2017-18 PRE-BUDGET SUBMISSION

The Australian Academy of Science welcomes the opportunity to make a submission to the Australian Government in advance of the 2017-18 Federal Budget. The recommendations in this submission are made in the context of the Government's ongoing implementation of the National Innovation and Science Agenda and the development during 2017 of the 2030 plan for Australian science and innovation.

Promoting and enhancing Australian innovation

The Academy of Science (the Academy) was established by Royal Charter in 1954 and comprises over 500 of Australia's most distinguished scientists, each elected for research that has expanded the frontiers of knowledge on a global scale. The Academy firmly believes that Australia's future industries, economic prosperity and social wellbeing depend on improvements in performance in science, technology, engineering and mathematics (STEM). A well-planned and well-resourced science and maths education and research capability will underpin innovation and growth into the future.

RECOMMENDATIONS

The Academy of Science recommends consideration of twelve specific budget measures. An overview of the measures is provided below, however, more detail on each is available. The Academy would welcome an opportunity to discuss these measures with relevant the Australian Government departments.

A strong, secure and globally-connected research and innovation capability.

The Government's National Innovation Science Agenda includes a **Global Innovation Strategy** to improve Australia's science, research and innovation collaboration with 17 priority economies. This strategy places Australia in a strong position to take advantage of the new opportunities for international science and technology engagement. The Academy maintains strong and productive relationships with the priority economies, particularly with the United Kingdom and other European nations. These existing links are valuable as Australia seeks to forge a path forward in the wake of Brexit, and with strengthened trade partnerships with countries such as France and Germany. In addition to collaborating with the 17 priority economies, the Academy recommends that:

1. **$4 million over four years is allocated to expand long-standing and strategically important bi-lateral science partnerships with Indonesia.** Indonesia is a key economic and strategic partner for Australia, but is not included in the list of priority economies for science engagement. Scientific diplomacy is a powerful and peaceful tool that can facilitate dialogue in more challenging areas. The Academy recommends that Australia take the opportunity to strengthen diplomatic ties with Indonesia and the region by establishing new bilateral research collaborations to solve common problems. Working in partnership with the Department of Foreign Affairs and Trade, the Academy has established relationships with the Indonesian science sector and is well-positioned to build on these. Examples of the collaborations that could be supported include: developing programs between Indonesia-Australia on blue carbon; exploring the use of hepatitis B as a model for disease elimination, and using big data and emerging technologies to help address some of Indonesia and Australia's shared challenges.

Supporting high-impact high-return science and innovation priority areas

Australia has nine science and research priority areas that cover major areas of challenge and opportunity for Australia over the coming decades. Within the context of these priorities, the Academy recommends consideration of the following Budget measures:

2. **$10 million over 4 years to establish an agricultural translation fund**. Australia is a world-leader in many areas of agricultural research, but performs at or below international averages in commercialising research findings into new agricultural products and services. Establishment of **a $100 million capital investment fund** modelled on the Biomedical Translation Fund would facilitate investment of matching government and private capital in promising Australian businesses to accelerate translation of more of Australia's great agricultural discoveries. $10 million would be required to establish this fund; $50 million capitalisation from the Australian Government would be matched by private investment and would not directly impact the underlying cash balance. This is a key recommendation of the Academy's Decadal Plan for Agricultural Science developed through broad consultation with research, government and industry stakeholders.

3. **$100 million investment over five years in a coordinated geoscience program to create the knowledge and technologies necessary to unlock Australia's non-bulk mineral wealth**. The potential value of Australian copper, lithium and other non-bulk commodities in global markets is in the trillions of dollars over the coming decades, but we don't yet have the ability to cost-effectively discover new reserves required to meet projected global demand. An investment by the Government in the UNCOVER initiative that has brought together industry, state and territory governments and research organisations would complement the investment in Geoscience Australia in the 2016-17 Budget, ensuring Australia becomes a world-leader in mineral exploration and remains a priority destination for global resources investment.

Support for research infrastructure and funding

Australia's innovative and internationally competitive mining, energy, agriculture, higher education, health and financial services sectors depend on a secure pipeline of highly-skilled STEM professionals and a robust underpinning framework of research infrastructure and industry and academic research effort in universities, publicly funded research agencies and industry organisations. To support world-class tertiary STEM training and research, the Academy recommends:

4. **Establishment of a capital investment fund to support new and upgraded research infrastructure.** The National Innovation and Science Agenda included a welcome long-term commitment in funding for the Australian Synchrotron and other research infrastructure supported by the National Capital Research Infrastructure Scheme (NCRIS). To support the Australian Government's forthcoming National Research Infrastructure Roadmap, and as recommended in the draft Roadmap and the Clark review of research infrastructure that preceded it, a capital fund will also be required to support new and upgraded research infrastructure over the coming decades. The Academy considers the Medical Research Future Fund and the Higher Education Endowment Fund to be relevant financing models.

Improving science and maths education in schools

Australia's performance on international school science and maths benchmarks is sliding, and unless urgent action is taken to better understand and tailor education policies and programs, the Australian businesses and the next generation of Australian workers will struggle to compete in the global market for high-paid STEM-intensive jobs. To address this issue, the Academy recommends:

5. **$4 million over four years to establish a prospective national science and mathematics education evaluation program**. A national evaluation of all relevant science and maths education programs–including those run by the Academy–is required to draw together existing impact and outcome information and to determine factors associated with both positive and poor and/or inconsistent student learning outcomes in different contexts. The findings of such an evaluation will provide the evidence-base to ensure Australia's future education funding priorities and policies are cost-effective and that they will reverse current declines and push Australia's student learning outcomes back into the top 10 OECD nations over the coming decade. The Academy of Science recommends that the Australian Council for Educational Research (ACER) and the Australian Curriculum Assessment and Reporting Authority would be best placed to coordinate such a national evaluation.

6. **$20 million over four years from 2018-19 to allow the Academy of Science to provide evidence-based learning and teaching resources and support to Australian science and maths students and teachers, including pre-service and in-service professional learning in areas of highest need across the country.** The Australian Academy of Science has a strong track record of working with the Australian Government to provide evidence-based school science and maths curriculum resources and professional learning to Australian science and maths students and teachers throughout Australia, with independent evaluation demonstrating the longer-term programs in improving student and teacher engagement and student learning outcomes. Funding of $5 million per annum will allow the Academy to continue using traditional and digital technologies to deliver freely-available, rigorous and research-based teaching and learning materials to enhance educational outcomes for the majority of Australian science and maths students and teachers from primary school to year 10.

   Current support for the Academy's three science and maths primary and secondary school education programs *Primary Connections, Science by Doing* and *ReSolve: Mathematics by Inquiry* concludes in June 2018. Rather than disparately funding each education program, the Academy proposes a partnership with the Australian Government to provide unified support for the delivery of these proven programs across the country. In doing so the programs would have greater reach, impact and allow for synergies to be created as students transition from primary to secondary school. In addition, a unified funding approach would provide administrative efficiencies. Collectively, *Primary Connections, Science by Doing* and *ReSolve: Mathematics by Inquiry* programs will allow the Academy to extend delivery of professional learning opportunities to over 5,000 primary and secondary teachers in the areas of highest need, helping to reduce disparity in education outcomes and, over the longer-term, helping to close the gap in social and economic outcomes for some of Australia's most vulnerable communities.

Building a workforce to sustain the future

Reviews of industry needs have shown that around 75 per cent of Australia's growth industries require a workforce rich in STEM skills. Consequently, policies that train and retain STEM graduates and that play to Australia's strengths in research are critical for job growth and economic prosperity. The Academy proposes 3 measures to achieve this:

7. **Increase funding for research disbursements through the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC) in line with projected CPI.** The 2016-17 Budget indicated expected annual increases in research funding through the ARC of just 0.4% p.a. from 2016-17 to 2019-20 and 1.9% p.a. through the NHMRC over the same period. These projections are lower than Treasury's projected increases in CPI of 2.25-2.5%

over the next three years, meaning that the Australian Government's support for vital research funding through these agencies is declining in real terms at the same time it is placing increasing emphasis on science and innovation. The declining research funding pool has led to historically low grant application success rates and the loss of the skilled workforce needed to sustain research capability for current and emerging industries. Moreover, the government's investment to educate and trained these highly-skilled scientists is not being realised.

8. **At least $2.56 billion in 2017-18 to the Medical Research Future Fund** along with any outstanding commitments for 2016-17 to meet the Government's 2016-17 Budget commitment to fully capitalising the Fund by 2020-21.

9. **Support for climate science coordination and capability.** The Academy of Science has recently completed a comprehensive review of Australia's climate science capability. It recommends that the Australian Government improve coordination of effort and address identified gaps in capability, commencing in 2017-18.

Rigorous evidence-based advice to policy-makers

As public policy challenges become increasingly complex, it is more important than ever that legislators and policy makers have ready access to relevant, timely, and well-targeted scientific advice. To facilitate provision of such advice and to increase the capacity of the science sector to deliver policy-relevant information, the Academy proposes three measures for the 2017-18 Federal Budget:

10. **$5.7 million over four years to establish an Australian Parliamentary Fellowships Program.** It is recommended that this program be modelled on the successful Congressional Science and Technology Fellowships and the Science and Technology Policy Fellowships managed by the American Association for the Advancement of Science and be designed to bring technical and scientific insight and expertise into the offices of Federal Members and Senators whilst enhancing the policy skills of tPhe science sector. Funding would support salary and on-costs of 10 Fellowships per annum plus $300,000 p.a. for administration of the program by the Australian Academy of Science.

11. **$450,000 per annum to enable the Australian Parliamentary Library to provide accessible reviews of scientific literature relevant to policy issues before the Parliament.** This proposal is based on the successful Parliamentary Office for Science and Technology in the UK, and would facilitate evidence-informed policy making on an ongoing basis.

12. **$600,000 over four years to support policy internships for Australian Postgraduate Award PhD scholarship holders with Australia's Learned Academies.** This initiative would provide opportunities for up to twenty Australian PhD students each year to extend the term of their existing scholarship by three months to undertake a policy-focused internship with one of Australia's four Learned Academies or the Australian Council of Learned Academies (ACOLA). Funding would be administered by the Department of Education and Training with an administrative component of $25,000 p.a. through ACOLA.