



Knowledge
Commercialisation
Australasia
techtransfer.org.au

SURVEY OF COMMERCIAL OUTCOMES FROM PUBLIC RESEARCH (SCOPR)

2019 REPORT

Survey and report delivered by



FOREWORD

There is an ever-present imperative to capture the commercial value of our research endeavour for our future wellbeing. To do so strategically, decision makers from laboratory, institutional and government levels need insights into how the research sector is currently engaging with industry to transfer knowledge and innovation, and thereby deliver benefits to our society from the fruits of our research.

For many years in Australia there has been a focus on improving innovation metrics, thus I am delighted to acknowledge the initiative of gemaker and Knowledge Commercialisation Australasia (KCA) in producing the inaugural Survey of Commercial Outcomes from Public Research (SCOPR).

The SCOPR takes its lead from the National Survey of Research Commercialisation (NSRC) produced since 2000 by the Department of Industry, Science, Energy and Resources. To avoid duplication, the Department has decided to cease the NSRC and will work with KCA to share knowledge, and access data collected by SCOPR.

As we face the COVID-19 pandemic, effective knowledge transfer is more important than ever, so I hope that this report will spur our research institutions to even greater achievements.

Realising effective knowledge transfer will depend on having skilled commercialisation professionals who can help researchers turn great ideas into beneficial products and services. I applaud KCA's support for technology transfer professionals whose impact is the subject of this extremely valuable survey and I thank all SCOPR participants.

A handwritten signature in dark ink, appearing to read 'Alan Finkel', with a stylized flourish at the end.

Dr Alan Finkel
Australia's Chief Scientist

September 2020

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DISCLAIMER

This report has been prepared solely for KCA for the purpose of providing an analysis of the commercial activities of Australasian public research organisations. As such, neither KCA or gemaker undertakes responsibility in any way whatsoever to any person or organisation for reliance on any information set out in this report, including any errors or omissions here-in, arising through negligence or otherwise, however caused.

INTRODUCTION

The **Survey of Commercialisation Outcomes from Public Research (SCOPR)** is an initiative of **Knowledge Commercialisation Australasia (KCA)**, the peak body representing technology transfer professionals and their organisations in Australia and New Zealand. SCOPR collects data from Australian and New Zealand universities, medical research institutes and publicly funded research agencies. It enables national and international benchmarking of respondents and helps to inform decisions by research organisations, government and industry stakeholders seeking to enhance industry engagement and research commercialisation.

KCA has developed SCOPR to replace the **National Survey of Research Commercialisation (NSRC)** produced from 2000-2016 by the Department of Industry, Science and Resources. To avoid duplication in metrics and survey population, the Department has decided to cease the NSRC and will work with KCA to share the critical information collected by SCOPR.

The inaugural SCOPR covers the calendar years 2017, 2018 and 2019. Forty-nine Australian and New Zealand research organisations responded to the survey. SCOPR is overseen by a committee representing KCA, the Group of Eight (Go8), the Association of Australian Medical Research Institutes (AAMRI) and KiwiNet. The survey and report have been delivered by **gemaker**, an award-winning Australian commercialisation consultancy, on behalf of KCA.

KCA has led best practice in industry engagement, technology transfer and entrepreneurship for research organisations since 1978 and is a founding member of the global Alliance of Technology Transfer Professionals. KCA is honoured to support the dedicated people who work at the intersection of research and industry. Although they comprise a small proportion of the staff of any research organisation, **technology transfer professional (TTPs)** are key to their organisations' real-world impact.

TTPs identify researchers' discoveries and innovations that have high potential for social benefit and commercial success and facilitate the complex and arduous journey from idea to reality, thereby ensuring that social and economic benefits result from the billions of public dollars spent each year on research. To illustrate the positive impacts of research commercialisation, this report includes four diverse case studies from SCOPR respondents – finalists in the 2020 KCA Awards, which celebrate world-class work in tech transfer.

KCA is committed to SCOPR because it showcases the vital work of TTPs, measures their impact and informs strategies to continually enhance professionalism in the tech transfer sector for the benefit of researchers, industry and the wider community.

Dr Erin Rayment
Chair KCA

John Grace AO
Chair SCOPR Committee

Natalie Chapman
Managing Director gemaker



SCOPR RESPONDENTS 2019

AUSTRALIA 34 respondents

UNIVERSITIES (24)

Australian National University
Curtin University
Edith Cowan University
Federation University Australia
Flinders University
Griffith University
James Cook University
La Trobe University
Macquarie University
Monash University
Queensland University of Technology
RMIT University
University of Adelaide
University of Queensland
University of Melbourne
University of Newcastle
University of New South Wales
University of South Australia
University of Southern Queensland
University of Sydney
University of Tasmania
University of Western Australia
University of Wollongong
Western Sydney University

MEDICAL RESEARCH INSTITUTES (7)

Bionics Institute of Australia
Black Dog Institute
Centenary Institute of Cancer Medicine and Cell Biology
Hudson Institute of Medical Research
Telethon Kids Institute
Walter and Eliza Hall Institute of Medical Research
Westmead Institute of Medical Research

OTHER PUBLIC RESEARCH ORGANISATIONS (2)

Australian Nuclear Science and Technology Organisation (ANSTO)
Commonwealth Scientific and Industrial Research Organisation (CSIRO)

OTHER RESEARCH ORGANISATION (1)

Meat and Livestock Australia Limited

NEW ZEALAND 15 respondents

UNIVERSITIES (6)

Auckland University of Technology
Lincoln University
Massey University
Victoria University of Wellington
University of Canterbury
University of Waikato

MEDICAL RESEARCH INSTITUTES (2)

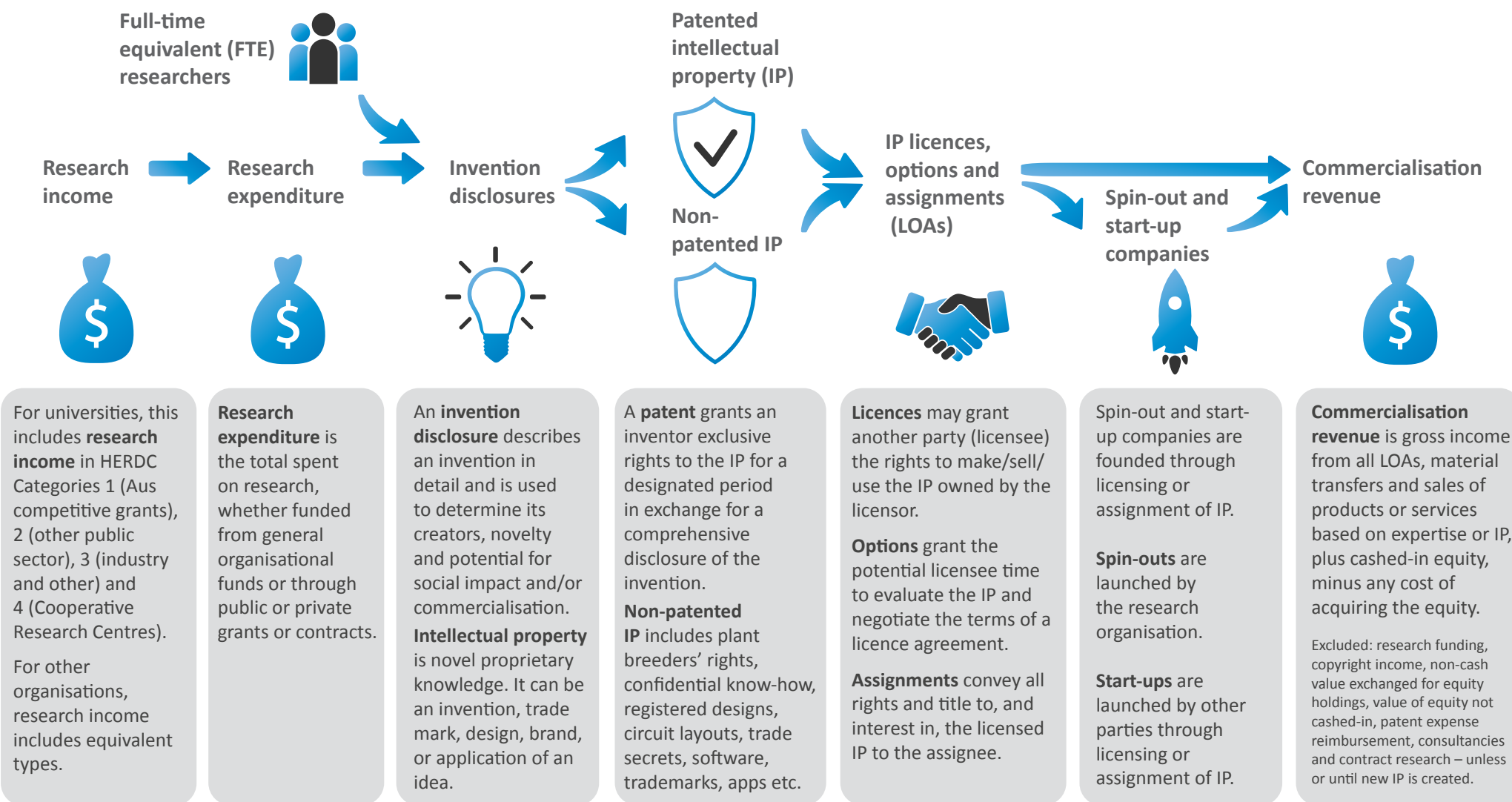
Malaghan Institute of Medical Research
Health Innovation Hub

OTHER PUBLIC RESEARCH ORGANISATIONS (7)

AgResearch Ltd
Callaghan Innovation
Cawthron Institute
GNS Science
Institute of Environmental Science and Research (ESR)
Manaaki Whenua Landcare Research
Plant and Food Research

SCOPR MEASURES

Commercialisation is managed by technology transfer staff



RESEARCH COMMERCIALISATION OUTCOMES: AGGREGATED DATA 2017-19

Notes: Not all respondents reported data for all measures. New Zealand reported aggregated data only.



Invention disclosures



New non-patented IP



New patent applications



New licences, options and assignments

AUSTRALIA 34 respondents

2019	1355	364	455	609
2018	1362	327	428	567
2017	1263	298	454	588

NEW ZEALAND 15 respondents

2019	274	69	144	not reported
2018	154	58	80	not reported
2017	186	47	90	not reported

RESEARCH COMMERCIALISATION OUTCOMES: AGGREGATED DATA 2017-19

Notes: Not all respondents reported data for all measures. New Zealand reported aggregated data only.



New spin-outs
and start-ups



Active spin-outs
and start-ups



Equity
holdings*



Commercialisation
revenue (AUD)

AUSTRALIA 34 respondents

2019	42	231	\$261.8 M	\$175.9 M
2018	48	217	\$178.5 M	\$119.4 M
2017	43	199	\$145.8 M	\$451.7 M [#]

NEW ZEALAND 15 respondents

2019	10	60	not reported	\$81.4 M
2018	10	50	not reported	not reported
2017	5	45	not reported	not reported

Notes:

New spin-out and start-up companies were incorporated in 2019.

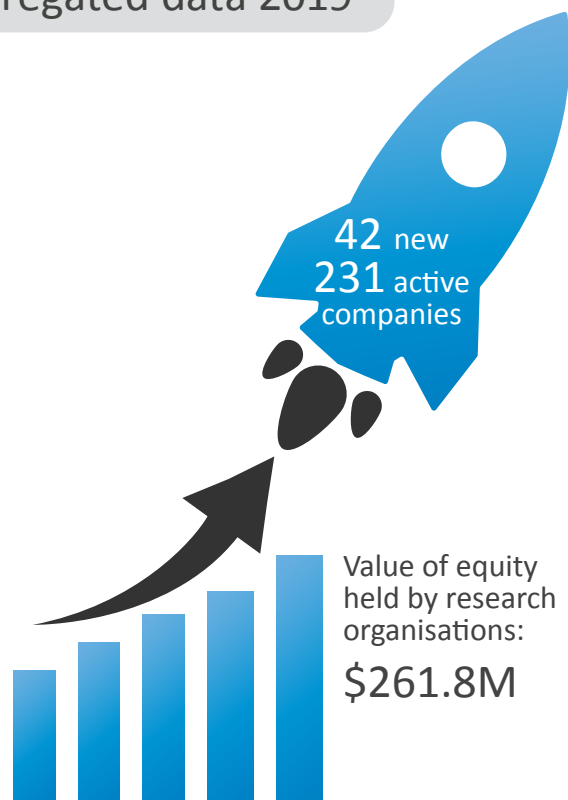
Active companies were incorporated in or before 2019. A company is active when it has sufficient financial resources to operate and make progress toward stated business goals.

*Total value of the equity held by respondents in all start-ups and spin-outs.

[#] In 2017, Walter and Eliza Hall Institute of Medical Research (WEHI) made a landmark deal worth \$325 million – more details on p. 20.

AUSTRALIAN SPIN-OUTS / START-UPS SHOWCASE

Aggregated data 2019



Example companies

AMAERO
ADDITIVE MANUFACTURING

Amaero International Ltd (ASX:3DA)
Source: Monash University
Sector: Manufacturing
Incorporated: 2013
Company value: \$55m
Jobs created: 15

CANOPUS
NETWORKS

Canopus Networks Pty Ltd
Source: UNSW
Sector: Telecommunications
Incorporated: 2018
Company value: \$10M
Jobs created: 12

 **vaxxas**

Vaxxas Pty Ltd
Source: The University of Queensland
Sector: Biotechnology
Incorporated: 2011
Jobs created: 40

CSIRO's commercialisation record
at June 2019

175+
Companies started
from CSIRO IP

\$2B+
Total market capitalisation
of portfolio companies

462+
Jobs in
portfolio companies

RESEARCH COMMERCIALISATION CASE STUDY 1 UQ, CEPI and CSL's COVID-19 global partnership

The WHO and the Coalition for Epidemic Preparedness Innovation (CEPI) believe the world needs multiple vaccines against the SARS-CoV-2 virus that causes COVID-19.

In January 2019, The University of Queensland (UQ) was the second university in the world to be awarded CEPI funding – US\$10.6 million over three years – to develop its vaccine platform technology for 'Disease X'. In January 2020, as a response to the WHO announcing COVID-19 as a pandemic, UQ was tasked by CEPI to produce a vaccine against COVID-19 and identify a partner for the late stage clinical development and distribution in an unprecedentedly short time.

Proteins on the surface of SARS-CoV-2 fuse the virus to host cell membranes, a key process in infection. These proteins are the major target of a protective immune response. But when separated from the virus structure, these proteins are inherently unstable, presenting a challenge for vaccine development. To induce the correct immune response and protect a person from subsequent infection, the protein must maintain the same shape in the vaccine as it does on the live virus. UQ researchers have overcome this problem by using proprietary molecular clamp technology first conceived in 2012 and patented by UniQuest.

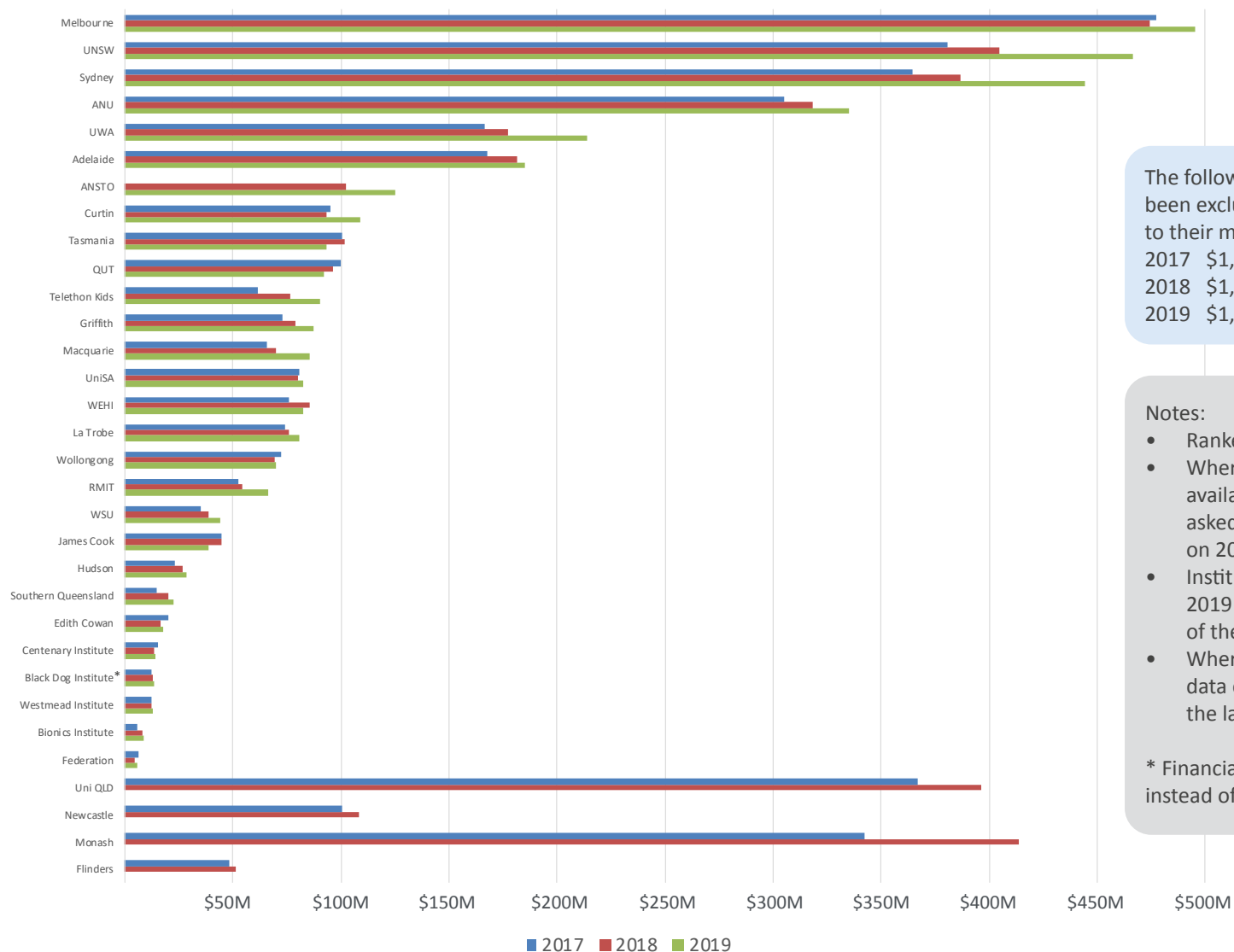
The first human subject was dosed with UQ's COVID-19 vaccine candidate on 13 July 2020 and a strategic partnership agreement signed with UQ, CEPI and CSL, less than 6 months after the request from CEPI. Should the first clinical trial be successful, CSL will be responsible for further clinical development, manufacture and distribution of the vaccine in accordance with the tripartite agreement. Should the development activities be successful then a vaccine could be available in 2021.



RESEARCH INCOME 2017-19



For universities, this includes research income in HERDC Categories 1 (Australian competitive grants), 2 (other public sector), 3 (industry and other) and 4 (Cooperative Research Centres). For other organisations, research income includes equivalent types.



The following CSIRO data have been excluded from the graph due to their magnitude:

2017 \$1,275,170,166
2018 \$1,285,168,048
2019 \$1,324,489,908

Notes:

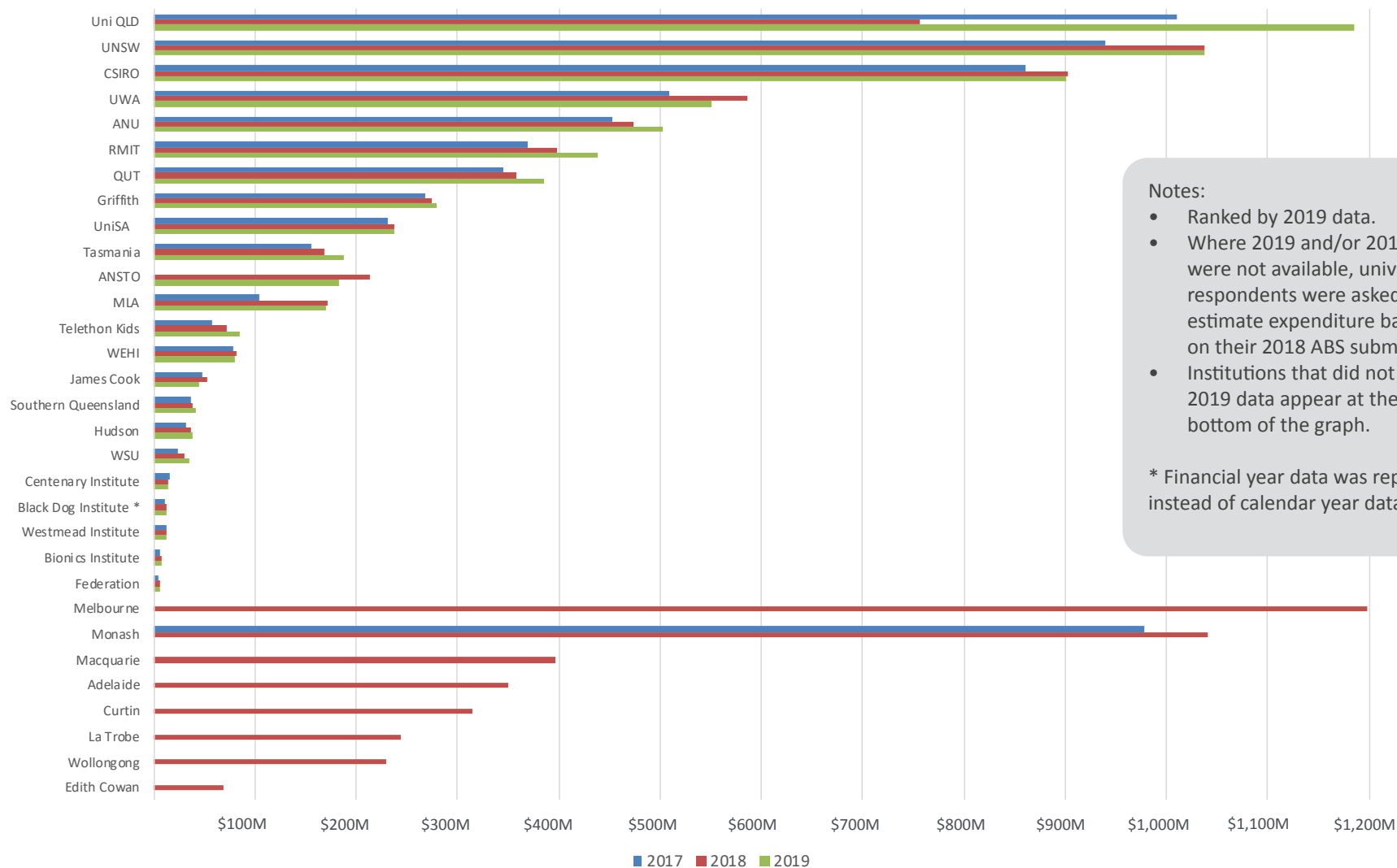
- Ranked by 2019 data.
- Where 2019 data were not available, respondents were asked to estimate income based on 2018 data.
- Institutions that did not report 2019 data appear at the bottom of the graph.
- Where 2017 and 2018 SCOPR data conflicted with HERDC data, the latter was used.

* Financial year data was reported instead of calendar year data.

RESEARCH EXPENDITURE 2017-19



Research expenditure is the total spent on research, whether funded from general organisational funds or through public or private grants or contracts.

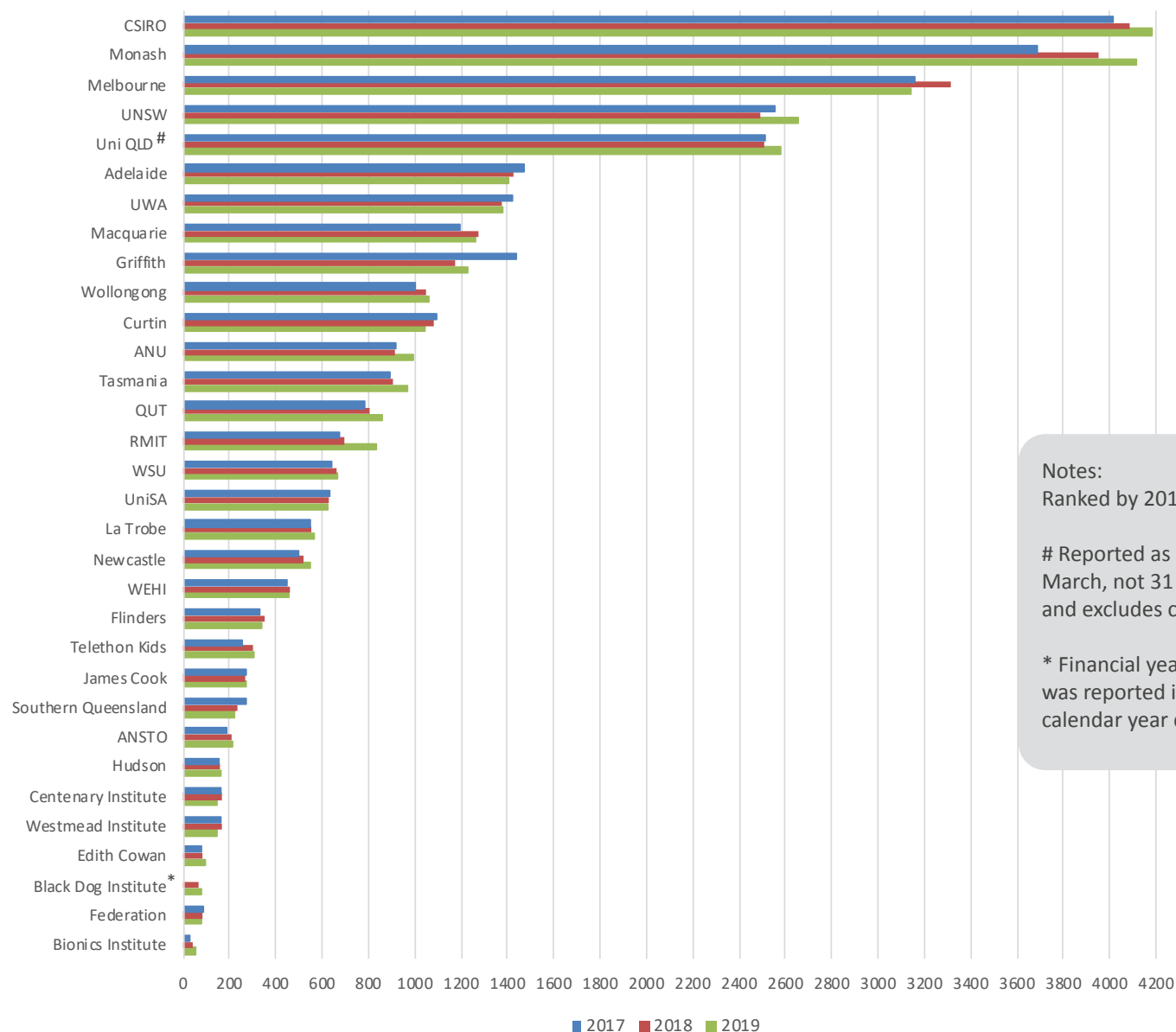


Notes:

- Ranked by 2019 data.
- Where 2019 and/or 2017 data were not available, university respondents were asked to estimate expenditure based on their 2018 ABS submission.
- Institutions that did not report 2019 data appear at the bottom of the graph.

* Financial year data was reported instead of calendar year data.

RESEARCHERS (FULL-TIME EQUIVALENT) 2017-2019



Notes:
Ranked by 2019 data.

Reported as at 31 March, not 31 December and excludes casuals.

* Financial year data was reported instead of calendar year data.

RESEARCH COMMERCIALISATION CASE STUDY 2 Faster, more accurate gold ore analysis with X-rays

PhotonAssay® uses high-energy X-rays to rapidly determine the gold content of mineral ores. This reduces sample turnaround from weeks to hours, enabling improved mineral processing control that may increase gold recovery by 1% to 3%, significantly raising the profitability of mining operations — worth \$2 billion per year to the gold industry alone.

PhotonAssay also eliminates the need for hazardous substances in the assay process, which improves environmental impacts and worker safety. Australia's national science agency, CSIRO, developed this patented technology over 15 years, leading to the 2016 spin-out of Chrysos Corporation to commercialise it.

PhotonAssay has been deployed at two sites in Australia, and Chrysos has tested over 500,000 samples from over 60 customers including many international mines. The technology has been used to prepare industry-standard resource reports for companies including Novo Resources, Silver Lake Resources and Gold Road Resources.

Chrysos now employs 20 people, including scientists, software engineers, project managers and other operational roles. In late 2019, Chrysos facilitated the transaction of \$15m of its shares by founding shareholders, including CSIRO. CSIRO uses the returns from its equity portfolio to invest in more breakthrough science.

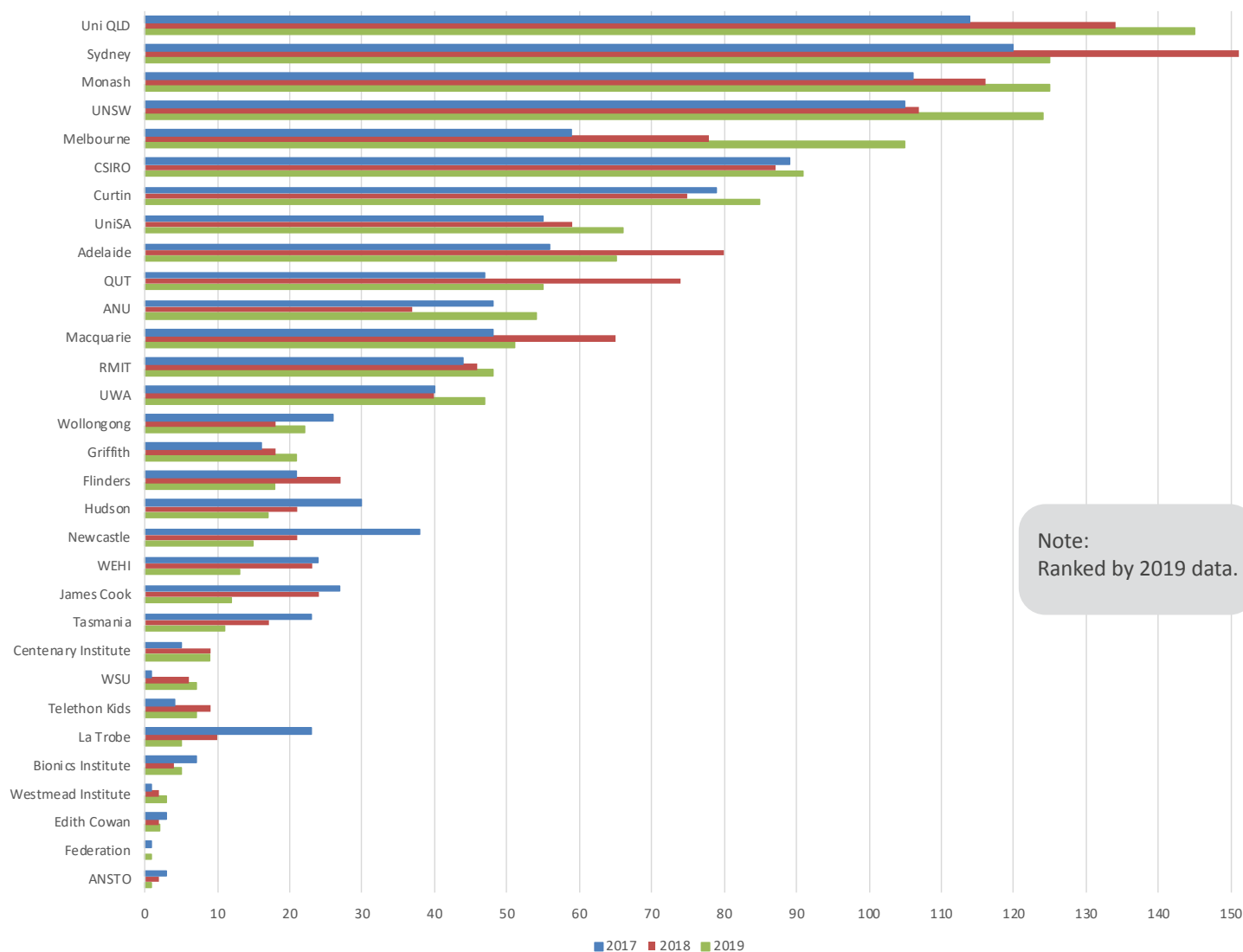
Chrysos recently announced that they have signed a deal with Kirkland Lake Gold Ltd to install the technology at its Fosterville Mine, representing the first agreement signed directly with a mining company (rather than a laboratory services provider) and an important diversification of its customer base.



INVENTION DISCLOSURES 2017-19



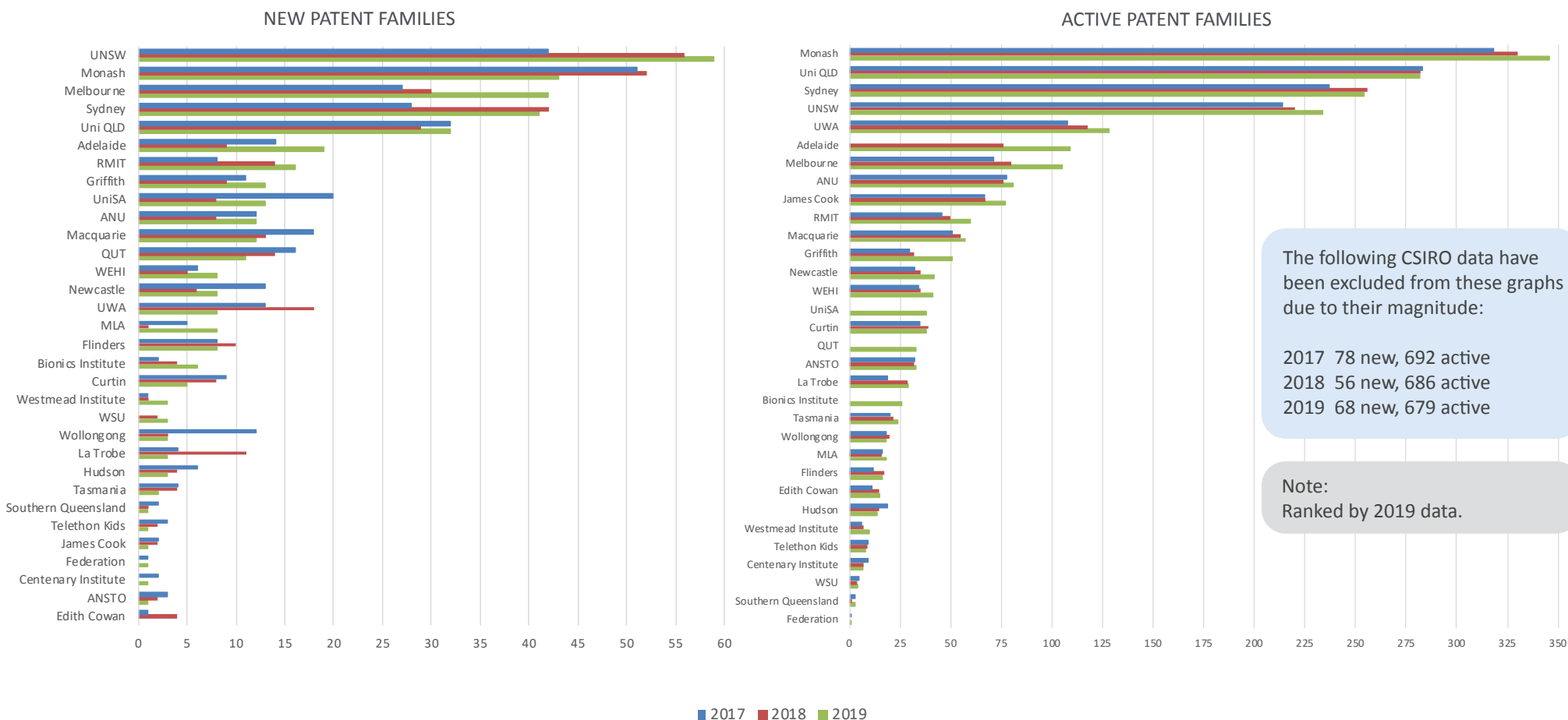
- An invention disclosure describes an invention (a technology or process) in detail and is used by the research organisation's tech transfer team to determine the invention's creators, novelty and potential for social impact and/or commercialisation.
- Reported disclosures include those managed by other institutions (national and international) where at least one of the inventors is from the reporting institution.



NEW AND ACTIVE PATENT FAMILIES 2017-19



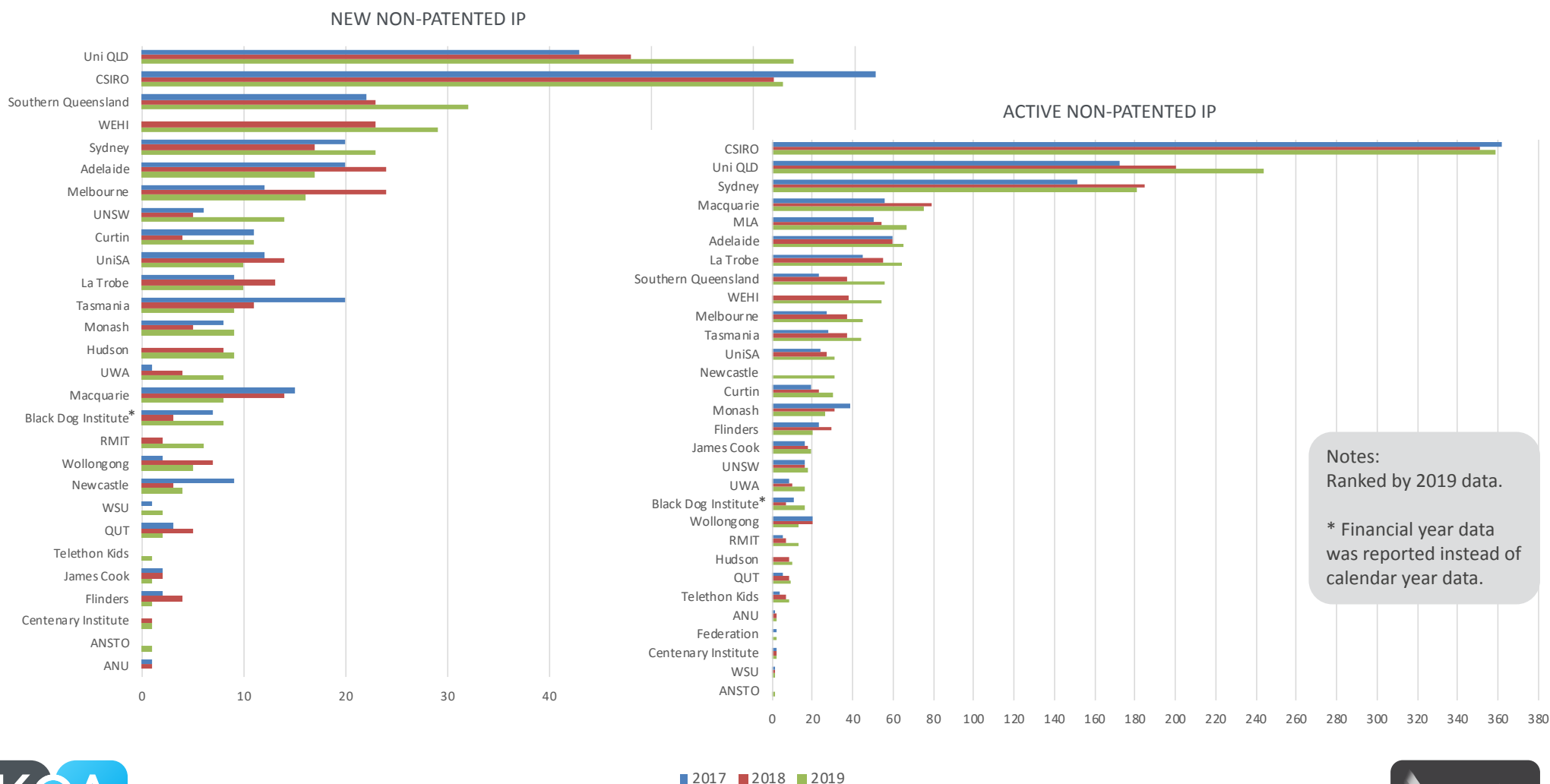
- New patents are applications first filed in 2019 – not follow-on filings (PCT, National, Continuation etc) – and are most likely to be Provisional applications.
- Active patents were filed in or before 2019 and have not expired.
- A patent family comprises all patent applications and follow-on filings for a single invention.
- Reported patent families include applications filed by other institutions (both national and international) where at least one of the inventors is from the reporting institution.



NEW AND ACTIVE NON-PATENTED IP 2017-19



- This includes all IP that is not, nor intended to be, the subject of a patent but is intended for commercialisation, such as plant breeders' rights, confidential know-how, registered designs, circuit layouts, trade secrets, software, trademarks, apps etc.
- It includes IP from other institutions (national and international) where at least one of the creators or inventors is from the reporting institution.
- It excludes copyright and IP such as know-how that is included with a patent as part of a commercial LOA.
- New non-patented IP was first identified in 2019. Active non-patented IP was identified in or before 2019.



RESEARCH COMMERCIALISATION CASE STUDY 3 Aussie varnish protects international masterpieces

Cautious and discerning art conservators use specialist varnishes made to exacting standards to preserve artworks, including masterpieces worth hundreds of millions of dollars. In 2014, the industry-leading MS2A varnish – developed in the UK in 1959 – went out of production and most of the technical knowledge behind it was lost.

In 2016, with MS2A stocks dwindling fast, the National Gallery of Victoria (NGV) approached the CSIRO about producing more. CSIRO researchers applied world-leading chemical expertise to develop a new, improved varnish called MS3.

After studying published information about the chemical structure of MS2A resin and working closely with NGV conservators, the CSIRO chemists were first able to recreate and then enhance the varnish by utilising flow chemistry, where a chemical reaction occurs in a controlled, continuously flowing stream. MS3 has better clarity and chemical stability than older synthetic and natural resins and can be produced with greater consistency.

As a niche, low-volume but high-value product, Melbourne-based chemical manufacturer Boron Molecular saw the opportunity MS3 presented, purchased the licence and commenced commercial production in 2019. MS3 is now being used in prominent galleries and museums all over the world, to protect valuable paintings for the benefit and appreciation of future generations.

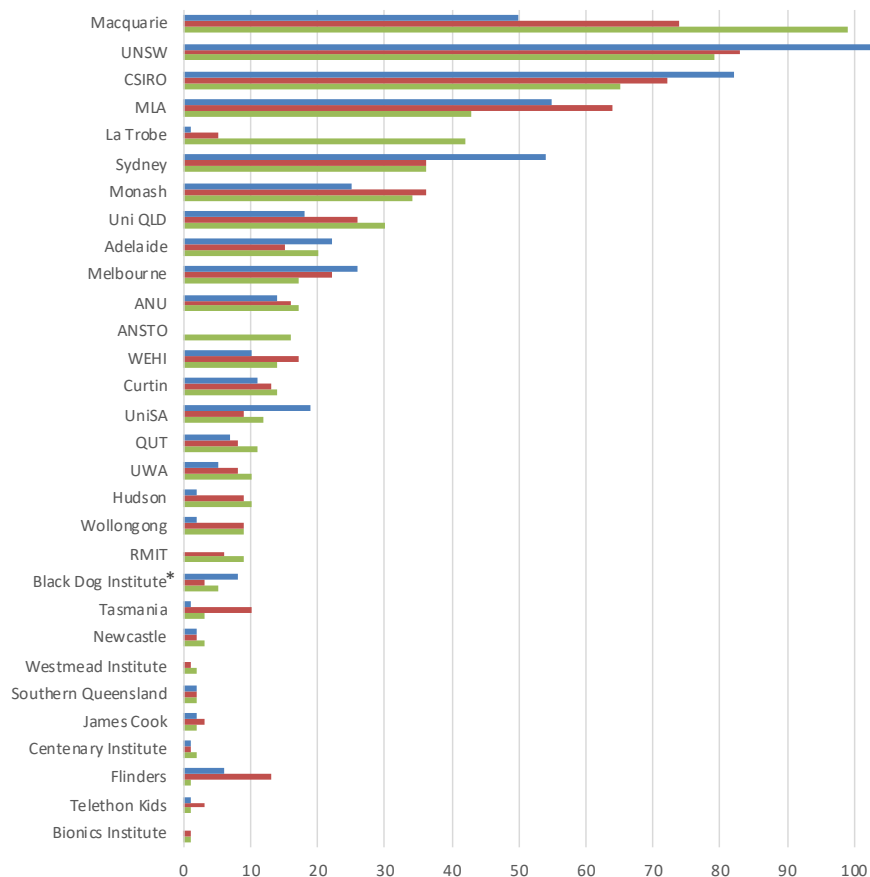


NEW AND ACTIVE LICENCES, OPTIONS AND ASSIGNMENTS (LOAs) 2017-19

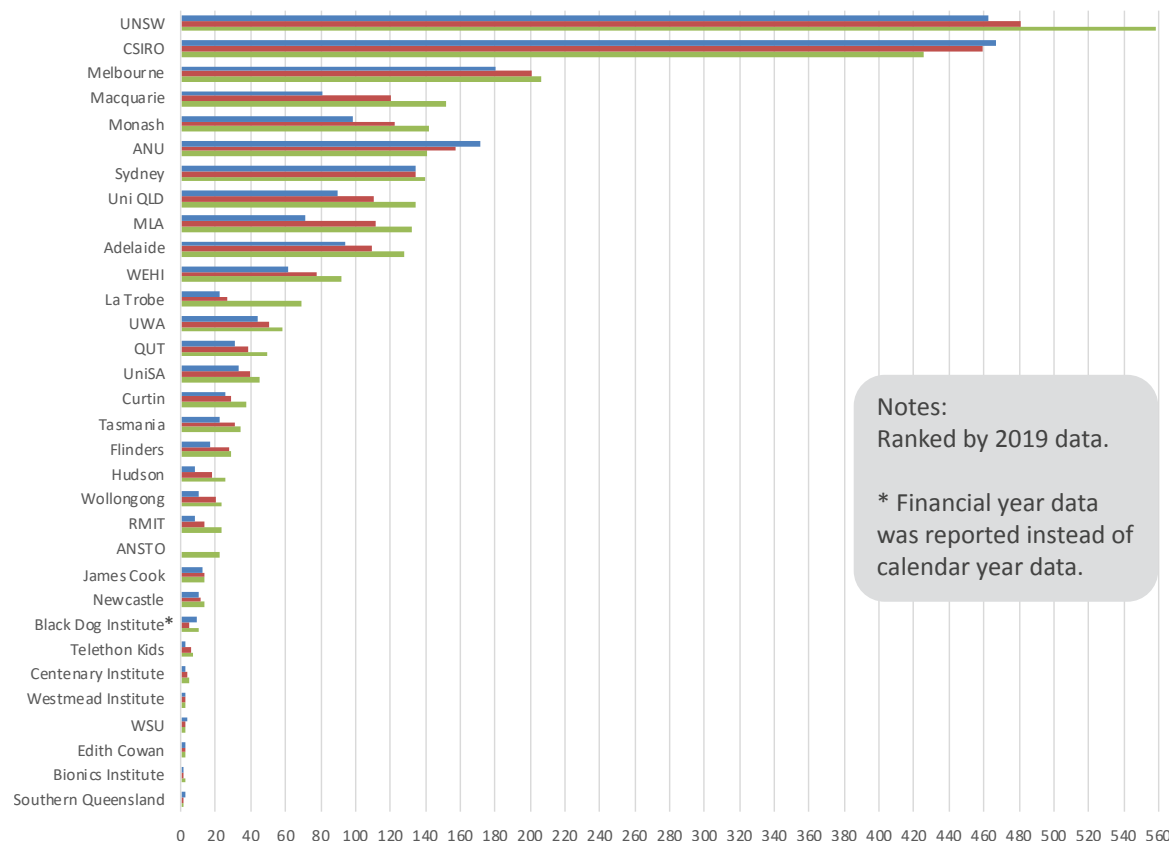


- LOAs count only when new IP is created. New LOAs commenced in 2019. Active LOAs commenced in or before 2019.
- Counted separately: each non-exclusive agreement; each new, stand-alone technology added to an existing LOA or in a multiple licence agreement.
- Counted only once: each commercial deal for a stand-alone technology (i.e. after an option has been signed, this is not counted again when the licence is exercised, nor when the IP is assigned) and multiple personal-use licences for a software product.
- Excluded: Copyright, Material Transfer Agreements, licences granting researchers freedom to operate under a research contract, provisions for the use of institutional background IP (unless this is the only IP in the LOA).

NEW LOAs



ACTIVE LOAs



Notes:
Ranked by 2019 data.

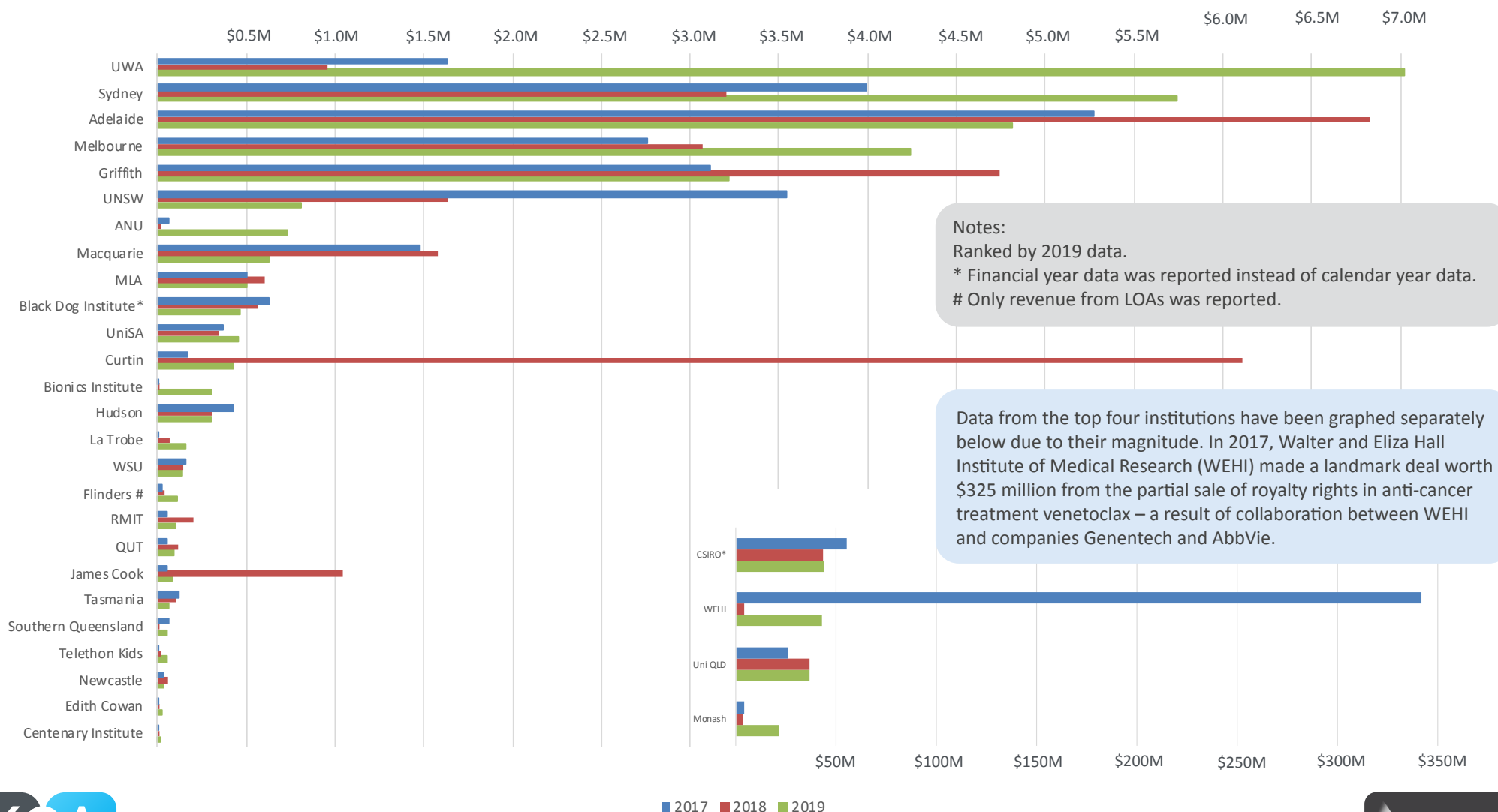
* Financial year data was reported instead of calendar year data.

■ 2017 ■ 2018 ■ 2019

COMMERCIALISATION REVENUE 2017-19



- Commercialisation revenue is the gross amount of income from all LOAs, material transfers and sales of products or services based on a research organisation's expertise or IP, plus cashed-in equity, minus any cost of acquiring the equity.
- Excluded: research funding, copyright income, non-cash value exchanged for equity holdings, value of equity not cashed-in, patent expense reimbursement, consultancies and contract research – unless or until new IP is created.

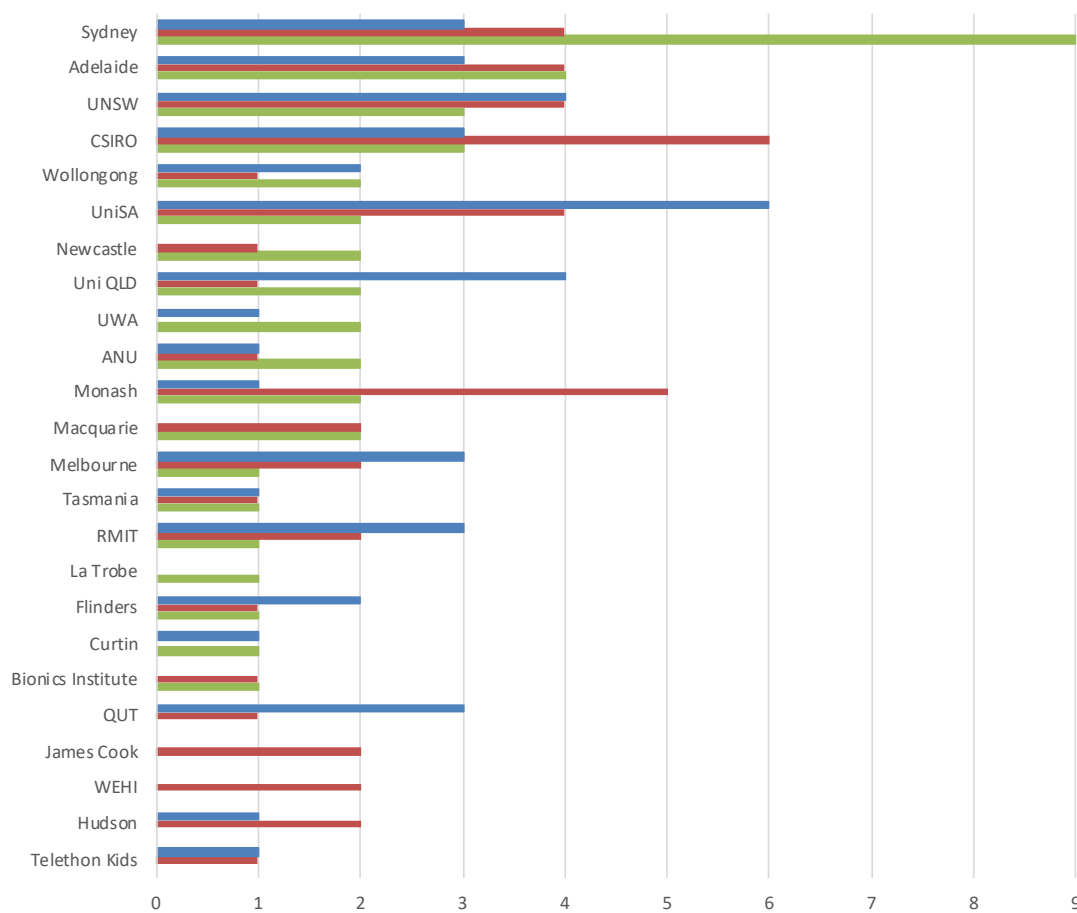


NEW AND ACTIVE START-UP AND SPIN-OUT COMPANIES 2017-19



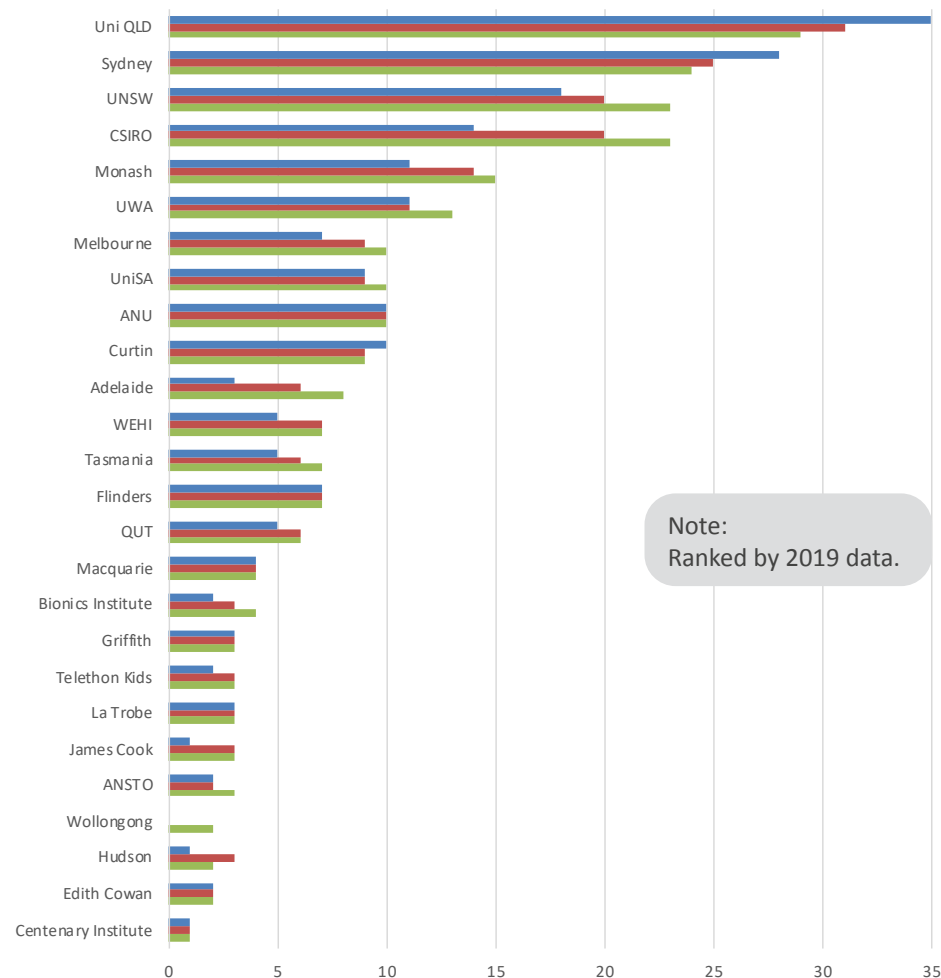
- Spin-out and start-up companies are founded through licensing or assignment of IP.
- Spin-outs are launched by the research organisation. Start-ups are launched by other parties through licensing or assignment of IP.
- New companies were incorporated in 2019. Active companies were incorporated in or before 2019. A company is active when it has sufficient financial resources to operate and make progress toward stated business goals.

NEW START-UPS AND SPIN-OUTS



■ 2017 ■ 2018 ■ 2019

ACTIVE START-UPS AND SPIN-OUTS



Note:
Ranked by 2019 data.

RESEARCH COMMERCIALISATION CASE STUDY 4 Giving a voice to people who can't verbalise their pain

85 percent of aged care residents with dementia experience pain but many cannot verbalise it and so express their suffering through difficult behaviour. Instead of pain relief, they are often given anti-psychotic drugs with side-effects including sedation that lead to falls, extended hospital stays, acute confusion and premature death.

To prevent this cascade, the PainChek® app – derived from Curtin University research – uses AI to recognise micro facial expressions of pain and a patented assessment system to objectively calculate a severity score. Carers can quickly assess patients from a safe distance, manage their pain appropriately, reduce behavioural issues and increase quality and length of life. The app seamlessly integrates with healthcare management systems to ensure best practice.

Responding to urgent market need – the current estimate of 50 million people with dementia is projected to rise to 152 million by 2050 – ePAT Pty Ltd was established in 2014 through private investment and listed as PainChek Ltd on the ASX in 2016. A \$5 million Federal Government grant in late 2019 has made the app available to 100,000 people living with dementia in residential aged care across Australia. By March 2020, 175 healthcare providers and 588 facilities were licensed to use the app and had completed more than 100,000 clinical pain assessments.

PainChek has expanded to New Zealand, Singapore and the UK and plans to enter Europe and the US. Although Curtin University has sold its shares in the company, its researchers continue to work with PainChek through a contractual agreement. In future, PainChek could also be used in hospitals, primary care and at home, and for non-verbal children and people with delirium, disabilities, or neuromuscular disorders or post-stroke.

