kisjes, Elsevier, 2013

³ [Rates of return to investment in science and innovation](#), UK Department for Business, Innovation and Skills, 2014

⁴ [2016 Defence White Paper](#), Department of Defence 2016

⁵ [Benchmarking Australian Science Performance](#), Australia's Chief Scientist, 2013

Australian researchers to keep achieving these results, and to leverage the huge potential this research represents.

Through the National Innovation and Science Agenda (NISA) and the National Collaborative Research Infrastructure Scheme (NCRIS) the Federal Government has recognised the importance of the STEM sector to Australia's future. These projects have provided investment specifically aimed at ensuring that research and industry work together to foster innovation and that the Australian public understands and values scientific endeavour. It is vital these projects continue to receive sustained, long-term support.

Science & Technology Australia (STA), the peak body for the STEM sector, represents about 70,000 scientists and technologists across the country. As evidenced by our own programs and activities, STA is deeply committed to a collaborative approach to fostering better connection and cooperation between the creation of new knowledge and its application. Australian students have already shown remarkable capability in this area according to an OECD report on collaborative problem solving skills⁶. Targeted investment in STEM education would provide a significant increase in science and technology capacity and outcomes, now and well in to the future.

Beyond equipping Australians with STEM skills and supporting world-class research, we must also continue to reach out to and embrace partnerships with industry and the Australian public. The benefits of STEM are enhanced significantly when we push innovative ideas and cutting-edge technology beyond the labs and research institutes and into our businesses and homes.

Through NISA, the Federal Government recognises the importance of cross-sectoral and public science engagement, and has achieved much already. STA strongly encourages the Government to extend and expand on this initiative to continue to build on its success, as well as provide incentive for the private sector to participate by implementing the recommendations made from the 2016 Research & Development Tax Incentive Review⁷.

Science & Technology Australia recommends a three-fold approach to ensure Australia remains at the forefront of science and technology research globally. STA recommends that the Government focus on the following areas in the 2018 Budget, as these focus areas are essential to Australia fostering a thriving science and technology sector to underpin a growing Australian economy:

- Investment in research and researchers
- Investment in research infrastructure
- Investment in science engagement

⁶ [PISA 2015 Results](#), OECD 2015

⁷ [Research and Development Tax Incentive Review](#), Innovation Australia 2016

Investment in research and researchers

In 2015 a report from the OECD⁸ on the state of industry investment in Australia presented a dismal view of private research investment. Since the release of those figures the Federal Government has enacted several initiatives to address this concern and follow up research has found that business investment in research is now beginning to improve.

Industry investment was, however, not the only area of research investment that should have raised concern. A lack of public investment in research is also a reality for the science and technology sector. Lack of investment has real implications for those working in science and technology in Australia with many mid-career researchers opting to pursue more stable career options overseas, resulting in a 'brain drain'⁹.

According to the Bureau of Statistics, Australia spends 1.88% of its GDP on research¹⁰, which is well below the OECD average of 2.35%¹¹.

Australia would greatly benefit from a strong government commitment to current and future research and innovation in Australia by increasing public investment in scientific research to 3% of GDP by 2030. This investment would provide a competitive edge for the nation's STEM sector for decades to come.

Recommendation: commit to increasing public investment in scientific research to 3% of GDP by 2030.

While there has been an understandable and necessary focus on encouraging the private sector to invest in research, there remains a strong argument for supporting blue-sky and basic research. Innovation is much like education; the basics of an idea must be understood before the application of that idea in the real world can occur. Just as basic arithmetic leads to algebra and the field of statistics, so too do 19th century geometry and the theory of relativity lead to real-world applications like technology to enable ridesharing and Uber¹². This is particularly relevant in the development of biomedical technologies where blue-sky research has been key to almost all innovation breakthroughs¹³.

We may not start out knowing where curiosity-driven research will take us, but we do know it leads to the innovations and advances of the future and is essential in any mature and sophisticated long term national plan for research and development.

⁸ [OECD Science, Technology and R&D Statistics](#), OECD iLibrary, 2016

⁹ [Three graphs that map Australia's 'brain drain'](#), Harrison Polites, The Australian 2014

¹⁰ [Gross Expenditure on R&D](#), Australian Bureau of Statistics 2017

¹¹ [Gross domestic spending on R&D](#), OECD Data, 2017

¹² [Tracing the links between basic research and real-world applications](#), B. Jones and M. Ahmadpoor, 2017

¹³ [Basic Blue Skies Research in the UK: Are we losing out?](#), Journal of Biomedical Discovery and Collaboration 2008

Australia's major scientific research agency, as well as key funding bodies such as the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC), did not have their funding increased to match inflation in the 2016-17 budget – which equates real-terms cuts in support for scientific endeavour.

It is STA's strong recommendation that Australia's government science funding bodies and scientific research agencies such as the CSIRO, AIMS, ARC and the NHMRC receive a top-up of 4% per year for the next 4 years. Given the benefits to the Australian economy, and the need to increase investment to match inflation, this relatively small investment would put these agencies back on track; will yield further opportunities to establish new industries; and will provide the nation with the capacity solve difficult and pressing problems using innovative solutions.

Recommendation: Invest an extra 4% per year over the next 4 years in Australia's government science funding bodies and scientific research agencies, to maintain investment in line with inflation and regain investment lost due to budget repair measures. These bodies and agencies include, but are not limited to: ARC; NHMRC; CSIRO; AIMS; GA; and BoM.

The Federal Government should also consider the importance of an agile and skilled future STEM workforce to compliment the direct investment in science and technology in Australia. According to the National Science Statement¹⁴ the Australian workforce will encounter a shortage of STEM skills moving forward. Without coordinated and consistent investment into STEM education across all levels of education Australia will fail to capitalise on the opportunities presented by the changing domestic and global economies.

While the National Innovation and Science Agenda focuses on the importance of STEM skills in primary and secondary education, the focus on STEM in higher education can also be improved. Three areas must be addressed to secure a strong future STEM workforce: incentives to encourage people to pursue STEM education; a strong, public Higher Education Sector; and equitable access to STEM education for all Australians.

Recommendation: strengthen the future of the STEM workforce through:

- **Maintaining public investment in Higher Education (including the withdrawal of the efficiency dividend proposed in the 2017 Higher Education Reform Package)**
- **Encourage enrolment in STEM education by reintroducing the HECS-HELP Benefit for mathematics or science graduates**
- **Increase the Higher Education Participation Partnerships Program by \$49 million to return the program to its 2013 peak level.**

¹⁴ [National Science Statement](#), Department of Industry, Innovation and Science 2017

Investment in research infrastructure

Two aspects of research infrastructure are essential to science and technology in Australia: firstly, the national research infrastructure discussed in the National Research Infrastructure Roadmap¹⁵, and secondly, shorter-term infrastructure investment as highlighted by the Clarke review into research infrastructure¹⁶.

The 2016 National Research Infrastructure Roadmap was created in a thorough and consultative manner, and STA supports the Roadmap's comprehensive list of "nine areas that underpin research in which Australia can and needs to excel". Following the release of the Roadmap, there has been little action to advance the recommendations set out by Australia's Chief Scientist, Dr Alan Finkel. Australia cannot afford to fall behind in the research economy and risk missing out on leading the discovery of the next generation of great innovations. The 2018-19 Federal Budget presents an opportunity for the Government to allocate the investment required for piloting these infrastructure projects, setting a strong course for the Australian STEM sector.

Recommendation: Allocate appropriate investment for the projects outlined in the National Research Infrastructure Roadmap.

The closure of the Education Investment Fund (EIF) has created a gap in research infrastructure funding for projects that do not fall within the scope of the National Research Infrastructure Roadmap. As per the Clark review into research infrastructure, STA supports the establishment of an independent panel to direct research infrastructure investment through a national investment fund.

Projects that have been previously funded through the EIF, such as the Australian Nuclear Science and Technology Organisation which has so far provided benefits to aviation, health and environmental science. Future Industries Fabrication project, have wide ranging benefits to both research and to industry. Projects developing research infrastructure in regional Australia are not specifically catered for by the NCRIS as they were in the EIF. Neither the National Research Infrastructure Roadmap nor the NCRIS provides investment in an agile enough way to ensure that research infrastructure funding is adaptable to the changing needs of the research and innovation sector. It is here that a fund like that recommended by the Clark review will be effective.

Recommendation: establish a research infrastructure investment fund of \$4 billion to direct investment through a panel of independent experts.

¹⁵ [2016 National Research Infrastructure Roadmap](#), Department of Education and Training 2017

¹⁶ [Research Infrastructure Review](#), Department of Education and Training 2016

Investment in Science Engagement

Science engagement has been a welcome focus for successive Federal Governments since the launch of the Inspiring Australia program¹⁷ in 2010. Successful and growing initiatives such as the Prime Ministers' Prizes for Science, National Science Week, and Science meets Parliament, have all enhanced connection and understanding both within Australia's leadership and the Australian public, improved the application of science and technology in Australian society and decision-making, and encouraged young people to pursue STEM subjects in education.

With investment in this program set to end in 2018, STA calls for continued investment in Science for Australia's Future over the coming 4 years.

Along with this continued investment, STA also recommends an increase to \$45 million over the next 4 years to maintain and expand the high-quality projects the initiative has initiated and supported, ensuring Australia's science engagement thrives into the future.

Recommendation: Commit \$45 million over the next 4 years for science engagement to expand the National Science Engagement Strategy and continue to invest in effective programs that have shown a proven benefit to science engagement in the Australian community and in public policy.

¹⁷ <https://industry.gov.au/science/InspiringAustralia/Pages/default.aspx>