

**AUSTRALIAN
TECHNOLOGY
NETWORK**
OF UNIVERSITIES



Curtin University is Western Australia's largest and most culturally diverse university with Australia's third largest international student population.

With campuses in Malaysia and Singapore as well as face-to-face teaching in a number of countries, Curtin has a strong commitment to international engagement. This cultural diversity adds a rich and valuable dimension to the campus atmosphere, preparing all graduates to live and work effectively in an increasingly global environment.





PainChek®

Improving quality of life for patients with dementia and their carers

- **Facial recognition and artificial intelligence technologies transform pain management**
 - **Enhanced quality of life for aged care patients and carers**
 - **Upskilling the local workforce, and creating global export potential**
-

PainChek® is an innovative pain assessment tool that uses artificial intelligence and facial recognition technology to identify and treat pain in non-verbal patients, particularly those suffering dementia. In the past, patients with dementia and challenging behaviours were frequently treated with escalating doses of anti-psychotic drugs. In 2012, a Curtin University research team from the School of Pharmacy and Biomedical Sciences identified that appropriate recognition of pain could prevent these behaviours, reduce the need for heavy medication, and improve quality of life for the patient and their carers.

They developed a smartphone app that uses facial recognition software to rapidly detect and quantify pain, based on the established Abbey Pain Scale, and tracks pain over an extended time frame to assist carers and family members to develop effective pain management plans. Clinical trials in aged care settings validated significant increases in patient wellbeing, reduced use of medication to control behaviour and efficient, automated record management.

Building on the Curtin University research, a spinout company was established in 2014, raised more than \$13m in capital funding and achieved regulatory clearance in Australia and Europe in 2017. The company now has clients in Australia, UK, Singapore and New Zealand.

They developed a smartphone app that uses facial recognition software to rapidly detect and quantify pain

As of 30th June 2020, 722 aged care facilities have taken up a PainChek® license covering 61,571 Aged Care beds, training over 3000 professional carers, with more than 135,000 clinical pain assessments completed. Thanks to a \$5 million Federal Government grant in 2019, PainChek® is being rolled out to 100,000 people in residential aged care across Australia. This is particularly valuable in light of the challenges in providing care during the COVID-19 pandemic.

Consulting group ACIL Allen estimates the total health benefits of PainChek® for Australians living with dementia with moderate to severe pain between 2018 and 2027 may be as much as \$1.4 billion.

The company has commenced the process to obtain FDA regulatory approval for the US and Canada, tapping into a massive global export market. New applications are being developed outside aged care settings for patients who cannot verbalise their pain, such as Alzheimer's patients, young children and people living with disability or neurological disorders.



Autism Academy for Software Quality Assurance

Developing employment opportunities for people living with autism

- **Industry linkages create pathways to high-value employment for people living with autism**
- **Training and practical experience empower job-ready trainees**
- **Harnessing the talents of people living with autism to address technology industry challenges**

Research shows fewer than one third of autistic adults have paid employment, with more than half never having held a paid position. Autism affects around one in every 100 people.

In 2016, Professor Tele Tan from Curtin University's School of Civil and Mechanical Engineering launched the Autism Academy for Software Quality Assurance (AASQA). It is a flagship outreach program of the Curtin Autism Research Group (CARG), whose research facilitates independence and autonomy for people on the autism spectrum. Professor Tan and colleagues recognised that many young people with autism have potential skills in the challenging field of software analysis. AASQA is an initiative that combines a software inspector training Academy with a social enterprise that creates employment opportunities in this area of growing market demand.

In 2018, AASQA was further complemented by the addition of a Neurodiversity Hub in collaboration with global technology services company, DXC. This program creates more work experience opportunities for neurodiverse students and links them into DXC's global network of neurodiverse-friendly employers, including SAP, Westpac, ANZ Bank and the Australian Government.

By the end of 2019, the Academy had trained 250 people, all of whom moved into high-value jobs. Another 180 are enrolled for 2020, growing to 400 in 2021. In addition, 36 trainees transitioned into tertiary education, 12 have completed their studies and another 36 have participated in high-value internships.

AASQA has broadened its reach, developing strong partnerships with commercial, state and non-profit entities, including BHP, BankWest, Planit Testing, rerisk Pty Ltd, the WA Department of Training and Workforce Development and the Autism Association of WA.

This model harnesses the talents of people with autism for the collective benefit of individuals, industry and the wider community. It creates pathways into valued, long term employment for those who may otherwise struggle to achieve the dignity of independence and work.



◀ Former Vice Chancellor Prof Deborah Terry and Former WA Chief Scientist, Lyn Beazley, visit AASQA.

New protein sources

Innovating feed crops to meet global demand

- **Unlocking new value from low-margin crops**
 - **Enabling the agriculture sector to adapt to a changing climate**
 - **Improved productivity for farmers and global export potential**
-

Global demand for plant protein and gluten free products is growing exponentially, as consumers reduce meat intake and avoid potential allergens. In 2017 the global gluten-free market was valued at around US\$4.72 billion and the plant-based protein market is worth US\$18.5 billion. Australia is a significant producer and consumer of these products in the Asia-Pacific region and a major exporter to the US and Europe. Global innovation in agriculture is also being driven by the imperative to find crops that prove resilient to climate change.

Collaborative research led by Curtin University's food scientist, Associate Professor Stuart Johnson, has converted low-margin crops of sorghum and lupins, typically used for animal feed, into innovative nutritional food ingredients that meet escalating consumer demands. His work on the nutritional value of sorghum informed the development of Sanitarium's Gluten Free Weet-Bix in 2014, the first staple food based primarily on sorghum to be commercially released in Australia. It quickly became the highest penetration gluten free cereal and segment leader within six months of launch.

A May 2020 agreement between Curtin and ASX-listed Wide Open Agriculture, a regenerative food and farming company, will focus on developing and commercialising a new technology that has the potential to unlock innovative and valuable functionality of proteins found in the lupin seed. Modified lupin protein is inexpensive and versatile, yet currently only four percent of the lupin crop is consumed by humans. CSIRO will also collaborate on this locally developed technology that offers immense potential to value-add to Western Australia's lupin crop, elevating it into a rapidly growing sector of the global food market.

Sorghum is drought resistant and thrives in hot temperatures that cause traditional cereal crops to fail. Western Australia is the world's leading producer of lupins, which also play a critical role in sustainable farming systems. As Australia's agricultural sector adapts to a changing climate and evolving consumer needs, these innovations have real-world, everyday applications that will benefit farmers, food ingredient manufacturers and consumers alike.



AROSE

Remote operations expertise leveraged between earth, the moon and space

- **Translating years of remote operations expertise to boost the emerging space sector**
- **Securing Australia's competitive position in the global space industry**
- **Creates local STEM employment and global export potential**

Perth is set to become a global centre for remote operations in space, with the launch in February 2020 of the Australian Remote Operations for Space and Earth (AROSE). The consortium comprises Curtin University, the Western Australian government and The University of Western Australia, with industry partners Woodside, Fugro and Nova Systems. Remote operations is the ability to connect, monitor and control technology, people and processes over vast distances, often in harsh or high-risk environments. It enhances the productivity and safety of industries through advanced remote asset management and research and development in robotics.

The Curtin team will contribute its unique 'Binar' technology, used to build 'CubeSats' – small, lightweight satellites with low launch costs and minimal fuel requirements. Curtin will be engineering all the systems required to operate the satellites, including power, computer, steering and communications systems. These tasks provide hands-on experience for Curtin PhD researchers and students. Under Curtin's Binar Spacecraft Program, 'Binar' being the Nyungar word for fireball, Curtin researchers aim to develop a lunar orbiter that will deliver data for NASA's Artemis program, which is expected to return astronauts to the moon within four years.

Through AROSE, Australia's globally recognised expertise in remote operations, developed over decades of experience at mine sites, undersea equipment installations, Antarctic exploration, offshore oil and gas rigs, will be leveraged in support of the rapidly growing space sector. According to the federal government's Australian Civil Space Strategy (2019-2028) this segment could grow from \$3.9 billion to \$12 billion by 2030, accounting for 20,000 jobs.

The technological advances made through the AROSE project will also benefit industries back on earth. Economic modelling indicates that AROSE will add \$196 million to the state's economy per year and support more than 1,500 jobs in the next five years.



◀ AROSE research team with industry partners and representatives from NASA and the Australian Space Agency.