Knowledge
Commercialisation
Australasia

techtransfer.org.au

SURVEY OF COMMERCIAL OUTCOMES FROM PUBLIC RESEARCH (SCOPR)

2020 REPORT

Survey and report delivered by

FOREWORD

Coming from a big family, I always had people around me that I could compare myself to, and measure myself against, to see if I was making progress. There was lots of data available allowing me to test, in a positive way, the progress I was making at school or sport.

How would I know I was improving if I didn't have a benchmark? The extended group fitted the bill.

It's the same for innovation, particularly when we consider the financial and human investment that we make. How do we make progress if we don't have good data that measures what we are doing? And what does successful innovation look like?

For some time Australia has been focusing on improving how we evaluate and measure our investment in research and innovation to ensure we are on the right path.

The second Survey of Commercial Outcomes from Public Research (SCOPR) report, built on the prior work of the Department of Industry, Science, Energy and Resources National Survey of Research Commercialisation (NSRC), is a welcome advance in our knowledge of how Australian research translation is faring. I congratulate Knowledge Commercialisation Australia and gemaker on producing a useful dataset for its respondents and a complete report as a whole.

One of my goals as Australia's Chief Scientist is to influence how we as a nation can increase our research translation efforts to achieve impact for society. Having access to information such as that contained in the SCOPR report will mean those working towards successful research commercialisation will have more tools to support their work, and build understanding of the important role they play in the process.

Dr Catherine P. Foley AO PSM
Australia's Chief Scientist

August 2021

CONTENTS

DISCLAIMER

INTRODUCTION

The **Survey of Commercialisation Outcomes from Public Research (SCOPR)** is conducted annually by **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, rural research corporations 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 research-industry engagement and research commercialisation.

KCA developed SCOPR to replace the **National Survey of Research Commercialisation**, produced from 2000-2016 by the Department of Industry, Science, Energy and Resources, and works closely with the Department to share the critical information collected by SCOPR. KCA contracted **gemaker**, an award-winning Australian commercialisation consultancy, to conduct the survey and deliver the report.

Participation in SCOPR is voluntary. Last year, 49 Australian and New Zealand research organisations participated in the inaugural SCOPR, providing data for 2017, 2018 and 2019. We now have four years of data as 56 organisations participated this year – a pleasing increase. The survey's 15 metrics can be grouped into three categories: normalising metrics; contracts and inventions; and the revenue these generate. In addition to this public summary report, a complete data set is available to participants.

In this year's survey an invitation was extended to respondents to provide case studies of their organisations' commercialisation activities. This report includes six such case studies.

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 (ATTP). Although they comprise a small proportion of the staff of any research organisation, **technology transfer professionals (TTPs)** are key to their organisations' real-world impact. TTPs 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.

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	John Grace AO	Natalie Chapman
Chair KCA	Chair SCOPR Committee	Managing Director gemaker

SCOPR RESPONDENTS 2021 (REPORTING DATA FOR 2020)

AUSTRALIA 39 respondents

UNIVERSITIES (25)

- Australian Catholic University (ACU)
- Australian National University (ANU)
- Central Queensland University (CQU)
- Curtin University (Curtin)
- Deakin University (Deakin)
- Edith Cowan University (Edith Cowan)
- Federation University Australia (Federation)
- Griffith University (Griffith)
- La Trobe University (La Trobe)
- Macquarie University (Macquarie)
- Monash University (Monash)
- Queensland University of Technology (QUT)
- RMIT University (RMIT)
- Swinburne University of Technology (Swinburne)
- University of Adelaide (Adelaide)
- University of Melbourne (Melbourne)
- University of Newcastle (Newcastle)
- University of New South Wales (UNSW)
- University of Queensland (Uni QLD)
- University of Southern Queensland (USQ)
- University of Sydney (Sydney)
- University of Tasmania (Tasmania)
- University of Technology Sydney (UTS)
- University of Western Australia (UWA)
- University of Wollongong (UOW)

MEDICAL RESEARCH INSTITUTES (10)

- Baker Heart and Diabetes Institute (Baker Institute)
- Centenary Institute of Cancer Medicine and Cell Biology (Centenary Institute)
- Children's Medical Research Institute (CMRI)
- Garvan Institute of Medical Research (Garvan)
- Murdoch Children's Research Institute (MCRI)
- Neuroscience Research Australia (NeuRA)
- Peter MacCallum Cancer Centre (PeterMac)
- St Vincent's Institute of Medical Research (SVI)
- Telethon Kids Institute (Telethon Kids)
- WEHI

OTHER PUBLIC RESEARCH ORGANISATIONS (2)

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

OTHER RESEARCH ORGANISATIONS (2)

- Meat and Livestock Australia Limited (MLA)
- Grains Research and Development Corporation (GRDC)

NEW ZEALAND 17 respondents

Note: Kiwi Innovation Network Limited (KiwiNet) provided aggregated data for all organisations except the University of Auckland.

UNIVERSITIES (7)

- Auckland University of Technology
- Lincoln University
- Massey University
- Victoria University of Wellington
- University of Auckland (Auckland)
- University of Canterbury
- University of Waikato

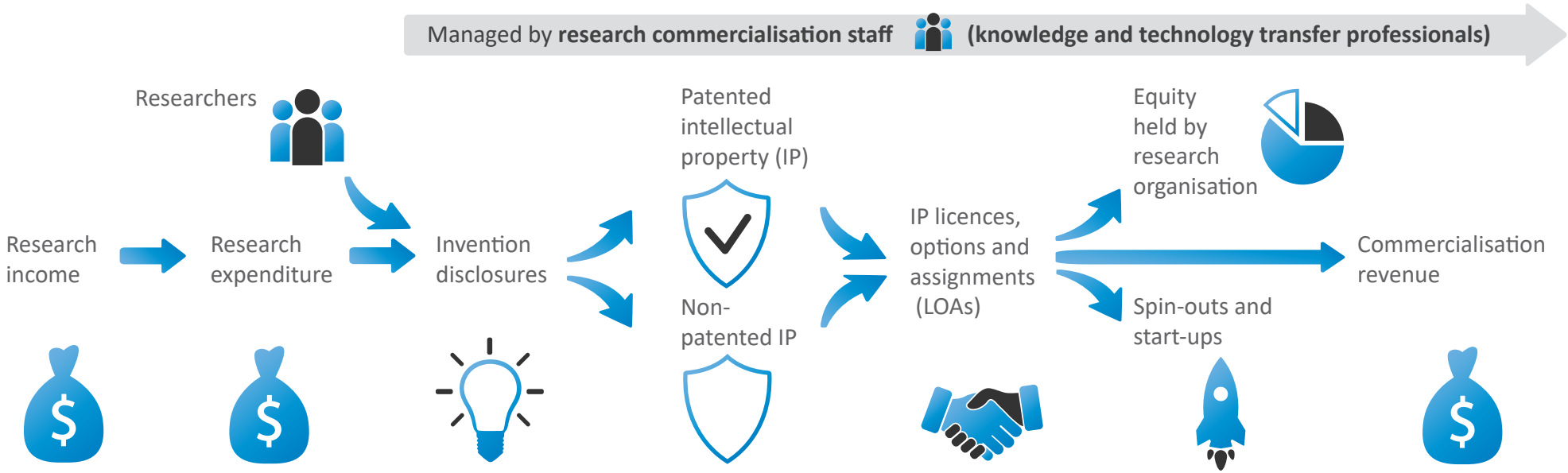
MEDICAL RESEARCH INSTITUTES (2)

- Malaghan Institute of Medical Research
- Health Innovation Hub

OTHER PUBLIC RESEARCH ORGANISATIONS (8)

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

SCOPR MEASURES



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

For other organisations, research income includes equivalent types.

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

Research contracts are a key means of commercialising the capabilities of research organisations.

An **invention disclosure** describes an invention in detail and is used to determine its creators, novelty and potential for social impact and/or commercialisation.

Intellectual property is novel proprietary knowledge. It can be an invention, trade mark, design, brand, or application of an idea.

A **patent** grants an inventor exclusive rights to the IP for a designated period in exchange for a comprehensive disclosure of the invention.

Non-patented IP includes plant breeders' rights, confidential know-how, registered designs, circuit layouts, trade secrets, software, trademarks, apps etc.

Licences grant another party (licensee) the rights to make/sell/use the IP owned by the licensor.

Options grant the potential licensee time to evaluate the IP and negotiate the terms of a licence agreement.

Assignments convey all rights and title to, and interest in, the licensed IP to the assignee.

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.

In either case, the research organisation may hold **equity** (a share of ownership) in the company.

Commercialisation revenue is gross income from all LOAs, commercial material transfers and sales of products or services based on 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.

RESEARCH COMMERCIALISATION OUTCOMES: AGGREGATED DATA 2017-2020

		Invention disclosures	New non-patented IP	New patent applications	New licences, options and assignments	Research commercialisation staff (FTE)
AUSTRALIA	**2020**	1393	261	427	626	236
39 respondents in 2021 (2020 data)	**2019**	1355	363*	455	609	
34 respondents in 2020 (2017-19 data)	**2018**	1362	330*	428	567	
	2017	1263	294*	454	588	
NEW ZEALAND	**2020**	478	173	81	35	89
17 respondents in 2021 (2020 data)	**2019**	274	69	144	not reported	
15 respondents in 2020 (2017-19 data)	**2018**	154	58	80	not reported	
	2017	186	47	90	not reported	

Notes:

- Not all respondents reported data for all measures.
- * Historical data corrected

RESEARCH COMMERCIALISATION OUTCOMES: AGGREGATED DATA


		New spin-outs and start-ups	Active spin-outs and start-ups	Equity held by research orgs in spin-outs and start-ups	Commercialisation revenue	Value of research contracts with for-profit companies
AUSTRALIA	**2020**	54	256	$555 M	$242 M	$737 M
39 respondents in 2021 (2020 data)	**2019**	42	231	$262 M	$179 M*	
34 respondents in 2020 (2017-19 data)	**2018**	48	217	$178 M	$119 M	
	2017	43	199	$146 M	$452 M#	
NEW ZEALAND	**2020**	8	67	NZ$88 M	NZ$199 M	NZ$546 M
17 respondents in 2021 (2020 data)	**2019**	10	60	not reported	NZ$81 M	
15 respondents in 2020 (2017-19 data)	**2018**	10	50	not reported	not reported	
	2017	5	45	not reported	not reported	

In 2017, WEHI received $325 M from the partial sale of royalty rights in anti-cancer treatment venetoclax – a result of collaboration with companies Genentech and AbbVie.

Notes:

- Not all respondents reported data for all measures.

* Historical data corrected

RESEARCH COMMERCIALISATION CASE STUDY 1

OxyGenie helps premature babies breathe

Prematurely born babies often struggle to breathe. Traditional respiratory support devices require ongoing manual adjustment of delivered oxygen by vigilant bedside staff to keep babies' blood oxygen levels in a narrow safe range.

OxyGenie is an automated system that controls delivered oxygen, substantially reducing periods of too-low or too-high oxygen, decreasing the risk for pre-term infants of long-term cognitive effects, permanent organ damage and mortality, and providing reassurance to their families.

It also lessens the burden on health systems related to labour-intensive manual control of oxygen delivery.

OxyGenie is a result of a decade-long interdisciplinary collaboration between Tasmanian engineers, medical researchers, and clinicians, led by Professor Peter Dargaville (Menzies Institute for Medical Research; Tasmanian Health Service) and Dr Timothy Gale (University of Tasmania).

In 2018, the University of Tasmania granted UK-based medical device firm SLE Ltd a licence to commercialise the patented closed-loop oxygen delivery technology. SLE incorporated the technology into their flagship ventilator, the SLE6000, naming the new module the OxyGenie. This unique advantage has driven sales in more than 40 countries.

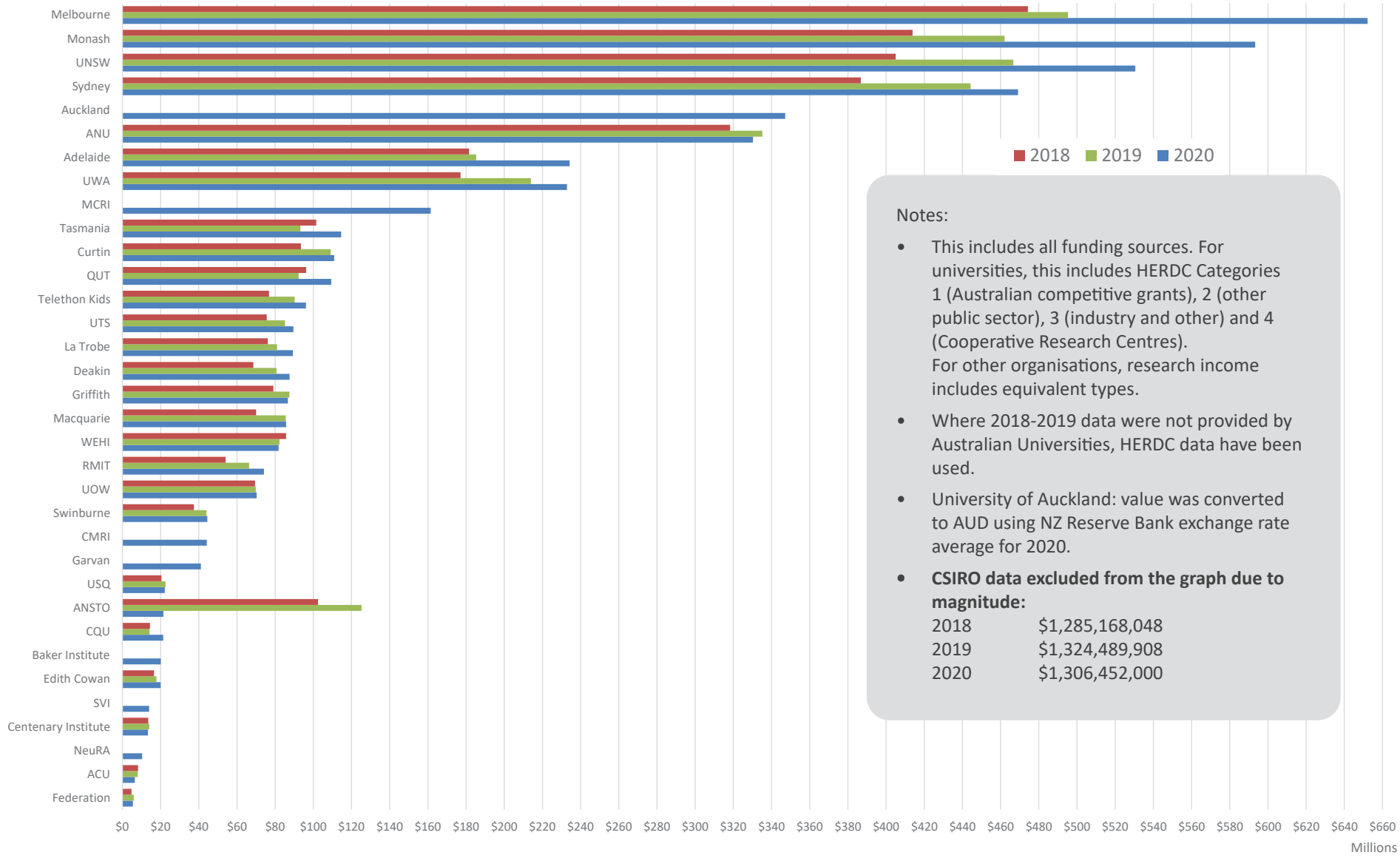
The OxyGenie team received the 2020 *Minister's Tasmanian STEM Innovation of the Year Award*, and a prestigious 2021 *Queen's Award* for Enterprise in the category of Innovation.

GRAPHS OF 2018-2020 DATA

Key metrics have been summarised for 2018-2020 in the graphs below. In all following graphs of the SCOPR measures, organisations are ranked by 2020 data. Where an organisation either did not provide data for 2020, or provided the answer zero, they have been excluded from that graph, even when historic data were provided. All graphs report data for the current year plus the previous two years.

KiwiNet's partner organisations participated in the survey as a consortium therefore, data relating to individual organisations was not included in the graphs.

RESEARCH INCOME (AUD) 2018-2020

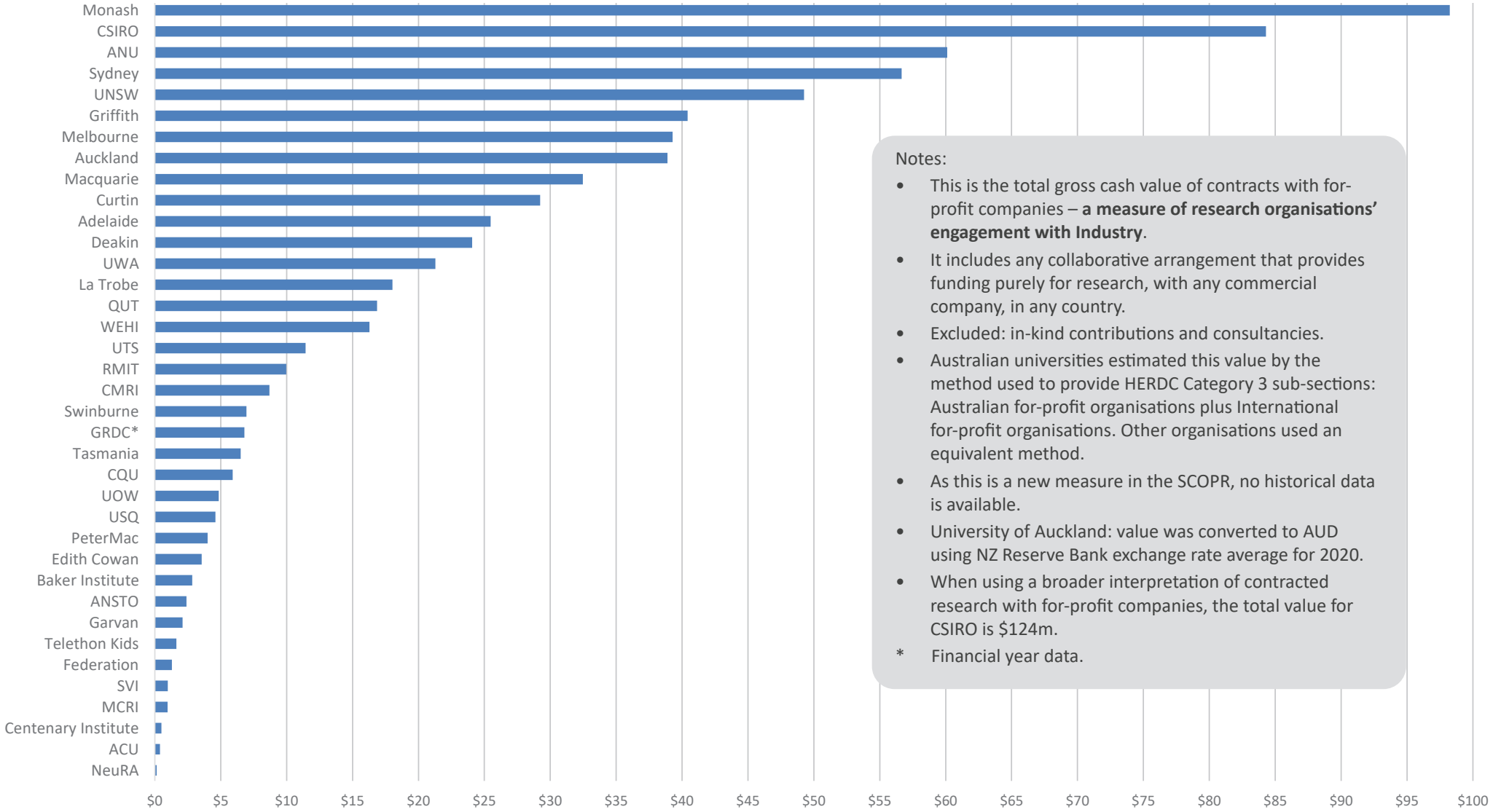


Notes:

- This includes all funding sources. For universities, this includes 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.
- Where 2018-2019 data were not provided by Australian Universities, HERDC data have been used.
- University of Auckland: value was converted to AUD using NZ Reserve Bank exchange rate average for 2020.
- **CSIRO data excluded from the graph due to magnitude:**

2018	$1,285,168,048
2019	$1,324,489,908
2020	$1,306,452,000

VALUE OF RESEARCH CONTRACTS FROM FOR-PROFIT COMPANIES (AUD) 2020

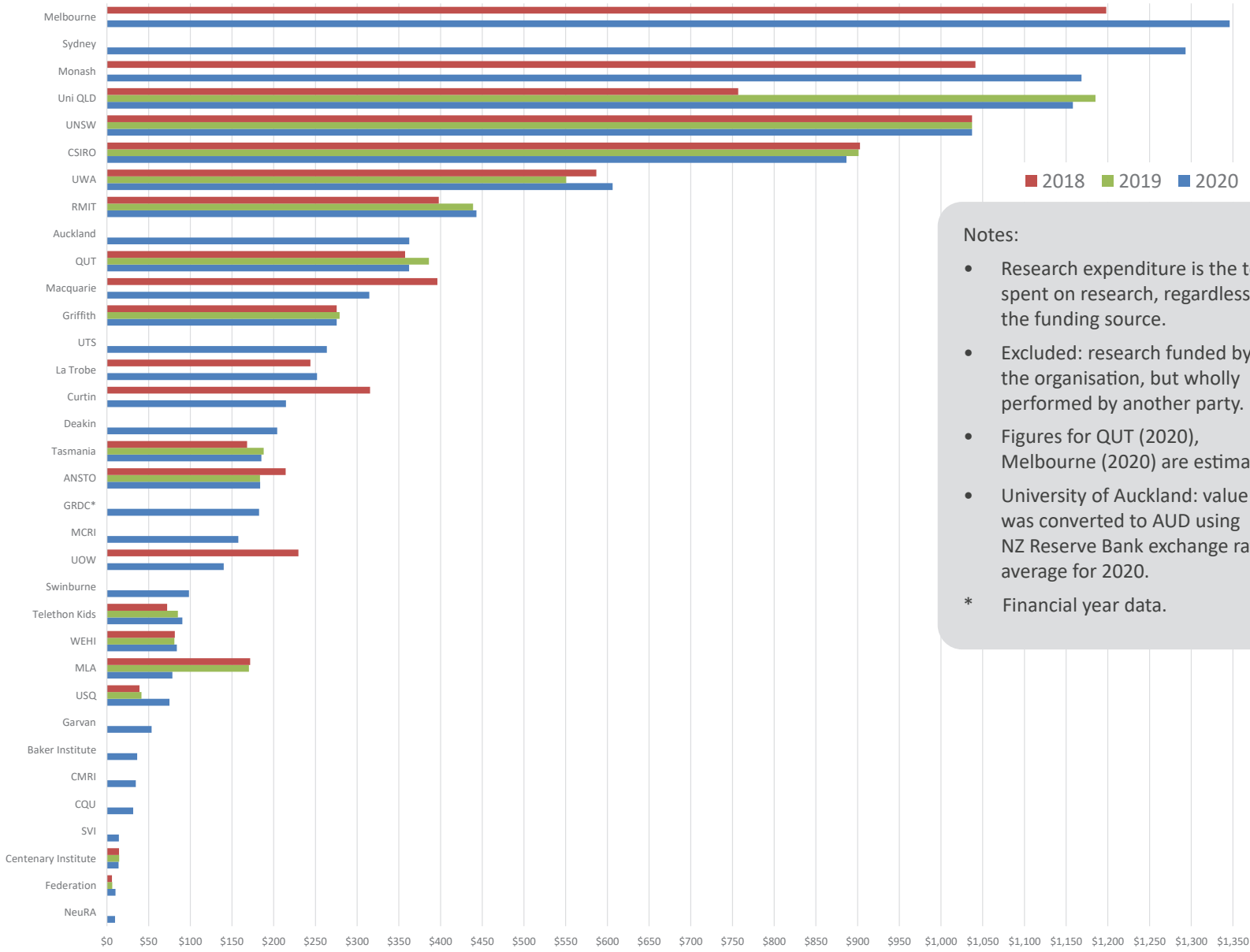


Notes:

- This is the total gross cash value of contracts with for-profit companies – **a measure of research organisations' engagement with Industry**.
- It includes any collaborative arrangement that provides funding purely for research, with any commercial company, in any country.
- Excluded: in-kind contributions and consultancies.
- Australian universities estimated this value by the method used to provide HERDC Category 3 sub-sections: Australian for-profit organisations plus International for-profit organisations. Other organisations used an equivalent method.
- As this is a new measure in the SCOPR, no historical data is available.
- University of Auckland: value was converted to AUD using NZ Reserve Bank exchange rate average for 2020.
- When using a broader interpretation of contracted research with for-profit companies, the total value for CSIRO is $124m.

* Financial year data.

RESEARCH EXPENDITURE (AUD) 2018-2020



Notes:

- Research expenditure is the total spent on research, regardless of the funding source.
- Excluded: research funded by the organisation, but wholly performed by another party.
- Figures for QUT (2020), Melbourne (2020) are estimates.
- University of Auckland: value was converted to AUD using NZ Reserve Bank exchange rate average for 2020.

* Financial year data.

RESEARCH COMMERCIALISATION CASE STUDY 2

PERC technology energises the global solar industry

To reduce carbon emissions and mitigate climate change and other negative environmental impacts, global economies are transitioning away from fossil fuels for energy generation.

Solar cells are emerging as the cheapest option for bulk electricity supply in most countries, largely due to the adoption of high-efficiency Passivated Emitter and Rear Cell (PERC) technology. Worldwide, over 90% of solar cells produced in 2020 used PERC technology.

This technology was invented in 1983 by Professor Martin Green (pictured) at the University of New South Wales (UNSW) and was the first solar cell to achieve 23% efficiency. The UNSW research team continued to optimise the design and break world records for solar cell efficiency for the next 30 years.

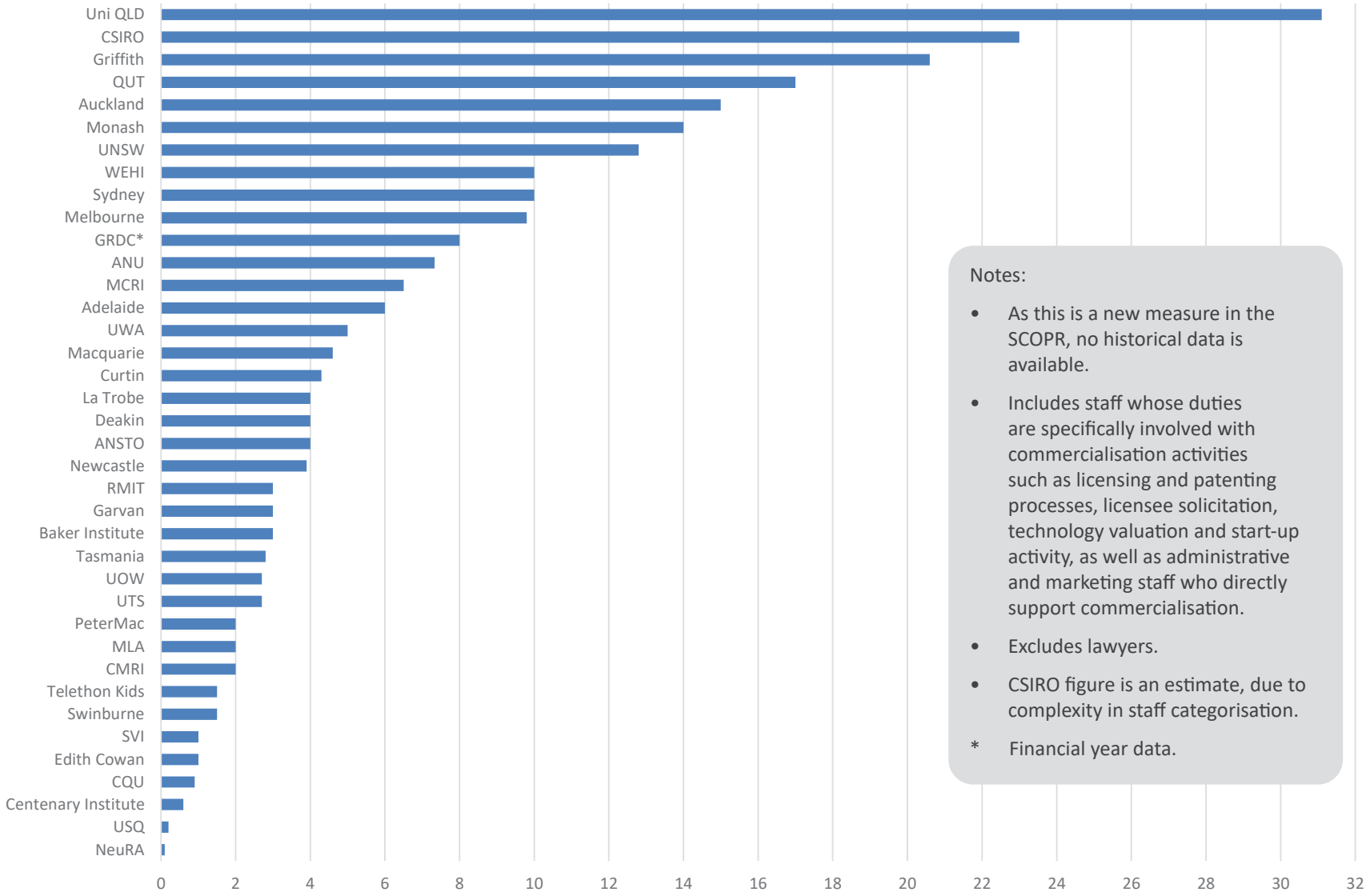
When their laboratory-scale PERC cells achieved 25% efficiency, the team focused on developing processes for large-scale manufacturing. From 2002, the team collaborated with industry partners and UNSW alumni, Suntech and Sunrise Global, to adapt PERC technology for commercial production.

This partnership created the world's first low-cost solar cell with efficiency over 20%: a 'p-type' cell called Pluto, launched in 2011. PERC technology was subsequently adopted by the major solar cell manufacturers worldwide.

The technology has dramatically reduced the cost of solar energy, accelerating the switch to cleaner power and cutting damaging emissions. Sales of systems using PERC exceeded US$130 billion in 2020 and are predicted to exceed US$1 trillion by 2030.

Photo credit: Anna Kucera

RESEARCH COMMERCIALISATION STAFF (FULL-TIME EQUIVALENT) 2020

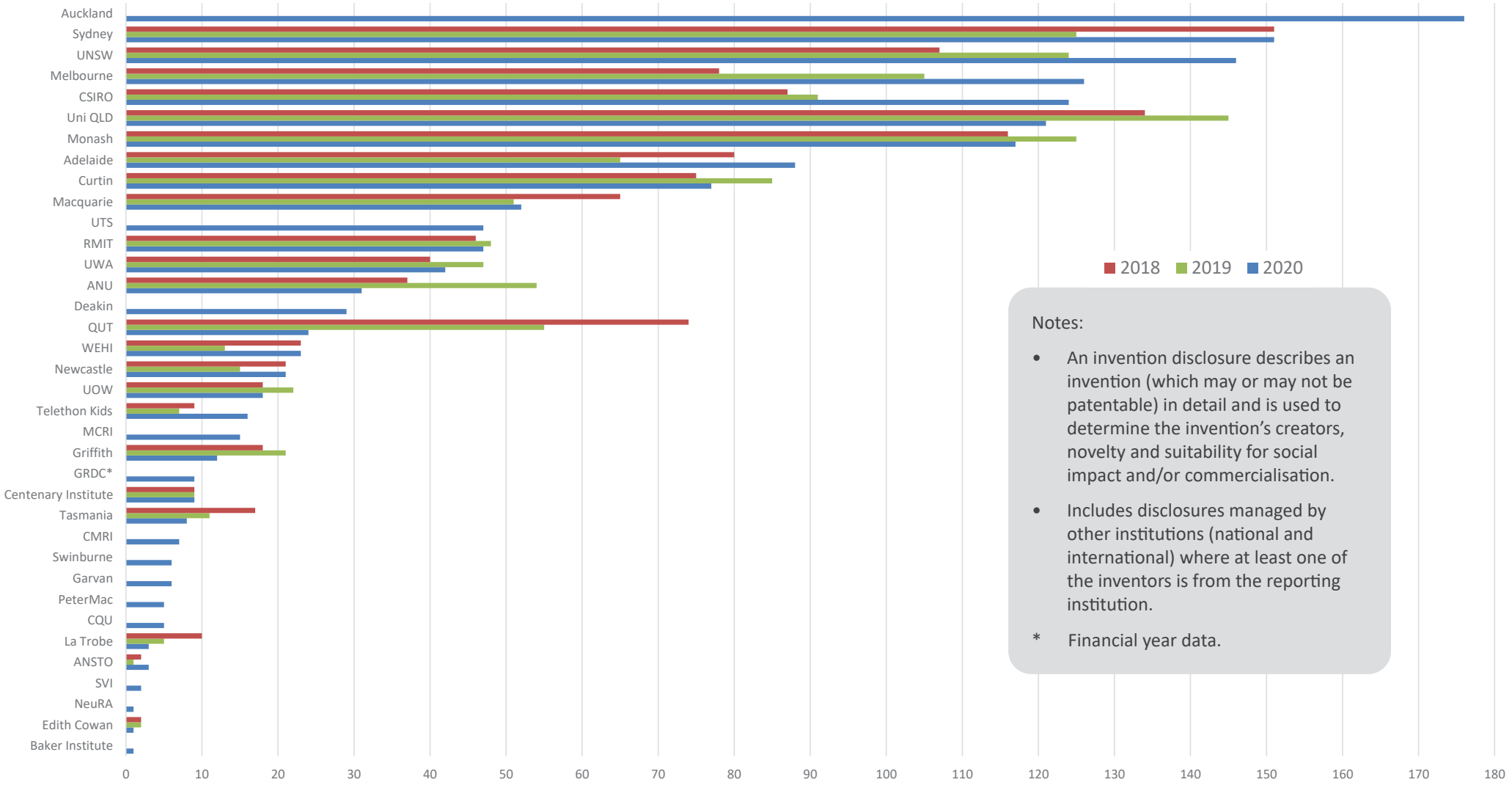


Notes:

- As this is a new measure in the SCOPR, no historical data is available.
- Includes staff whose duties are specifically involved with commercialisation activities such as licensing and patenting processes, licensee solicitation, technology valuation and start-up activity, as well as administrative and marketing staff who directly support commercialisation.
- Excludes lawyers.
- CSIRO figure is an estimate, due to complexity in staff categorisation.

* Financial year data.

INVENTION DISCLOSURES 2018-2020



Notes:

- An invention disclosure describes an invention (which may or may not be patentable) in detail and is used to determine the invention's creators, novelty and suitability for social impact and/or commercialisation.
- Includes disclosures managed by other institutions (national and international) where at least one of the inventors is from the reporting institution.

* Financial year data.

RESEARCH COMMERCIALISATION CASE STUDY 3

Coviu video telehealth platform goes viral

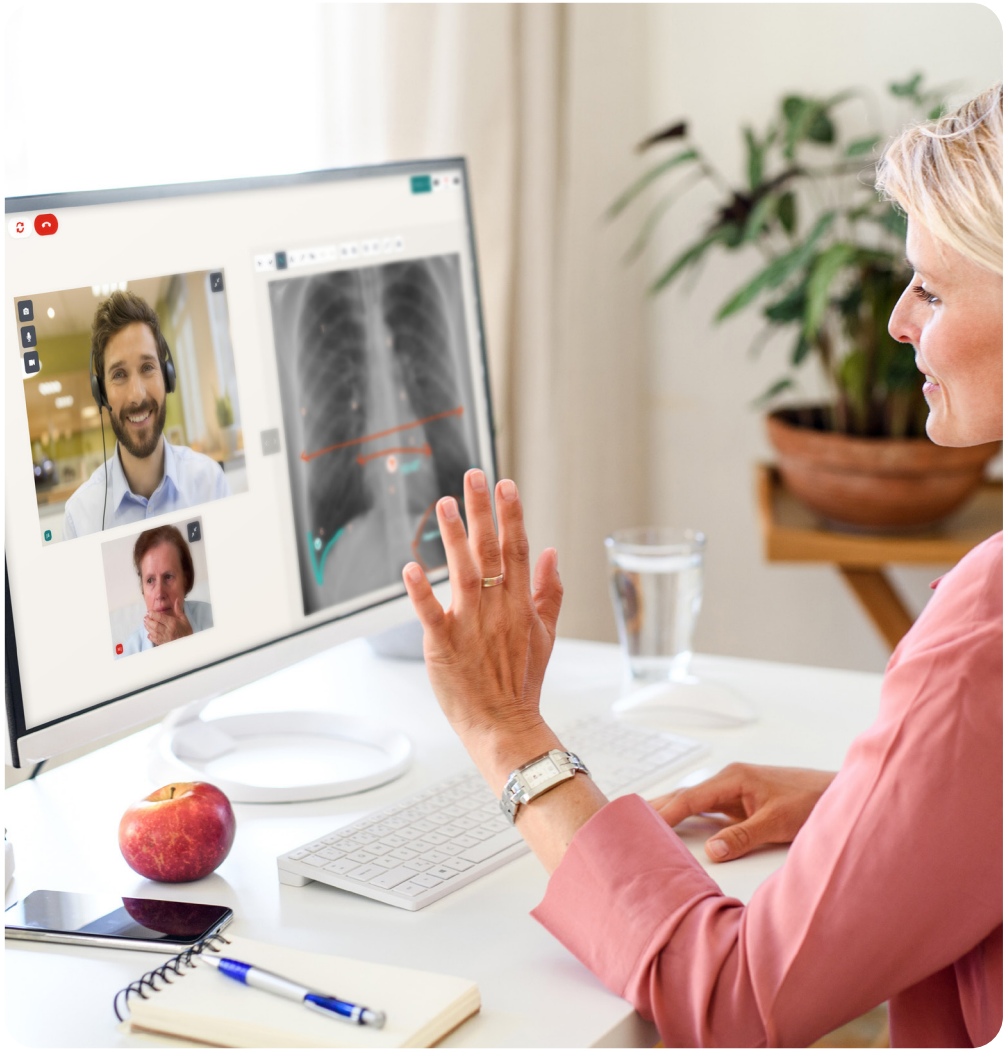
With lockdowns and social distancing accelerating global adoption of telehealth, Coviu's growth has accelerated too. Coviu's purpose-built, secure, feature-rich platform has enabled 65,000+ Australian health carers to deliver more than 4.3 million remote consultations, and has become the Australian Government's video telehealth platform of choice. In 2020, Coviu ranked 2nd on Deloitte's list of fastest growing companies with 11,553% growth.

Benefits include reduced no-shows, waiting time, travel and other costs, as well as increased patient satisfaction and service flexibility. Ideal for rural and remote areas and for elderly, disabled or otherwise immobile people, Coviu also allows busy families and professionals to avoid travel and time out to see a doctor.

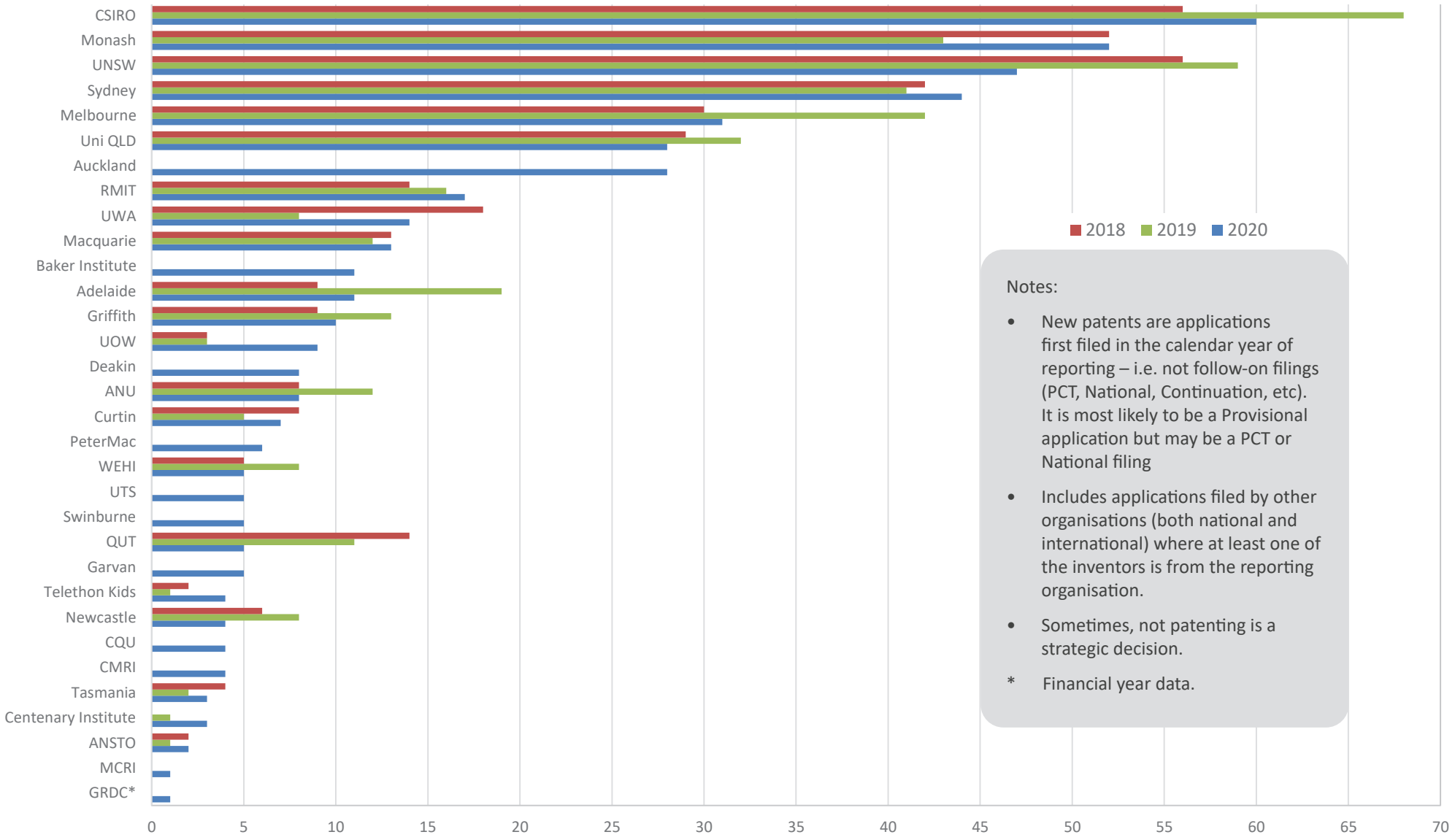
The latest version of the platform boasts AI-enhanced clinical tools and integrates with practice management systems to facilitate appointment bookings, patient triaging, prescription fulfilment, in-call payments, and Medicare reimbursements. Users can also draw diagrams on an interactive 'whiteboard' to help explain diagnoses and treatments.

Coviu's IP sprang from NICTA (National Information and Communications Technology Australia Ltd – a Research Centre of Excellence) with input from clinicians and healthcare businesses. Its development continued when NICTA became part of CSIRO's Data61 in 2015, and when the company spun out with investment from Main Sequence Ventures in 2018.

In 2020, Coviu concluded a further A$6 million investment round. Through continuous innovation and end-user consultation, Coviu aims to make video visits the new standard of care.



NEW PATENT FAMILIES 2018-2020

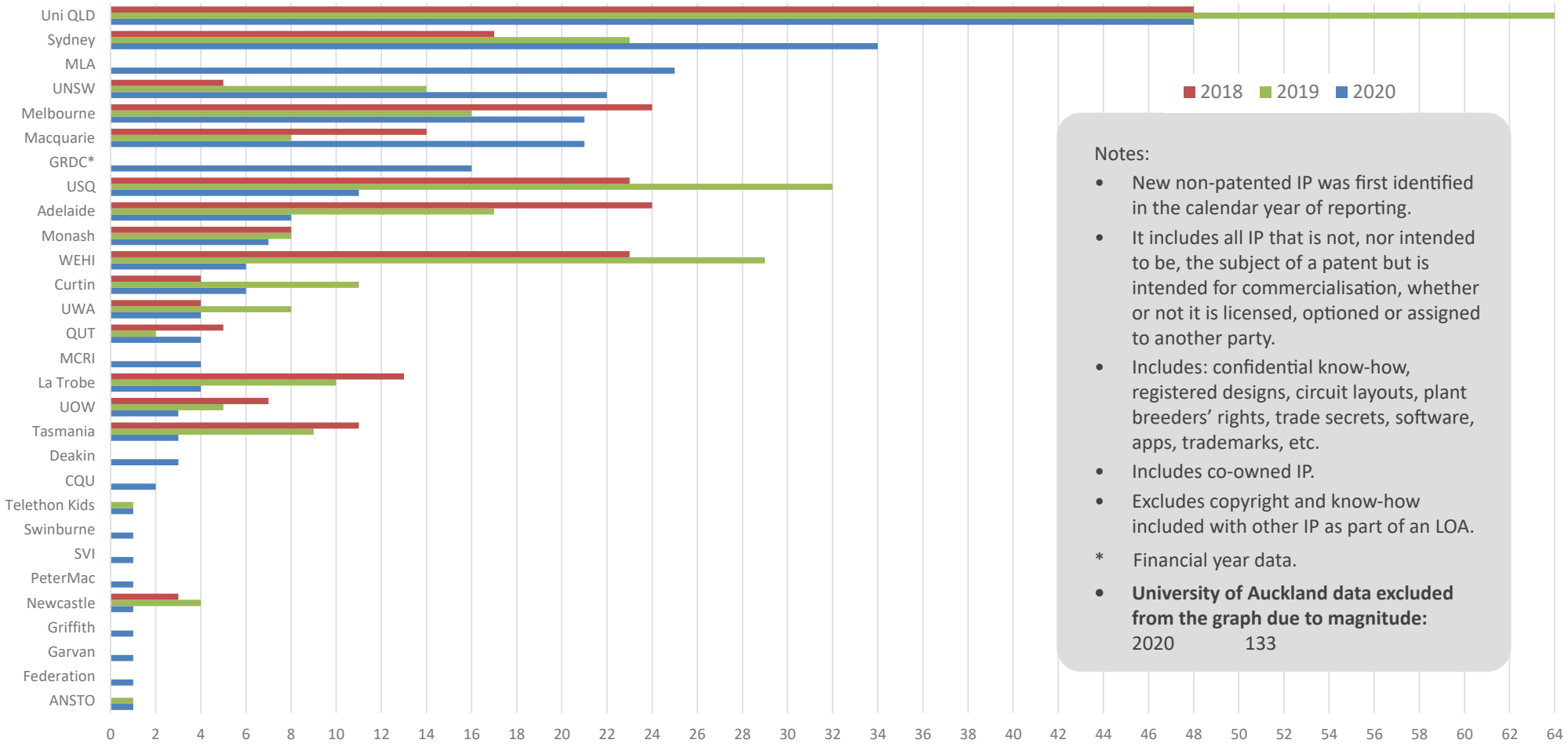


Notes:

- New patents are applications first filed in the calendar year of reporting – i.e. not follow-on filings (PCT, National, Continuation, etc). It is most likely to be a Provisional application but may be a PCT or National filing
- Includes applications filed by other organisations (both national and international) where at least one of the inventors is from the reporting organisation.
- Sometimes, not patenting is a strategic decision.

* Financial year data.

NEW NON-PATENTED IP 2018-2020



Notes:

- New non-patented IP was first identified in the calendar year of reporting.
- It includes all IP that is not, nor intended to be, the subject of a patent but is intended for commercialisation, whether or not it is licensed, optioned or assigned to another party.
- Includes: confidential know-how, registered designs, circuit layouts, plant breeders' rights, trade secrets, software, apps, trademarks, etc.
- Includes co-owned IP.
- Excludes copyright and know-how included with other IP as part of an LOA.

* Financial year data.

- **University of Auckland data excluded from the graph due to magnitude:**
  2020 133

RESEARCH COMMERCIALISATION CASE STUDY 4

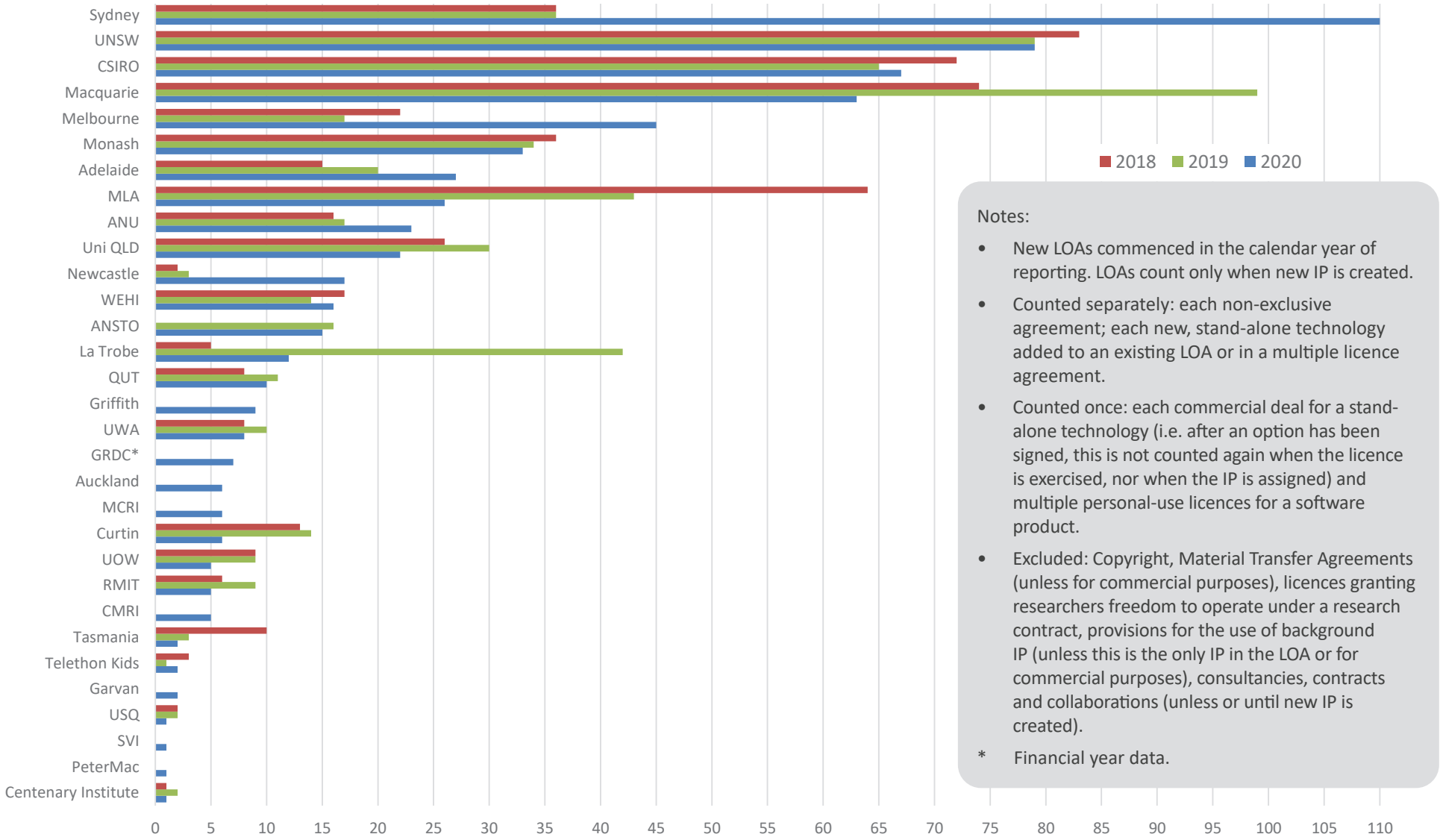
Making invisible radiation visible to keep workers safe

To improve the safety of workers in radioactive environments, ANSTO, the home of Australian expertise in nuclear science and technology, has developed novel radiation imaging technology. CORIS360® can quickly, accurately, and efficiently locate, identify and visualise radiation sources. Compact and portable, with a 360° × 90° field of view, CORIS360 can be remotely operated, protecting personnel from radiation exposure. Applications include nuclear security, defence, radiation services, health physics, and nuclear decommissioning.

Globally, more than 365 nuclear reactors have been retired from operation but are yet to be decommissioned. CORIS360 is specifically designed to address this challenge. Traditional radiation imaging methods require up to 10 times more sampling than CORIS360, which uses compressed sensing techniques to produce precise, high-quality images while saving time and money. In a recent decommissioning project, CORIS360 reduced radiation mapping time by months, delivering savings of more than A$430,000. In addition, as CORIS360 accurately identifies radioactive materials, these can be segregated from non-radioactive building waste, which can then be recycled or disposed of at much lower cost.

Prototypes were tested internationally in a wide range of operational environments to gain user feedback that informed the design of a simple, intuitive, and attractive user experience. CORIS360 helps non-experts understand complex radiation environments through the visualisation of radiation across the full energy range. It has received Conformité Européenne (CE) accreditation and ongoing product demonstrations are driving domestic and global sales.

NEW LICENCES, OPTIONS AND ASSIGNMENTS (LOAs) 2018-2020

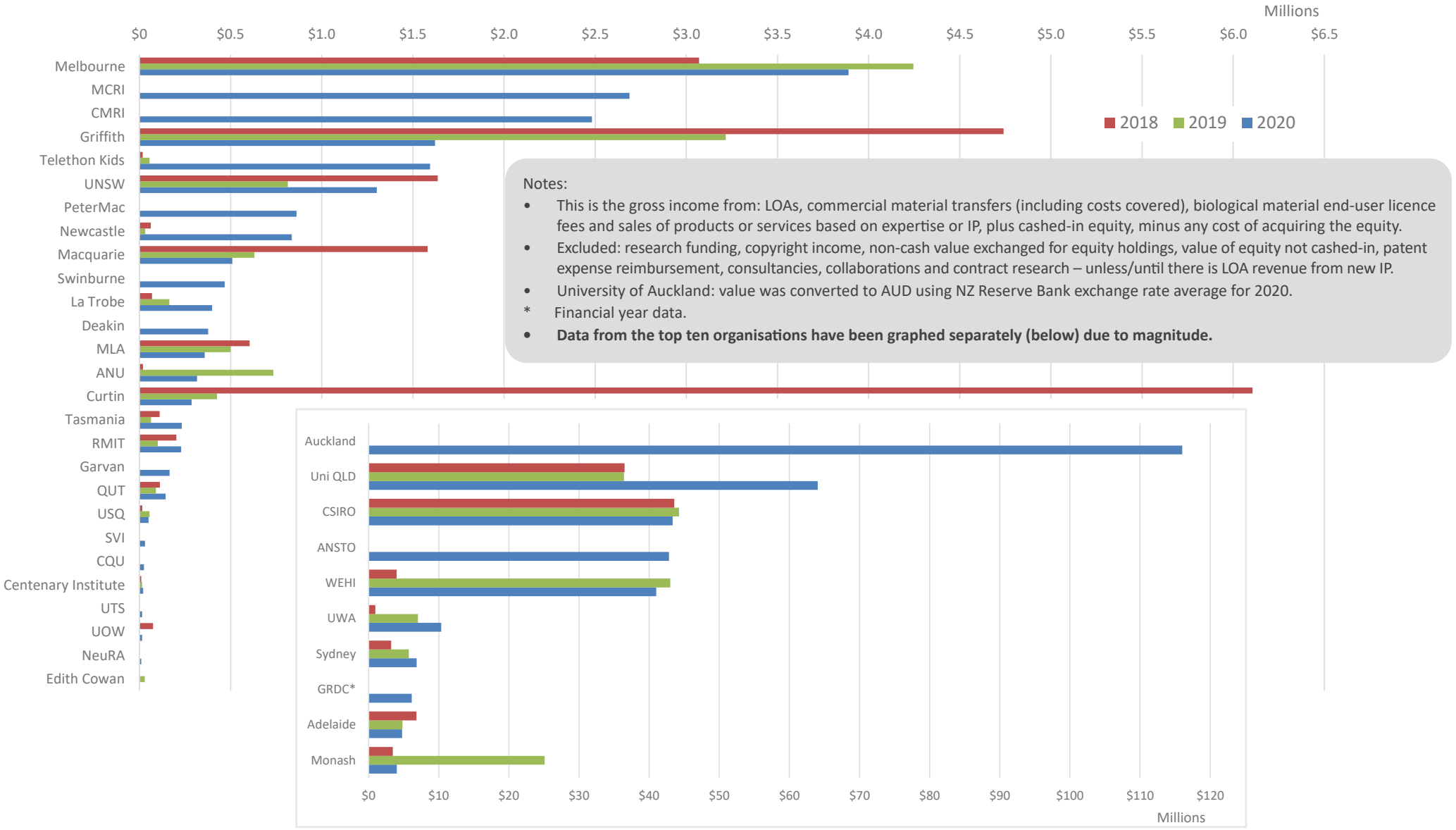


Notes:

- New LOAs commenced in the calendar year of reporting. LOAs count only when new IP is created.
- Counted separately: each non-exclusive agreement; each new, stand-alone technology added to an existing LOA or in a multiple licence agreement.
- Counted 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 (unless for commercial purposes), licences granting researchers freedom to operate under a research contract, provisions for the use of background IP (unless this is the only IP in the LOA or for commercial purposes), consultancies, contracts and collaborations (unless or until new IP is created).

* Financial year data.

COMMERCIALISATION REVENUE (AUD) 2018-2020



Notes:

- This is the gross income from: LOAs, commercial material transfers (including costs covered), biological material end-user licence fees and sales of products or services based on 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, collaborations and contract research – unless/until there is LOA revenue from new IP.
- University of Auckland: value was converted to AUD using NZ Reserve Bank exchange rate average for 2020.

* Financial year data.

- **Data from the top ten organisations have been graphed separately (below) due to magnitude.**

RESEARCH COMMERCIALISATION CASE STUDY 5

A new weapon against ‘superbugs’

Antimicrobial resistance causes 700,000 deaths globally per year, and this figure could increase to 10 million by 2050 without new antibiotics[1]. Three ‘superbugs’ – pathogenic microbes with multi-drug resistance – have been identified by the WHO as the top priority for the urgent development of new antibiotics.

As last-line therapy against these ‘superbugs’, clinicians resort to using the polymyxin antibiotics that were developed in the mid-20th century, but these can cause kidney damage and are not efficacious against lung infections.

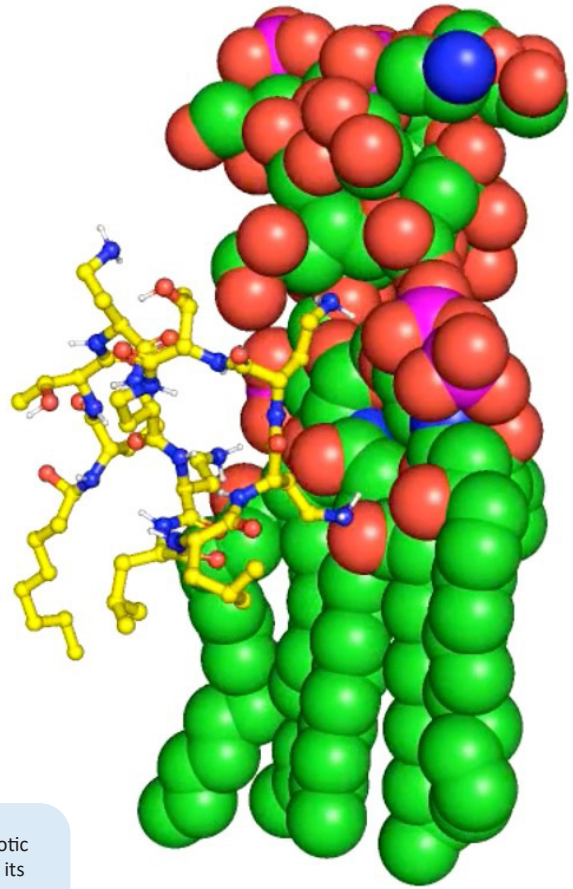
Now, a team of researchers from Monash University, led by Professor Jian Li, have developed – from concept – novel synthetic polymyxin antibiotics with much-enhanced safety and efficacy, particularly against lung infections.

Development was initially funded by the National Health and Medical Research Council. Subsequently, major funding from the US National Institutes of Health and collaboration with US biotech company Qpex Biopharma Inc. (Qpex) produced a best-in-class drug candidate for clinical evaluation: QPX9003.

Two patents protecting Monash’s novel polymyxins were filed in 2014 and 2015, and a licensing deal with Qpex was finalised in 2019.

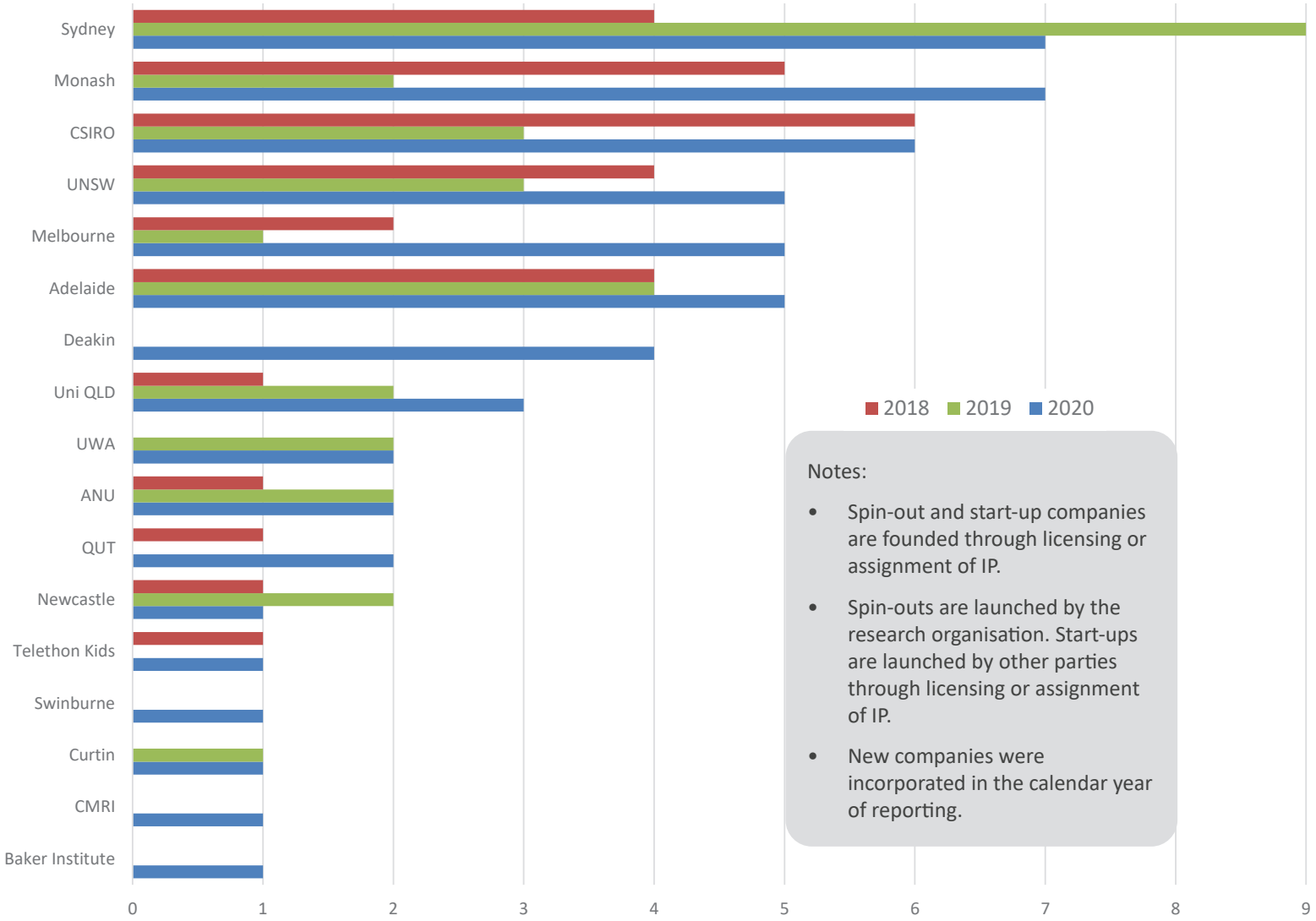
Qpex commenced a clinical trial of QPX9003 in June 2021, as part of a partnership with the US Biomedical Advanced Research and Development Authority. If successful, QPX9003 will be the first new polymyxin antibiotic approved for clinical use since the 1950s, and will help address the urgent threat from ‘superbugs’.

1. amr-review.org



An illustration of how the antibiotic molecule (yellow) interacts with its target molecule, disrupting the outer membrane to kill the bacterium.

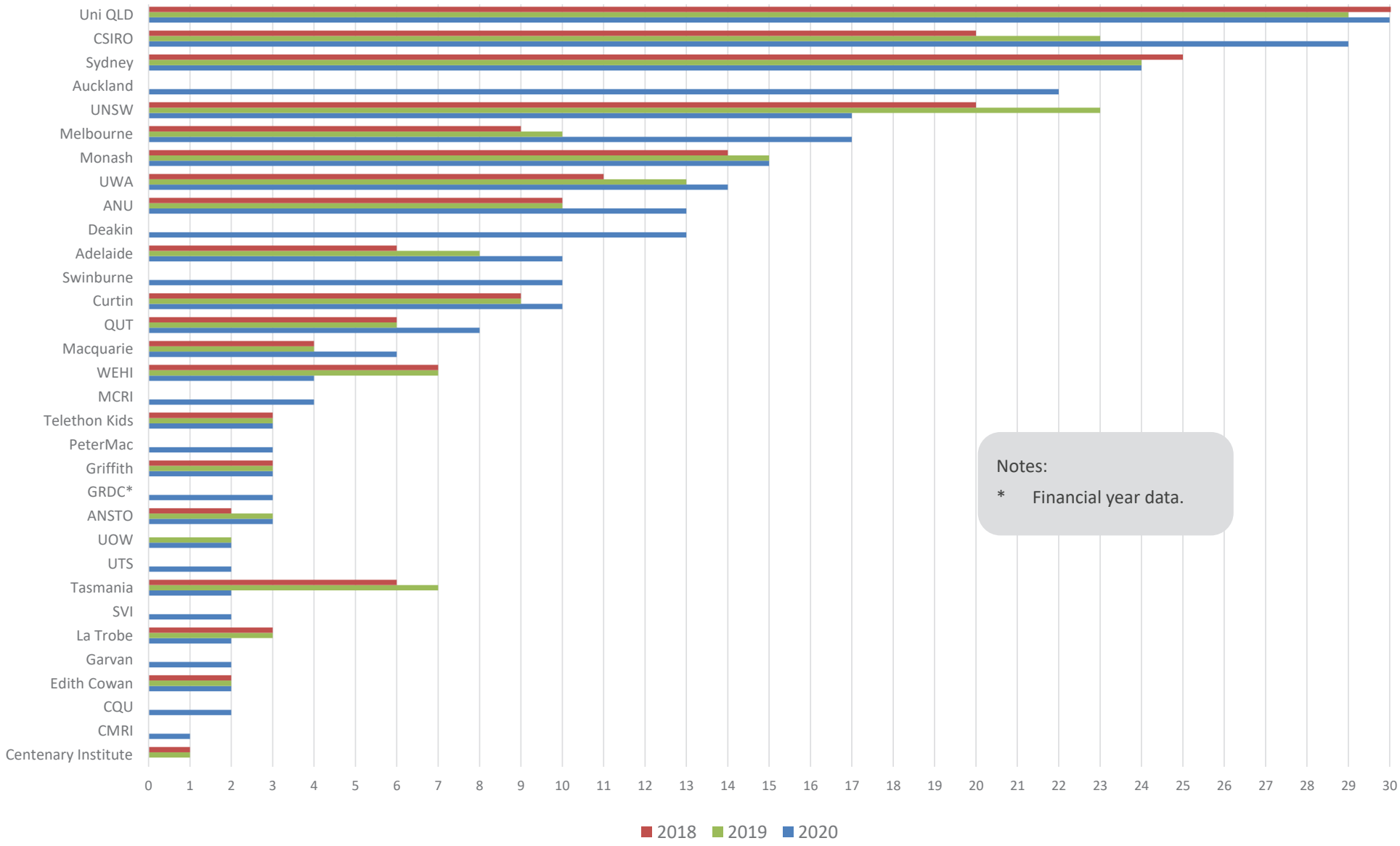
NEW START-UP AND SPIN-OUT COMPANIES 2018-2020



Notes:

- 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 the calendar year of reporting.

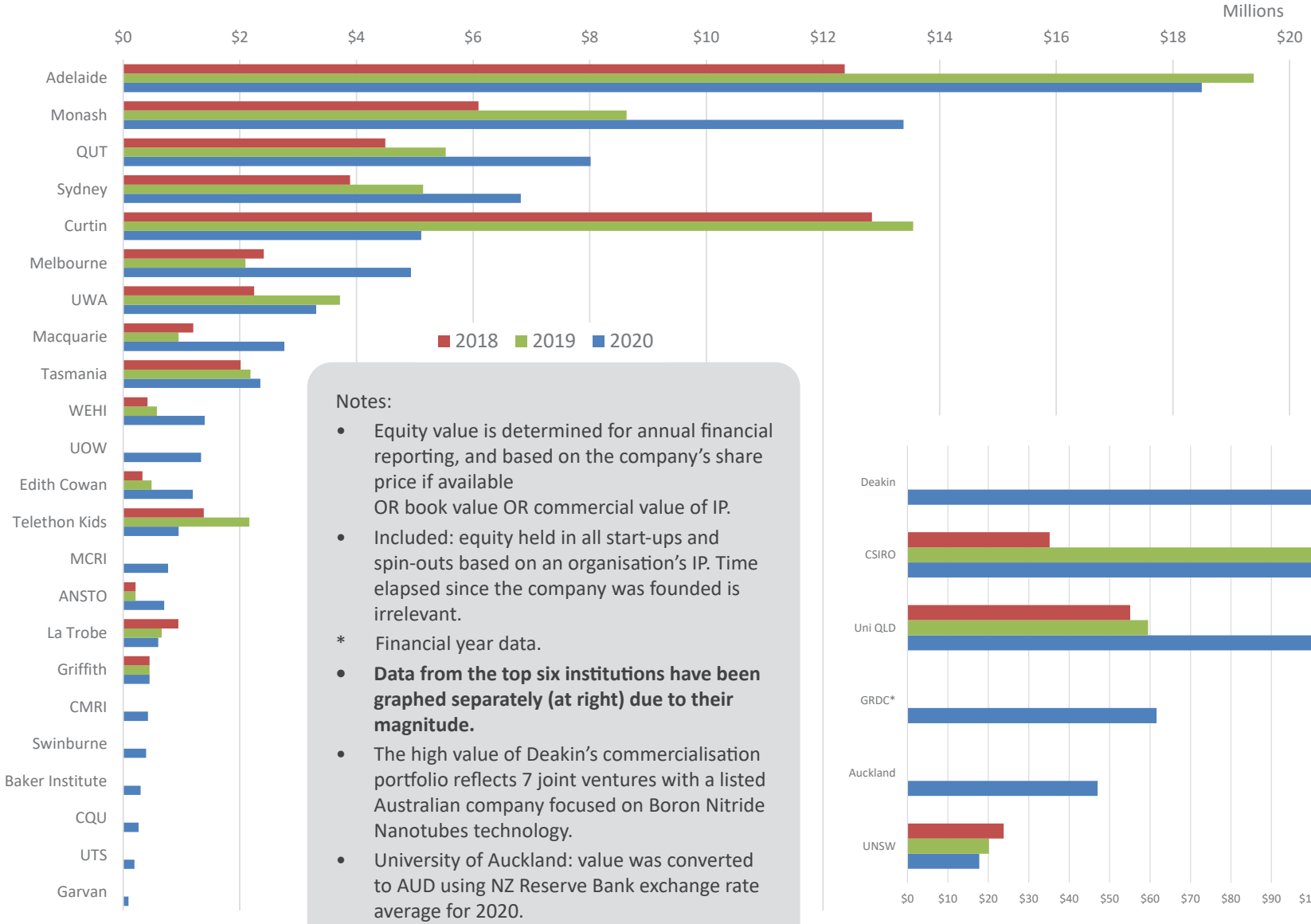
ACTIVE START-UP AND SPIN-OUT COMPANIES 2018-2020



Notes:

* Financial year data.

EQUITY HELD IN START-UP AND SPIN-OUT COMPANIES 2018-2020

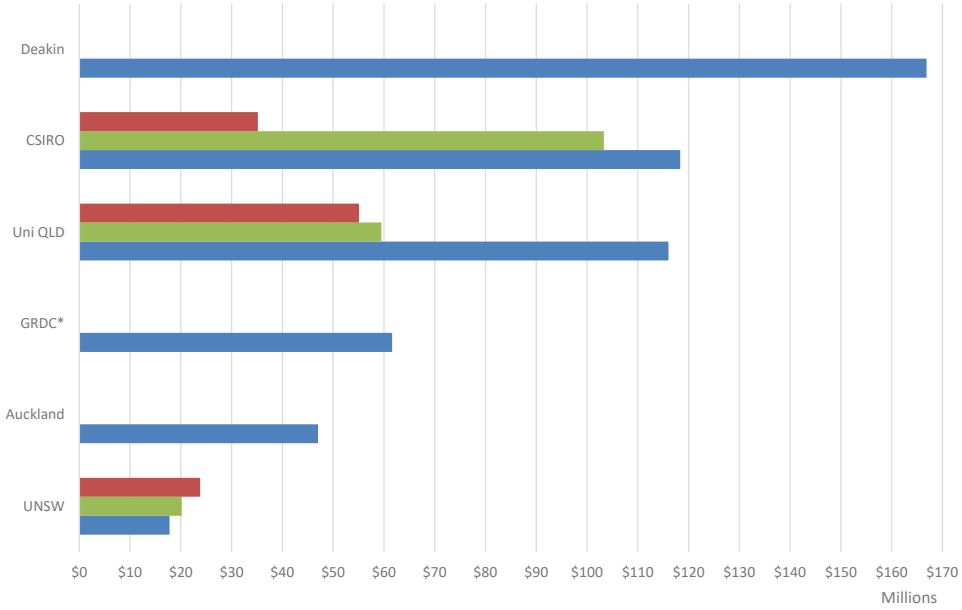


Notes:

- Equity value is determined for annual financial reporting, and based on the company's share price if available
  OR book value OR commercial value of IP.
- Included: equity held in all start-ups and spin-outs based on an organisation's IP. Time elapsed since the company was founded is irrelevant.

* Financial year data.

- **Data from the top six institutions have been graphed separately (at right) due to their magnitude.**
- The high value of Deakin's commercialisation portfolio reflects 7 joint ventures with a listed Australian company focused on Boron Nitride Nanotubes technology.
- University of Auckland: value was converted to AUD using NZ Reserve Bank exchange rate average for 2020.



RESEARCH COMMERCIALISATION CASE STUDY 6

Digital Farmhand does the dirty work to drive productivity

Farmers face increasing climate instability and competition. To maintain economic viability, they must increase productivity while ensuring environmental sustainability. Enter the Digital Farmhand. Developed by the University of Sydney's Australian Centre for Field Robotics (ACFR), this purpose-built, mobile, intelligent robot reduces labour and farm input costs by efficiently performing a range of agricultural activities.

For example, with specialised tools, it combats weeds through targeted chemical spraying or physical removal. Onboard AI builds reports on soil and plant conditions and crop yield.

The Digital Farmhand operates autonomously or by remote control with a battery life of up to 10 hours or, with the addition of a solar panel, up to 15 hours. Carrying or towing up to 200kg, it successfully traverses diverse farm landscapes.

Through R&D spanning 15 years, the ACFR team created a range of robotic platforms and AI tools. In 2019, they obtained $6.5 million investment from UniSeed, one of Australia's largest agtech funds, and venture capital firms Carthona Capital and BridgeLane Group, to commercialise their technology though spin-out company Agerris.

A strategy of engaging with farmers throughout development of the Digital Farmhand has shaped a working system attracting significant interest from end users, with 14 commercial robots already deployed across multiple farms. Agerris is developing additional intelligent tools for the Digital Farmhand, to extend its range of farm operations, as well as other agricultural robot platforms.