



An Australian
Brain
Initiative.

Our
Vision.



Australian
Brain
Alliance

Our Vision

Our vision for Australia's future is for a dynamic, thriving and globally competitive technology sector based on a sophisticated, world-class brain science capability.

We envisage a future where hundreds of Australian technology companies employing tens of thousands of highly-skilled workers will design, manufacture and sell advanced brain-inspired technologies, transforming the lives of Australians and people around the world.

Future technologies will be based on an enhanced understanding of how the brain processes and encodes information.

These technologies, the approaches and applications they enable will support the widespread adoption of personalised learning and training at school and throughout the lifespan. They will also drive growth and innovation in health, workplace productivity, and defence capability.

With success driven by the passion and creativity of its entrepreneurs, world-leading support from government in systems and incentives, and the strong, connected and dynamic research capacity of the world's brightest and most productive, our vision is for Australia's neurotechnology industry to be among the world's top five most innovative and competitive.

We imagine a future in which Australian and international brain scientists and entrepreneurs will develop and hone their skills in Australia, and establish their careers and businesses on shore, resulting in unparalleled opportunities for Australia to attract and retain the very best brain scientists.

This is a future in which brain sciences, neurotechnologies and the applications they support have the understanding and encouragement of the public, engendering pride in Australia's foresight and ability to lead a global revolution based on brain-inspired technologies. Thus ensuring the economic, social and health benefits that all Australians deserve.

Our mission

Understanding the human brain is one of the greatest challenges of our time and we are on the cusp of a revolution in brain sciences. Accelerated advances in technologies are allowing researchers to understand, modify and interface with the brain in unprecedented ways; enabling the treatment of devastating brain disorders, enrich education and learning, and facilitate the development of neurotech-based industries.

Other international brain initiatives are tackling the fundamental and momentous challenge of mapping the trillions of connections in the brain. To complement this effort, Australia has an opportunity to focus on understanding brain function; cracking the brain's code through cutting-edge research, new partnerships between academia and industry and the translation of this new knowledge to schools, hospitals and Australian workplaces.

The human brain is staggeringly complex, and Australian neuroscientists and psychologists have a long and distinguished record of achievement in unravelling its mysteries and creating new applications and technologies. Critically, we now have an unprecedented capacity to image, probe, and intervene in brain function, creating a plethora of exciting opportunities for the application of the latest findings in neuroscience to the technology, health, education and broader industrial sectors.

Australia also leads the world in neuroprosthetics – the technology that links the brain to devices. We are now in a position to lead revolutionary high-tech industries based on neurotechnology. New brain-machine interfaces as well as stimulating and recording devices are using information about the brain to produce smarter, implantable and wearable devices that can relieve pain, restore sensory and motor function, treat debilitating brain disorders such as Parkinson's disease and drive genuine progress for the delivery of highly personalised mental health care.

The Australian Brain Initiative will:

- Make major advances in understanding healthy, optimal brain function.
- Create advanced industries based on this unique understanding of the brain.
- Identify causes and develop novel treatments for debilitating brain disorders.
- Produce sustainable, collaborative networks of frontline brain researchers with the capacity to unlock the mysteries of the brain and ensure the social, health and economic benefit of all Australians.

New advances in our understanding of how the brain encodes, stores and retrieves information provides a state-of-the-art platform for developing computational methodologies, including neural network modelling, machine learning, artificial intelligence, robotics, and brain machine interfaces that allow thought-controlled prosthetics.

The possibilities are enormous and far-reaching: from targeted treatments of brain disorders, to more effective ways to educate our children and grandchildren, evidence-based methods to enhance productivity in the workforce, improved decision making in complex environments and revolutionary industries based on innovative neurotechnologies.

If we fail to make a strategic national investment in brain sciences, Australia will fall behind while the rest of the world takes advantage of the commercial, medical, educational and electronic advances that will be based on brain research.

Delivering Australia's first national research initiative in brain science

As the world enters a new era of brain research, it is clear that a comprehensive understanding of something as complex as the human brain will require the coordinated effort of people working in a wide variety of fields, from physics, mathematics, computing, robotics and engineering to biology, genetics, medicine and psychology. An integrated transdisciplinary approach is required to provide revolutionary solutions to some of the most difficult problems of our time.

The Australian Brain Alliance's plan is built on three main principles to transform Australia's brain research capabilities and ensure flow-ons to Australian high-tech industries.

- 1) high-impact, transdisciplinary collaborations.
- 2) research funding that doesn't differentiate between medical and basic research.
- 3) advancing Australia through neuroinnovation.

High-impact research collaborations to transform Australia's brain research sector

Currently, Australian brain science comprises eminent, world leaders in human cognitive neuroscience as well as the biology, physiology and genetics of the nervous system.

We also boast excellent capability in brain imaging and mathematical neuroscience, and a history of success in neurotechnology development and translation such as "Cochlear", an exemplar of the kind of neurotechnology success stories we envisage will be born out of high impact transdisciplinary collaborations in brain science.

However, as is the case in most other research disciplines, Australia's brain research is largely carried out by individual laboratories ensconced within university departments or focused research institutes, and is not readily available for industry partnership.

Facilitating a transdisciplinary approach to brain science will increase communication across scientific disciplines, develop new connections between researchers, and lead to collaborations that will deliver innovative ways to understand the brain and harness its potential for next generation technology development.

Indeed, for Australia to make a significant contribution to the unfolding revolution in brain science, we must utilise and grow our pool of talent by promoting knowledge exchange across disciplinary boundaries.

Brain research is typically funded by conventional 3-5 year grants to address specific questions proposed by researchers focused on specific areas of expertise.

This type of research is critical for making progress in specific areas and should continue to exist alongside a proposed national brain initiative that addresses big questions.

These focused disciplinary research programs on their own are not sufficient to achieve an overarching understanding of how the brain functions, or to facilitate the large industrial, health and educational outcomes which the Australian Brain Initiative aspires to achieve.

That's why we're calling for a major investment in talented, innovative researchers to drive these changes in our approach to brain science and translate discovery into advanced technologies.

The Brain Alliance is proposing a funding process that will support the best research by transdisciplinary teams of researchers. A competitive process will stimulate creativity and innovation, promote collaboration between high-calibre researchers and ensure that resources are allocated to the best projects.

We propose that applications should not differentiate between basic and applied research, and that while research questions will not be determined a priori, we will provide high-level scientific schema to canvass the big questions in brain sciences, and seed the motivation for long-term transdisciplinary collaboration in Australian brain research.

Alongside an integrated translational framework developed to function intimately with this discovery pipeline, the Australian Brain Initiative aims to build the research infrastructure of the future and foster the development of a thriving Australian neurotech industry.

Innovating Australia: Identifying and supporting early stage discoveries in brain research suitable for technology transfer

Australia has demonstrated world leading excellence in neuroscience research and neurotechnologies. The Australian Brain Alliance offers a new vision for brain research and brain-inspired technology development in Australia that will revolutionise how we live and work; and will alleviate the human suffering of mental illness, neurological disease, brain and nervous system injury or degeneration, and intellectual disabilities.

Australia needs rapid technology transfer, and a consistent pipeline of discoveries that underpin the most compelling therapeutics and the most enduring technologies for the benefit of Australians.

What will be achieved?

Bringing together basic researchers and industry to create an innovation pipeline for new, advanced technologies, an Australian Brain Initiative will not only build the research infrastructure of the future, but it will also cement Australia as one of the world's leading centres for understanding the human brain.

By cracking the brains code, we can neuroengineer Australia's future.