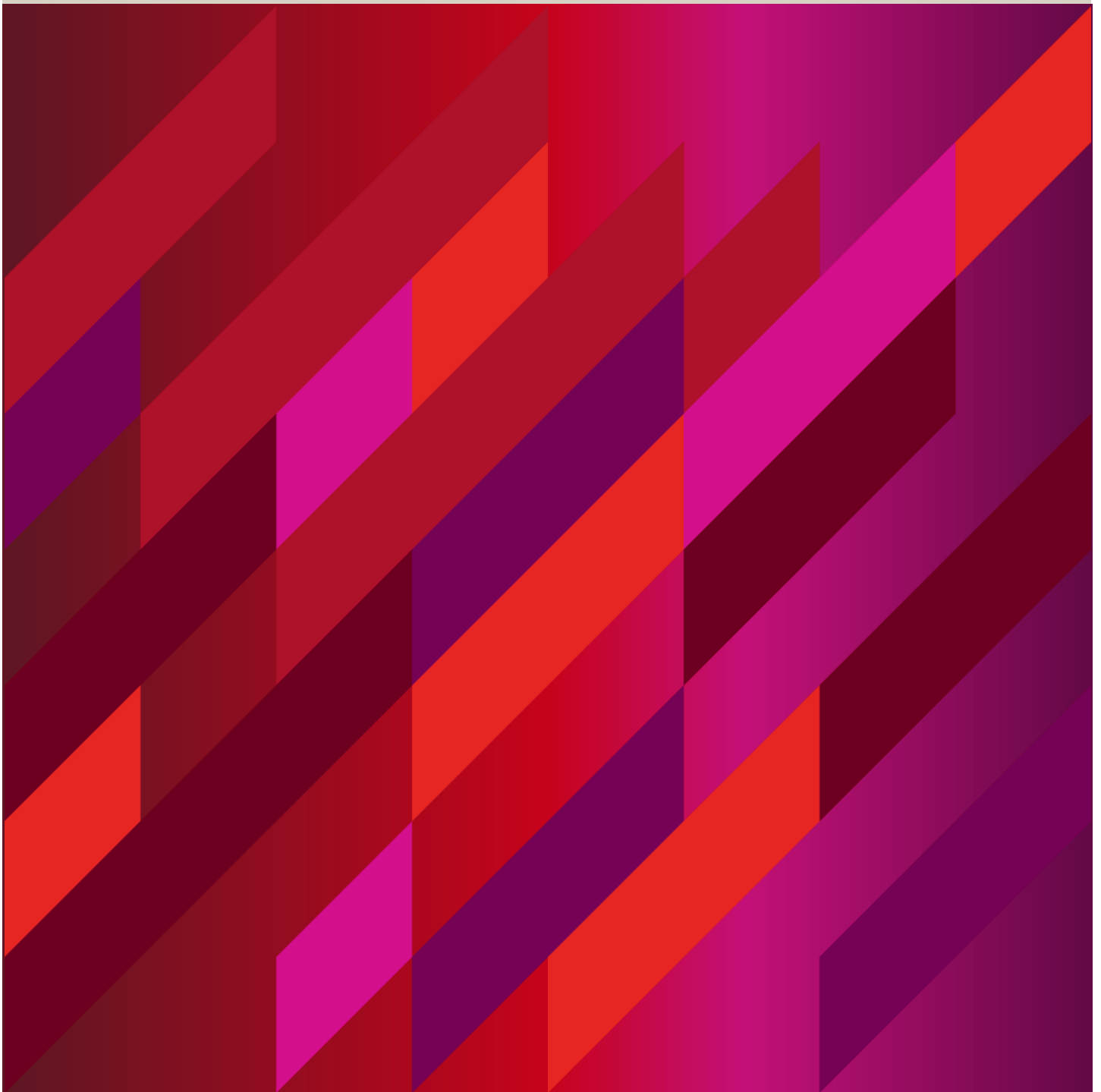




MACQUARIE
University

Inquiry into Australia's Future in Research and Innovation



Macquarie University

Macquarie University was founded in 1964 to be a radical and unconventional addition to New South Wales tertiary education. In 2016, more than 50 years after its founding, Macquarie University remains a hub of innovation and discovery.

Macquarie is proudly a university of service and engagement - providing transformative learning and life experiences, and serving the world through discovery, the dissemination of knowledge and ideas, innovation and partnerships.

Our unique location, in the heart of Australia's largest high-technology precinct provides an environment of outstanding research and innovation. Through learning and teaching opportunities with world-leading organisations Macquarie translates knowledge into value.

How can the research and innovation sector better assist in overcoming Australia's geographic, economic and labour challenges?

Macquarie University commends the Joint Select Committee on Trade and Investment Growth for inviting submissions on this question of national significance. In our response below, we provide input on key aspects of the terms of reference such as commercialisation and innovation as well as initiatives Macquarie is taking to ensure it is effectively connected to its industry partners.

Recommendations:

- Increase penetration of Science, Technology, Engineering and Mathematics (STEM) PhD candidates into industry;
- Ensure future policy changes do not come at the expense of Australia's ability to conduct basic research;
- Equalise academic incentives to publish and/or patent;
- Improve the public collection of data for research and innovation.

Internationalisation

Australia's long term ability to excel in research and innovation will require a deeper and more sustained approach to international engagement. This engagement must happen jointly across government, industry and universities.

Enabling and facilitating foreign direct investment into emerging Australian ideas and technologies is essential. Doing so in such a way that does not involve a loss of Australian talent overseas is critical. The Australian Government has a key role to play in raising the profile of Australian research expertise internationally and ensuring a stable regulatory environment that promotes international collaboration and partnerships.

Many of Australia's key trading partners (particularly in Asia) have an impressive record of nurturing and sustaining excellence in STEM subjects. A whole of government and industry approach is required to ensure Australia catches up and begins to lead in this space. All levels of the education cycle need to be nurtured in order to ensure a robust future in research and innovation capable of competing with our key trading partners.

For example, In the 2015 report by the Australian Academy of Science "[The importance of advanced physical and mathematical sciences to the Australian economy](#)"¹, Mathematics and Statistics accounted for five of the top seven business sectors which are based upon a single core science discipline, with a combined annual value to the economy of \$18 billion. When considered in the context of those business sectors based upon multiple science disciplines, the Mathematical Sciences ranked in all of the top eight sectors with a total value of \$57 billion per annum. Despite this significant contribution by Mathematical Sciences to Australia's innovation economy, Australia still ranks among the lowest in the OECD for PhD numbers¹. As a result of this, many Australian companies are outsourcing their research requirements offshore or sourcing skilled staff from overseas. Australia must increase the penetration of graduates in the core STEM disciplines into industry. To do so will require both a change in the business sector's willingness to invest in home-grown research and development (R&D) in the Mathematical Sciences and also changes in the way in which the university sector trains industry ready graduates. Only by working together will the business and university sector overturn the trends in declining graduates in the Mathematical Sciences and provide the research foundation upon which Australia's future innovative economy will be built.

¹ "[The importance of advanced physical and mathematical sciences to the Australian economy](#)", Australian Academy of Science, Canberra, 2015¹

Commercialisation

Macquarie University notes the Australian Government's Industry Growth Centres Initiative and commends this industry-led approach to driving innovation. By strategically focusing on areas of strength this initiative will improve Australian productivity and competitiveness.

Macquarie also notes that while there is much to be improved with regard to Australian commercialisation, future policy changes should not come at the expense of Australia's capability to conduct basic research. Pure research opens new opportunities and feeds the research 'food-chain'. Australia needs to retain and continue to improve its capabilities in basic research as well as improve university-industry processes of commercialisation. Neither element of the research and innovation sector should come at the expense of the other.

Macquarie notes that Canada, Chile and the USA all have government assistance for the Commercialisation Offices within universities, predominantly in the form of technology transfer assistance. Australia would greatly benefit from support of this nature.

Additionally, the incentives put in place by the Australian Government for researchers are somewhat counterintuitive when it comes to commercialisation. There is a structural promotion of publication over patenting. Australian researchers can and do conduct both activities, however, there needs to be equality in terms of recognition and reward for these activities.

Commercialisation needs to be understood as more than just income generation, it involves the realisation of many other forms of economic value. For example, many of the commercialisable ideas generated through the discipline of Biological Sciences will not lead to start-up companies or technological exports, but they will provide enormous benefits to the Australian economy and environment. In developing instruments to assist the commercialisation of ideas, the Australian Government should ensure that these instruments do not discriminate between streams of research and innovation due to prescribed notions of realisable economic value.

Innovation

To enable innovation, there needs to be effective interaction between researchers and industry so that researchers can assist industry in addressing real business issues. This can be developed through initiatives such as a focus on student employability and the placement of higher degree research candidates within industry. It can also be assisted through government policies that provide for small businesses and start-ups to sell to the Australian Government – as is done in the USA.

Australian information technology innovations would greatly benefit from policies regarding the systematic collection of data sets for research. For instance, national policies regarding the collection of health data for research in Australia lag behind Scandinavian countries. This decreases the potential for Australia to innovate in this area.

Though Australians have levels of expertise in computer science, the country lacks a vibrant start-up/incubator culture. A nexus of commercialisation, venture capital and information technology 'literacy' is required. Unless the Australian investment environment understands the risks associated with information technology and with start-ups more generally, then innovators will be penalised if they attempt to commercialise in Australia.

Macquarie University initiatives in advancing university and industry engagement

Macquarie University is uniquely located adjacent to Australia's largest high technology precinct, Macquarie Park. The Park has a focus on medical technologies and information communications technology (ICT) industries, and Macquarie has developed strong partnerships with many of these companies. In collaboration with our corporate partners, we are currently scoping an initiative to transform the existing Macquarie Business Park into an Innovation District, with Macquarie University as the anchor institution. The Innovation District will foster a network of corporate and community partners with Macquarie University serving as the focus point and facilitator for research collaboration within the Park.

A significant number of corporates (~20) have offices on campus. Cochlear, one of Australia's most innovative companies, has its global headquarters and manufacturing facilities onsite at Macquarie. Cochlear is closely linked with Macquarie's globally recognised Australian Hearing Hub, which brings together university researchers, non-profit organisations and industry to improve hearing and communication outcomes. This is a great example of Macquarie's efforts to translate academic research into commercially important technology that will benefit Australia economically.

Based on the principle of mutual benefit, Macquarie established a dedicated Office of Corporate Engagement in 2013. The office streamlines the process for corporates who wish to engage with the University across areas such as research, student placements and executive education, enabling them to have a "one stop shop" to facilitate their engagement with the University. Dedicated Corporate Engagement Managers handle the strategic relationships that Macquarie has with its industry partners such as Johnson & Johnson and Optus.

Macquarie also has strong industry engagement through the work integrated learning programs we offer to our students, including internships. It is worth noting that from 2016, all undergraduate students at Macquarie will be required to complete an industry or community placement as part of their degree. Activities like this foster strong links between the University and its partners – over 1,400 organisations to date.

Innovation Case Studies

MACQUARIE UNIVERSITY HOSPITAL

Macquarie University Hospital is Australia's first and only private not-for-profit teaching hospital on a university campus. Modelled on renowned international university hospitals, the hospital's approach to treatment is based on combining the best available knowledge and expertise to ensure patients receive a comprehensive and integrated service, as well as the utmost compassion, support and care.

The hospital features the very latest technology, much of it unavailable anywhere else in the country, and is conveniently located at the heart of a large and integrated medical precinct, collocated next to the Macquarie University Clinic, and the Faculty of Medicine and Health Sciences, Macquarie University.

As an academic hospital, Macquarie University Hospital health professionals are committed to a culture of continuous improvement through teaching and research, and follow three simply stated aims: to heal, to learn, to discover.

The hospital's two main research programs are:

- **Neurosciences Program:** this program focuses on how the brain helps control the vascular, respiratory and cardio-vascular system;
- **Vascular Program:** this program focuses on how the vascular system and heart impacts on the brain.

AUSTRALIAN PROTEOME ANALYSIS FACILITY

The Australian Proteome Analysis Facility (APAF) was the birthplace of the term proteomics in 1995 and was the world's first dedicated high throughput proteomics laboratory. APAF's aim is to assist the scientific community address their protein analysis needs and to be recognised as the market leader in proteomic services and expertise. APAF uses cutting-edge infrastructure, technical excellence and scientific innovation to provide high quality outcomes with professional service.

While APAF's principle activities focus on the delivery of world leading proteomics services, the group is also active in partnering with other organisations to deliver collaborative research outcomes in fields such as

- Proteomics technology evaluation, research and development;
- Human health research;
- Agricultural research;
- Food research and characterisation;
- Environmental sustainability.

Innovation Case Studies

AUSTRALIAN HEARING HUB

The Australian Hearing Hub is a unique, world-class facility purpose-designed to facilitate collaborative research into hearing and related speech and language disorders. It is an initiative of the Australian Government being conducted as part of the Education Investment Fund.

It brings together the University's internationally leading research teams (Language Sciences and Cognitive Sciences), clinical research/professional training teams (Audiology and Speech Language Pathology) and a major government research organisation. It also brings together Australian Hearing with the National Acoustic Laboratories and major not-for-profit organisations offering clinical and related social services for hearing disorders, like The Shepherd Centre.

Colocated with Cochlear's Global Headquarters, the Australian Hearing Hub will help make Macquarie University a truly global leader for hearing and related disorders.

The Australian Hearing Hub enables ground breaking advances in mapping brain/hearing function, understanding auditory processing, assessing auditory system disorders, developing hearing aid and implant technologies and improving strategies for rehabilitation and learning to hear.

Conclusion

Australia needs to be more structurally attuned towards facilitating innovation. This necessitates changes at every level of the innovation ecosystem. Instead of mimicking the policies and processes of other countries successful in this area, Australia should develop new approaches towards the commercialisation of ideas. The geographic, economic and labour makeup of Australia should not just be seen as a challenge, but as an opportunity as well.

Australia's unique university landscape is a key enabler of its ability to excel in research and innovation. Long-term engagement between universities and industry on an international scale is critical to the creation of new ideas and the promotion of Australia's prosperity. As a university of service and engagement, Macquarie University is keenly interested in seeing Australia turn its geographic, economic and labour challenges into opportunities.