



Australian Academy of Science

2015-16 PRE-BUDGET SUBMISSION TO TREASURY
PRIORITIES FOR AUSTRALIAN SCIENCE

FROM THE AUSTRALIAN ACADEMY OF SCIENCE / 2015

AUSTRALIAN ACADEMY OF SCIENCE – 2015-16 PRE-BUDGET SUBMISSION TO TREASURY

EXECUTIVE SUMMARY

Scientific discovery and innovation underpin every aspect of Australian society and are fundamental to the health and prosperity of our nation. However, in recent years, a progressive reduction in Australian Government investment in Australian science relative to other budget priorities is threatening our ability to deliver further dividends in national prosperity and wellbeing through science and innovation.

Urgent action is required for Australia to remain a scientifically advanced nation at the forefront of the global knowledge economy. While the Government's Industry Innovation and Competitiveness Agenda and the Medical Research Future Fund are welcome initiatives, they are not sufficient to offset the damaging effect of recent cuts to funding, and the impact of these cuts on private investment in R&D.

This submission from the Australian Academy of Science calls on the Government to:

Recommendations

- | | Cost |
|---|-------------------------------|
| 1. Safeguard science funding at current levels until the Government has considered its response to the Chief Scientist's <i>Science, Technology, Engineering and Mathematics: Australia's Future</i> strategy | Cost neutral |
| 2. Allocate a fixed percentage of overall Australian Government investment in science to maintaining and operating vital research infrastructure. If a long-term commitment cannot be made in the 2015 Federal Budget given the research infrastructure reviews underway, then the existing allocation for NCRIS funding in 2015-16 of \$150 million should be protected in the Budget. | Cost neutral |
| 3. Implement the 2014-15 Federal Budget measure to make the ARC Future Fellowship program a continuing program. | Cost neutral |
| 4. Establish an international science engagement strategy, drawing together existing programs with an investment of approximately 0.3% of Australian Government expenditure on science, research and innovation. | \$25m per annum for 10 years. |

ABOUT THE AUSTRALIAN ACADEMY OF SCIENCE

The Australian Academy of Science was established by Royal Charter in 1954. It promotes scientific excellence, disseminates scientific knowledge, and provides independent scientific advice for the benefit of Australia and the world. The Academy is made up of more than 470 of Australia's leading scientists, each elected for his or her outstanding contribution to science.

PRIORITY AREA 1—HALTING THE DECLINE IN AUSTRALIAN GOVERNMENT SUPPORT FOR SCIENCE

ISSUE

To safeguard our future economic prosperity, it is essential that the Australian Government invests directly in innovation-led strategies that achieve productivity gains, and a workforce with the skills and ability to compete internationally in many areas of scientific research, industry and tertiary education.

The challenges facing Australia are significant and pose real threats to Australia's long-term economic and social welfare. Australia's best hope for creating a strong and competitive economy, addressing the significant social and environmental challenges that lie on the horizon, and improving our quality of life is through investing in science, innovation and education.

CURRENT SITUATION

Australian Government investment in science, research and innovation has suffered in recent years, with cuts of \$227 million in 2012-13¹ and an estimated \$386 million in 2014-15. This leaves Government investment in science at its lowest level in cash terms since 2010-11². Analysis from the Parliamentary Library has shown that the Australian Government's investment in science as a proportion of GDP is at its lowest level in 30 years³.

Programs that were designed to improve on the low levels of researcher–industry collaboration and create real wealth for the nation, such as the Innovation Investment Fund, Commercialisation Australia, and Enterprise Solutions, have been discontinued, and in their place are now less ambitious and greatly scaled back programs. The 2014 Cooperative Research Centres round was suspended, with no new applications being permitted to proceed. There have been multi-million dollar cuts to key science agencies such as CSIRO, the Defence Science and Technology Organisation (DSTO), and the Australian Research Council (ARC).

The Government has made a welcome commitment to establish the Medical Research Future Fund and will establish five new Industry Growth Centres as part of the Industry Innovation and Competitiveness Agenda. Both of these initiatives will help to support and advance science and innovation over the coming years and decades. However, in the short term, they are not of sufficient magnitude to offset the detrimental impact of the cuts to Australia's scientific institutions, workforce, facilities and industries; impacts which will take years to reverse even if funding is restored.

OUTCOME

The negative impact of these cuts in the science budget is already affecting the research sector and any further cuts will irreparably harm Australia's capacity to produce the science and research it needs to drive sustainable and responsible economic growth.

Cuts in public funding for science threaten the viability and competitiveness of private investment in R&D from Australian and international business. Given that the Australian Government's \$9.2 billion annual spend on science is matched approximately two to one by private investment in R&D (making it one of our leading economic sectors), it is imperative that appropriate supports and incentives remain in place, and that reductions in Government support do not tip the balance and begin actively discouraging industrial R&D.

In terms of overall government and industry support for science, research and development, Australia sits in 15th place in the OECD, and is below the OECD average⁴. For example, Japan’s public and private investment in science sits at 3.4% of GDP, while Korea is investing a world-leading 4.4%⁵. Singapore is set to triple R&D investment between 2010 and 2015⁶. Further afield Finland is now investing nearly 4% of its GDP in research⁷. However, the most recent figures show Australia is investing just 2.2% of GDP in R&D⁸, and the Chief Scientist has warned that this will probably fall below 2%⁹.

More importantly, Australia’s Federal Government investment in science has fallen as a percentage of GDP from a peak of almost 0.75% in the mid-1990s to a low of just 0.56% in 2014, and the total dollar investment has fallen almost 10% over the past three years (see Figure 1). If the downward trends in funding for Australian science continue during a time when comparable countries are significantly increasing science investment, it is inevitable that Australia will struggle to contribute to or compete in the global knowledge economy over the coming decades.

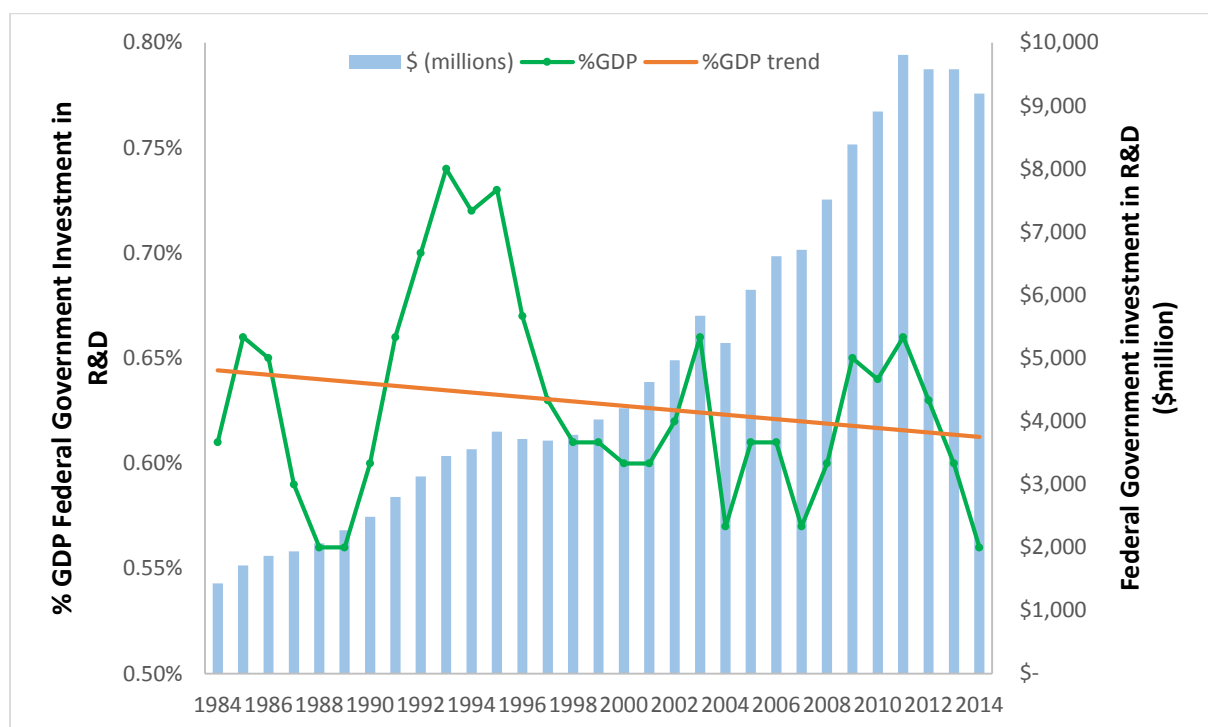


Figure 1: Changes in Federal Government investment in R&D actual dollars and as a percentage of GDP.

RECOMMENDATION

The Academy urges the Treasurer to ensure that there are no further reductions in science in the 2015 Federal Budget, and that further consideration of direct and indirect funding of science be undertaken in the context of the Government’s response to the Chief Scientist’s *Science, Technology, Engineering and Mathematics (STEM): Australia’s Future Strategy*.

PRIORITY AREA 2—RESEARCH INFRASTRUCTURE

ISSUE

For Australia’s scientists to undertake world-class research they need access to world-class research facilities and supporting infrastructure. The National Commission of Audit emphasised that quality research infrastructure is a critical component of the research and development system¹⁰. To reduce expensive infrastructure duplication, and to ensure Australia has the right research infrastructure assets available in the right places, the National Collaborative Research Infrastructure Strategy (NCRIS) has sensibly and successfully guided Australia’s major national research infrastructure investments. Unfortunately, the previous government allowed programs in this area to lapse and did not commit to the long-term infrastructure funding required; putting the future survival of major national research infrastructure in doubt.

It is not in the public interest, and it is not cost-effective, to invest considerable sums of public funds in significant and long-lived research infrastructure with no ongoing plan on how it is to be sustained and operated. Research infrastructure needs to be seen as more than just physical assets; it includes enabling infrastructure, data streams, information and communication technologies and skilled support¹¹. The construction of research infrastructure and its ongoing operation need to be seen as a core function of the research system, and guided by a national research infrastructure strategy. These activities need to be supported through the science budget.

CURRENT SITUATION

The major national research facilities funded through NCRIS have delivered exceptional and outstanding benefits to researchers, industry, businesses and governments. Successive reviews have demonstrated that NCRIS is an efficient, effective and appropriate model for developing important research infrastructure in Australia¹². NCRIS enables an estimated 30,000+ researchers to access world leading equipment and facilities¹³. It consists of 12 capabilities made up of 27 projects and facilities employing more than 1,500 highly skilled scientific and technical experts across 222 institutions¹⁴. However the effectiveness and future viability of these facilities has been severely undermined by the decision of the previous government to not provide an ongoing funding mechanism for their continued operation.

This lack of ongoing funding for these facilities through the NCRIS program has meant that every year since 2011 our national research infrastructure has effectively been on financial life-support, with no provision within the forward estimates to enable vital operational planning, or to invest in essential new major research facilities required to undertake world-leading science. This is despite these facilities having been established through past multi-million dollar government investments. The facilities have managed to stay operational on a year-to-year basis through one-off Budget appropriations, however this is an ineffective and disruptive way to fund and operate these facilities over the long-term.

In addition to the lack of ongoing funding provision for the building and operation of major national research infrastructure assets, there has been a major policy vacuum in this area, with the last national infrastructure strategy guiding the development of these critical assets being released in 2004. Policy in this area needs to be kept current so that the right investments can be made in research infrastructure in order to respond to changing requirements and priorities. The Academy welcomes the reviews that are currently underway and looks forward to the release of a new national research infrastructure plan.

OUTCOME

The ongoing de-funding threat and potential closure of research infrastructure facilities has been highly disruptive to the facilities, the research sector, and to industry. This has made it difficult to persuade researchers and industry to invest time and money in long-term research projects that make full use of these facilities. The ongoing threat of closure has also made it difficult for these major public facilities to attract and retain the outstanding staff needed for their daily operation.

RECOMMENDATION

The Academy recommends that the Government allocate a fixed percentage of overall Australian Government investment in science to maintaining and operating vital research infrastructure. If a long-term commitment cannot be made in the 2015 Federal Budget given the research infrastructure reviews currently underway, then the existing allocation for NCRIS funding in 2015-16 of \$150 million should be protected in the Budget.

PRIORITY AREA 3—AUSTRALIAN RESEARCH COUNCIL FUTURE FELLOWSHIPS

ISSUE

The Australian Research Council Future Fellowships scheme has revolutionised Australia’s ability to attract and retain the very best mid-career researchers. In many cases these researchers will go on to become the international scientific leaders who ensure that Australia contributes to and benefits from critical breakthroughs in knowledge and understanding across all fields of science. The Future Fellowships scheme remains one of the few sources of support for high-achieving mid-career researchers. An independent evaluation of the scheme has shown it is a tremendous success¹⁵, and The Minister for Education has noted:

“The ARC’s Future Fellowships scheme is coveted by researchers throughout Australia as it provides the funding boost that can change the course of a career, and enable them to make a crucial contribution to solving major problems.”¹⁶

CURRENT SITUATION

The 2014-15 Federal Budget included funding for the ARC Future Fellowships scheme across the forward estimates, however this remains in doubt pending a decision by Parliament on the Government’s higher education reforms. The uncertainty over funding is detrimentally impacting Australia’s research workforce; in particular those outstanding mid-career researchers who would be strong candidates for the scheme but who in some cases will be forced to look overseas or to other professions due to the lack of opportunities.

OUTCOME

Should the Government not follow through on its 2014-15 Budget commitment and make the Future Fellowships scheme an ongoing program, there would be a substantial reduction in investigator-led research and an increased brain drain as Australia becomes a far less desirable place to undertake research. There are no other programs that support mid-career research fellowships across the full range of disciplines.

RECOMMENDATION

The Academy calls on the Government to implement the 2014-15 Federal Budget measure to make the ARC Future Fellowships scheme a continuing program.

PRIORITY AREA 4—INTERNATIONAL SCIENCE COLLABORATION

ISSUE

Science is increasingly becoming an international endeavour, meaning that there is a growing requirement for Australian scientists to collaborate with other nations and international colleagues. International engagement and collaboration in science produces immense benefits that enhance Australia's science investment, with the need for continued collaboration set out by the Government and others on numerous occasions^{17 18 19 20 21 22}. International science collaboration enhances Australia's existing investment in science in at least four ways:

1. Gives critical mass to Australia's research effort
2. Ensures our researchers and innovators can contribute to, shape and access the best knowledge available around the world, and then apply it in the national interest
3. Leverage intellectual and scientific capital from the considerable, and much larger, investment in science and research that is occurring overseas, particularly in Asia
4. Supports Australia's diplomatic efforts and interests with other nations.

CURRENT SITUATION

Unlike most other developed nations, Australia no longer has an international science collaboration policy or funding stream. This has left Australian science stranded and unable to take advantage of the significant bilateral and multilateral investments in science being made by other nations in our region. The scientific centre of gravity is moving further towards Asia each year as China, Japan, Korea and India increase their substantial investments in science. China is now second only to the US in terms of number of scientific publications, and five of the top 15 scientific nations in terms of scientific output are in Asia²³. Japan has overtaken the United States to become the highest producer of triadic patent families.

Australian science is ranked 12th in terms of scientific output when measured by number of publications produced, and has a very high number of citations per article²⁴. The high quality of Australian science has enabled it to become a partner of choice in international science, giving Australia an opportunity to participate in and leverage intellectual scientific capital from some of the largest science investing nations. Prior to 2011, Australia had a funded international science strategy and was able to take advantage of collaboration opportunities and build partnerships with leading science nations and scientists. The previous government allowed this program to lapse, putting in place a couple of much smaller country specific-programs with China and India. While these programs are valuable, the lack of opportunity to collaborate and engage with our international partners at a national level leaves Australia at a strategic disadvantage.

OUTCOME

Other nations are investing heavily in science and many are willing and ready to collaborate with Australia. However, the lack of policy or funding to engage means that Australia has had to decline many valuable opportunities to benefit from collaboration strategies and funding streams. International scientific collaboration is a competitive undertaking, with the rest of the world actively pursuing policies to internationalise their research effort and to collaborate with those nations investing heavily in science. The United Kingdom recently announced a £375 million international science partnerships program, and the EU Horizon 2020 program is an €80 billion international research endeavour with collaborations being developed both within, and importantly beyond, the EU with partners willing to co-invest.

RECOMMENDATION

Australia must leverage its considerable intellectual talent so that it is able to take advantage of and participate more fully in international science collaboration. Investing in international science should be seen as a core activity. A very small fraction of Australia's \$9 billion annual investment in science needs to be dedicated to and focused on the internationalisation of Australia's science endeavour.

The Academy calls on the Government to establish an international science engagement strategy, drawing together existing programs with an investment of approximately 0.3% of Australian Government expenditure on science, research and innovation. The cost of implementing this measure would be \$25 million per annum.

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