

TOWARDS A BETTER TOMORROW



Future Transport Technology Roadmap 2021-2024

Using innovative technologies
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future **transport**
technology

It happened again.

I found myself boasting about Tech23 alumni. This time I was talking about Atmo - one of this year's Tech23 and how it gives us new insight into the gut. That was at the hairdresser's.

In the playground a few weeks ago, I was boasting that I knew Seer (Tech23 2019) as a friend's teenage child grapples with a new diagnosis - and yes, it had been instrumental in their journey to find relief for their daughter.

In the laneway having a drink during lockdown I am bursting to share what I have learnt on the Tech23 Impact Circles that day - my brain full of the amazing solutions - tempted to inform people of the value of psychedelic treatment for mental illness (Psylo), new ways for farmers to manage weeds (RapidAIM), the benefit of Seaweed for methane reduction (Sea Forest), keeping people safe at work (Presien)... you get the idea!

It has also been interesting to see how people light up when they hear these stories - of clever Australians doing things in labs and precincts all around the country and increasingly overseas. Unless they are just being polite, they seem to love to hear of the likes of Swoop Aero, Gelion and Liquid Instruments. There is real respect for the value these companies are trying to create for all of us to share. Entrepreneurs, researchers and inventors who set out to chip away at big challenges that will help us find better ways to feed, heal, power and work. They deserve our respect - and our gratitude. And hats off to anyone who is helping them too!

This year we are announcing the 23 companies through the publication of this booklet. We think the 23 for 2021 are great, and want to congratulate them for what they have done so far and cheer them on to realise their potential!

In COVID times we set out to create what we missed most from events - the serendipitous conversations you chance to have in hallways or after the "real" session has stopped on stage. Thanks to all those who have taken part in the Tech23 Impact Circles, providing insights and information so generously. In this booklet we have collated some more perspectives of industry leaders in our midst. We hope that readers of the booklet gain another small glimpse of the personalities, the passion and the intelligence of the types of people who nurture mighty endeavours all around the country.

There are so many people to thank for making the 13th Tech23 happen! I want to thank the sponsors especially - Transport for NSW, Main Sequence CSIRO Innovation Fund, AusIndustry Entrepreneurs' Programme delivered in partnership with i4 Connect, AWS Startups, Addisons, ASX, ANSTO, Curtin University, Cicada Innovations and evokeAG. And I want to thank so many individuals who have provided their energy, guidance, time and, expertise to help us with Tech23 this year.

For those of you who get to celebrate the 23 in Sydney on the 15th of December - enjoy! Haven't we had it confirmed during these COVID times that innovation does indeed walk on two legs - and so much of the magic of life happens with us being at the right place at the right time?!

Rachel Slattery

THE 23

4

PERSPECTIVES

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Atmo Biosciences

Demystifying the human gut microbiome

Atmo Biosciences is a digital health business developing the world's first ingestible, gas-sensing capsule for monitoring the health of the human gut and its microbiome.

Atmo's gas-sensing capsule continuously measures clinically important gaseous biomarkers as it travels through the gut and transmits the data wirelessly to the cloud for aggregation and analysis, providing gastroenterologists and researchers with objective insights into microbiome function and gut health. This enables improved diagnosis and more personalised treatment for common gastrointestinal disorders – leading to earlier relief of symptoms and improved healthcare outcomes for the millions of sufferers worldwide.



FOUNDERS

Dr Kyle Berean VP Technology

Dr Adam Chrimes Principal Engineer

Malcolm Hebblewhite CEO

Dr James John VP Operations

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WHAT DOES SUCCESS LOOK LIKE TO YOU?

Commercialising a medical device that improves quality of life for the millions of sufferers of common GI conditions, and demystifying microbiome function by opening up a window and shining a light on what is the black box of gut physiology.

MALCOLM HEBBLEWHITE Co-founder and CEO, Atmo Biosciences

Malcolm Hebblewhite is an executive and entrepreneur with more than 25 years of technical, commercial and international business experience in medical device and technology-based product development. Mal was a pre-IPO employee of ResMed (NYSE:RMD;ASX:RMD), and held executive roles of increasing responsibility for the company in business development, marketing and M&A in Australia, the USA, and Europe. More recently, Mal worked in commercial and business development roles at leading healthtech innovation company Planet Innovation, before founding Atmo Biosciences in 2018. He holds a B.E.(Hons)(Aerospace) from UNSW, an MBA from the Kellogg Graduate School of Business at Northwestern University.



WOULD YOU LIKE TO CALL OUT A MENTOR WHO HAS HELPED YOUR COMPANY?

Professor Peter Gibson, chief clinical advisor, who has provided dedicated and valuable leadership throughout the life of the company. Professor Kourosh Kalantar-zadeh, leader of the group at RMIT that invented the technology, for his vision and creativity.






CipherStash

The safest place for Personal Identifying Information



CipherStash

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CipherStash is an end-to-end, searchable encrypted data storage platform that keeps data secure by ensuring it's always encrypted.

It's fast, flexible and based on existing industry standards. Both documents and queries are encrypted (and decrypted) using the encryption service. CipherStash was designed from the ground up to meet very high levels of security and compliance. Instead of building on top of existing relational-databases or search indexes (which have major security drawbacks, even when encrypted), CipherStash uses a fast, memory-mapped B-tree and an Order-Revealing Encryption scheme based on research from Stanford University.

DAN DRAPER

Founder & CEO, CipherStash

Dan is the CEO and Founder of CipherStash, a Sydney based data security startup building a searchable encrypted data storage platform for sensitive data. Previously, Dan has worked as a VP of Engineering at Medical Director and at Expert360 and is also the Executive Producer for the forthcoming docu-series, Debugging Diversity. Dan is an experienced cryptography engineer and his mission is to empower all developers with the knowledge they need to build secure applications.



We make it easy for developers to build more secure applications that store sensitive data. We are focusing on fintech, health-tech and eCommerce.

Our team is an intersection of three important capabilities: we understand the academic research, we understand the practical engineering required to make that research useful and we understand the developer community.

Diverse teams are sorely required in technology. They lead to better outcomes and more profitable businesses. Our industry still does not do enough to support founders or employees from under-represented groups.

Diabetes Neuromathix

Intelligent artificial pancreas transforms unstable diabetes

Using proprietary, patented artificial intelligence (AI) algorithms developed by a related company, Diabetes Neuromathix (DNx) data-mines individual medical histories of people with type-1 diabetes, to generate organ-scale personalised models of type-1 diabetes in their bodies.

A novel form of AI, able to run on isolated Edge devices such as a computing tablet, then generates interactive personalised insulin dosing strategies. As Team MachineGenes, DNx had its technology peer-reviewed by international experts before being listed in 2020 by the IBM Watson AI XPRIZE as one of their ten semi-finalists worldwide, and the only one from outside North America and Europe.

DR NIGEL GREENWOOD

**Co-founder & CEO,
Diabetes Neuromathix**

A mathematician, Nigel Greenwood is the inventor of the algorithms that underpin DNx, based on new forms of machine learning/AI he developed. These were inspired by evolutionary ecosystems, rather than the neural networks conventionally used for ML/AI.

He is one of Australia's Spitfire Memorial Defence Fellows and was Leader of Team MachineGenes, one of the global semi-finalists in the IBM Watson AI XPRIZE (2017-2021). A former Australian Government senior analyst and former Honorary Senior Fellow at the University of Queensland, he turned entrepreneur and co-founded DNx with Professor Jenny Gunton to transform the quality of life of people with unstable forms of type-1 diabetes. He is the named inventor for multiple AI patents in the United States and other international markets.

His algorithms were among those showcased by the United Nations' 2019 "AI for Good" Global Summit in Geneva, Switzerland.



PROF JENNY GUNTON

**Co-founder & Chief Medical Officer,
Diabetes Neuromathix**

Professor Jenny Gunton heads the Centre for Diabetes, Obesity and Endocrinology Research (CDOER) and Westmead Institute for Medical Research (WIMR). She is Chair of Medicine at Westmead Hospital and a clinical endocrinology/diabetologist.

She received her PhD from the University of Sydney in 2003 having studied in Rob Baxter's lab at the Kolling Institute. She completed her post-doctoral fellowship in Ron Kahn's lab at the Joslin Diabetes Center and Harvard Medical School in 2005. She returned to Australia to the Garvan Institute and set up the Diabetes and Transcription Factors lab. In 2012, she became the President of the Australian Diabetes Society and in 2014 became Chair of Medicine at Sydney University, Westmead Hospital. Her lab moved to the new WIMR in late 2014.

Her research interests include diabetes, obesity, and vitamin D. She is particularly interested in the intersection of transcription factors and their regulation by nutrients.



FOUNDERS

Dr Nigel Greenwood CEO

Prof Jenny Gunton Chief Medical Officer

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FiberSense

Ubiquitous sensing using existing Fiberoptic infrastructure



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FiberSense is an Aussie-founded deeptech scaleup repurposing existing telco Fiberoptic cables already in the ground, allowing them to act as massive ubiquitous vibration sensor networks to detect and give insights into all movement/vibration in the urban environment.

DR MARK ENGLUND Founder & CEO, FiberSense

Mark Englund is the Founder and inventor of FiberSense's technology, with the vision to bring the power of ubiquitous, continuous, real-time, gapless, massive-scale vibration sensing, to make people safer, cities run better and help save the planet. He has previously built and sold Redfern Photonics, worked internationally in the Photonics & Telecoms industries, was a researcher at DSTL, and has a PhD in Physics from the University of Sydney.



We are very grateful to the corporate innovators and allies who have supported FiberSense's early growth. By acting as early adopters and reference customers, they have been a vital part of our development and in return have recieved game changing sensing insights that are helping their organisations as they show other utilities and cities what is possible with FiberSense.

FiberSense is bringing the power of massive scale sensing to make people safer, reduce emissions and make cities work better. We prevent accidental excavation strikes on dangerous underground critical infrastructure such as high voltage power, gas pipes or other vital underground utilities. We cut emissions associated with lost water and burst pipes, by speeding up identification and prevention. We help cities to sense and understand what is happening inside them, for example measuring vehicle movement and long term traffic patterns in real time to enable true smart city operations without the costs associated with scaling up IoT/point sensor deployments.

Gridcognition

Bankable distributed energy project simulations

Gridcognition provides advanced software to plan and optimise distributed energy projects. Their software is used by large energy suppliers, energy project developers, technology providers, and large energy users.

They believe the future of energy is small, smart and clean, and that software can be used to accelerate decarbonisation to help tackle climate change.

Gridcognition is a fast growing technology startup and they want to have a global impact. They are looking for smart, savvy and curious learners to join their distributed team and to help invent new technology to lead the world into a decentralised energy future.



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FABIAN LE GAY BRERETON Co-founder & CEO, Gridcognition

Fabian Le Gay Brereton is Co-founder and CEO at Gridcognition. Fabian holds a BSc Computer Science (Hons) from University of Western Australia and has 25 years of experience in the software and technology industries. He has spent the last ten years dedicated to the energy and sustainability space and is passionate about the role distributed energy resources will play in the future energy system.



In 2010, Fabian co-founded Greensense, a cloud-based energy management software platform that in 2016 was acquired by ERM Power, one of Australia's largest energy businesses, and which was later acquired by Shell.

ON ATTRACTING AND RETAINING TALENT:

Working in a sector with a real purpose, in our case accelerating the transition to a zero-carbon energy system, definitely matters to the new generation coming into the workforce, and we're already seeing that work in our favour.

IF YOUR COMPANY HAD A THEME SONG, WHAT WOULD IT BE AND WHY?

Another One Bites The Dust by Queen. Because decarbonisation means replacing fossil fuel infrastructure, and decentralisation puts new energy assets in the hands of consumers and business. Everytime we can get more decentralised energy resources deployed, another one bites the dust...

HB11 Energy

Clean, safe and unlimited energy

THE 23



FOUNDERS

Lukasz Gadowski *Director*


Prof Heinrich Hora *Scientific Director*


Jan Kirchhoff *Financial Director*

Dr Warren McKenzie *Managing Director*

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Based on the careers' work by HB11 Energy Founder Emeritus Professor Heinrich Hora, HB11's approach is the nuclear fusion of hydrogen and boron using high-power lasers.

It has recently been proven scientifically viable in several internationally significant experimental breakthroughs. HB11 Energy is conducting an international research program aimed at reaching net-energy-gain, then a power plant that will provide large-scale clean energy generation in a timeframe to make an impact on climate change.

DR WARREN MCKENZIE

Founder & Managing Director, HB11 Energy



Warren McKenzie is a Materials Scientist specialising in nanotechnology and building companies from scientific breakthroughs.

Beyond university-based achievements, he has founded or been instrumental in the establishment of five companies from universities, all of which are enjoying continued success.

Warren is a Fellow of the Royal Society of New South Wales, Adjunct Academic at UNSW Materials, an Endeavour Fellow and Surf Lifesaver.

WHAT IMPACT IS YOUR COMPANY HOPING TO MAKE ON THE WORLD?

Make a big impact on carbon emissions, with added economic benefits rather than consequences.

HOW MANY FOUNDERS HAS YOUR COMPANY GOT? HOW DID YOU MEET?

Four founders. HB11 Energy's research into laser fusion was started by Prof Heinrich Hora shortly after the discovery of the laser in the 1960's. His theories were proven true in the 2010's uncovering a new approach to large-scale fusion energy production. Dr McKenzie met Prof Hora at UNSW Sydney and worked with family friend Jan Kirchhoff to found HB11 Energy as the best way to drive the project outside of the University. On opening our first funding raise, deeptech veteran entrepreneur and investor Lukasz Gadowski joined as the fourth Founder to help with the accelerated growth of HB11 Energy.

HydGene Renewables

On-demand renewable hydrogen from bio-waste

HydGene Renewables are synthetic biologists and engineers who revolutionise the way we produce chemicals – such as hydrogen – a clean fuel that will enable the world to reach a net zero-carbon emissions target.

They have engineered a biocatalyst solution that generates carbon-neutral and high purity hydrogen from renewable biomass such as straw and sugarcane. Being different to other hydrogen technologies, they produce hydrogen on-site and on-demand and eliminate the significant challenges for hydrogen storage and transport. They are cost-competitive with fossil fuel derived hydrogen and support the decarbonisation of major existing hydrogen industries including the farming, chemical, manufacturing and transportation sectors.



FOUNDERS

Louise Brown CEO

Ante Jerkovic Chief Engineer,
Analytics and Engineering Team
Leader

Kerstin Petroll Chief Technical
Officer, Strain Engineer &
Fermentation Team Leader

Robert Willows Chief Scientific
Officer

LOUISE BROWN Founder & CEO, HydGene Renewables

Louise Brown is the CEO and Co-founder of HydGene Renewables. She has a PhD in biophysics and more than 15 years' experience in bioengineering and characterisation of complex protein systems while at Macquarie University. Under the guidance of Co-founder Professor Robert Willows, the technology was first developed by Macquarie University undergraduates who successfully showed that bacteria can be re-engineered to produce hydrogen. With Co-founders Dr Kerstin Petroll and Dr Ante Jerkovic, the team raised further funding from ARENA to improve hydrogen production efficiency, and a BRII government grant support in 2021 to apply the technology for converting farm-waste into hydrogen.



*Success
to us is showing
how we can engineer
new solutions using
biology to help decarbonise
the planet and create new
value from waste in a
sustainable and
safe way.*

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Achieving global net-zero targets requires industries to decarbonise. Hydrogen will play a key role if low-cost clean hydrogen can be produced at scale. While cheap green hydrogen is on the horizon, it then must be moved and stored, often adding up to 80% or more to the final cost for the end-user! Our low cost and safe solution to this challenge is to produce clean hydrogen on-site and only when its needed.

Innofocus Photonics Technology

*Smarter, greener, happier life
by laser nanofabrication*

THE 23



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Innofocus Photonics Technology is a cutting-edge technology startup company providing world-leading intelligent laser nano-fabrication system equipment and services for both academia and industries.

Leveraged by their leading photonics products and solutions, they are able to realise the fabrication of new advanced materials and deepen the development of energy-saving, emission reduction, and green healthcare solutions. The specific application domains include graphene photothermal materials and solutions; electroless cooling materials and solutions; photonics devices like fiber Bragg grating (FBG), wavelength-division multiplexing (WDM) and photonics wire bonding (PWB) waveguides, and microlens array; nano-structured surface engineering solution for long-lasting disinfection and deodorisation; and seed/foilage coating protection solution for agriculture productivity.

FRANK YAO Founder & CEO, Innofocus Photonics Technology

Frank Yao is the Founder and CEO of Innofocus Photonics Technology. He is an entrepreneur focused on transforming technologies into business solutions and value services.

Frank also holds non-executive director roles in several companies in the UK, USA, and China. He used to be CMO & Chief Business Architect for a multi-billion USD revenue technology business. Frank has 20+ years work experience across Asia, Europe, ME, and Australasia. His previous responsibilities include R&D, strategy, portfolio management, marketing, sales and operations.



HOW DID YOU DECIDE ON YOUR COMPANY NAME?

At Innofocus, our vision is to "Explore Infinity Through Light". To achieve it, we believe in "Keep Innovating, Stay Focused", which is written in the DNA of our team.

Innofocus is dedicated to developing products and solutions to enable advanced technology research and enrich happier daily life. Our market is rapidly extending from advanced manufacturing to new energy, smart glass/film, new materials, intelligent IoT ecosystem, and green healthcare industries. We look forward to creating greater value for scientific research, green energy alternative solutions, and new materials applications.

With our continuous innovation, we are able to leverage the latest photonics products and solutions to realize the fabrication of many new green materials and deepen the development of energy saving and emission reduction solutions. The typical application domains include graphene photothermal materials and solutions, electroless cooling materials and solutions, photonics WDM devices and solutions, FBG devices and solutions, etc. We rejoice to be able to transform the technology of photonics into equipment and devices, enabling products and solutions that can benefit people's livelihood.

Jupiter Ionics

We're powering the Green Ammonia revolution

Jupiter Ionics is an early stage company made up of a team of passionate scientists and engineers with a vision for a future economy powered by carbon neutral Green Ammonia.

Spun out from Monash University in 2021, they are developing breakthrough electrochemical technologies that will underpin modular and decentralised production units that require only water, air and renewable electricity to produce ammonia and related fertilisers.



FOUNDERS

Dr Charlie Day CEO

Prof Doug MacFarlane CSO

Dr Alexandr Simonov

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Decarbonising ammonia production is the world's problem, in the sense that we need ammonia-based fertiliser to feed us, but it is currently a major source of carbon emissions. Specifically, we are trying to improve the experience of farmers using nitrogen-based fertilisers.

DR CHARLIE DAY CEO, Jupiter Ionics

Charlie Day's passion is leading, investing in and working with teams who are pushing back the boundaries of the possible through innovation, scientific research and commercialisation. With over 20 years' experience in this area, he joined Jupiter Ionics as inaugural CEO in 2021 when the company raised its seed investment round. Prior to that, Charlie was CEO of Innovation & Science Australia, a high level strategic advisory board for the Australian Government.

Charlie has a degree in Classics and an honours degree in Chemical Engineering from the University of Melbourne, along with a doctorate in jet engine design from Oxford University, where he studied as a Rhodes Scholar.



WHAT IMPACT IS YOUR COMPANY HOPING TO MAKE ON THE WORLD?

We want to make it possible for the entire population of the world to be fed and to flourish without condemning the planet to runaway global warming

Mass Dynamics

*Smarter mass spectrometry
data to knowledge*



FOUNDERS










Paula Burton CEO

Dr Giuseppe Infusini Proteomics
Informatics Lead

Aaron Triantafyllidis Technical
Product Lead

A/Prof Andrew Webb Chief
Scientist

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PAULA BURTON

Co-founder & CEO, Mass Dynamics

As CEO and Co-founder at Mass Dynamics (MD), Paula Burton loves connecting dots between modern business strategy, technology, shared value outcomes and super-talented people to bring the company's mission to life. What gives her endless energy and drive is knowing that MD is contributing directly towards helping life scientists free humanity and society from the burden of disease.

Imagine a tool that is so powerful and versatile that it can play a major role in accelerating medical research and drug development and holds the potential to answer infinite questions about nature. That's what mass spectrometry is.

However, to harness this technology, we must first overcome industry-wide challenges in a) processing, analysis and sharing of mass spectrometry data, and b) the transformation of this data to knowledge.

Mass Dynamics exists to make this possible for global life scientists so they can maintain focus on researching and developing life-enriching diagnoses, treatments and preventions and ultimately free humanity from the burden of disease.

*Matt Allen
and Dave Thomas
have been instrumental
on our journey. From not only
providing first cheques, but
connecting us with their network
to bring on further capital,
guiding decisions and helping
us with the harsh reality
checks when we
need it*



MGA Thermal

*Empowering renewables
through thermal energy storage*

MGA Thermal technology is a newly invented type of thermal storage material, Miscibility Gap Alloys (MGA). These alloys can store a huge amount of energy as heat, in a safe and easy to use way.

Modular blocks of MGA are stacked into insulated storage tanks, which can store energy for use in a range of applications - improving the electrical grid's stability, residential and commercial space heating, industrial process/waste heat, and even electric vehicles. Their first focus though, is enabling intermittent renewable energy sources such as the sun and wind, to provide base load electricity to the grid.








FOUNDERS

Erich Kisi CEO

Alexander Post CTO

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We are solving the problem of how to firm and dispatch renewable energy on demand by providing an affordable, scalable, medium duration energy storage solution. This helps renewable energy generators by creating a market in times of oversupply of renewables, manufacturing companies by providing a source of firmed thermal energy from renewable sources and thermal power station asset owners by enabling retro-fit.

ERICH KISI CEO, MGA Thermal

Erich Kisi is the CEO of MGA Thermal, a company dedicated to the provision of cost effective scalable thermal energy storage materials and associated knowhow. He is a co-inventor of the patented Miscibility Gap Alloy (MGA) thermal energy storage materials with 10 years of development experience in that field. A former Professor in Materials Science at the University of Newcastle in Australia, he has more than 35 years of experience in academic and applied research leading to two books, >170 refereed papers, three patents and five members of the MGA team who are Erich's former PhD students.



We are scaling up our manufacturing in powers of ten every year as well as developing new products. One of our challenges is simultaneously scaling our team.

MicroTau

*Solving human problems
with nature's surfaces*



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WHAT MAKES YOUR TEAM UNIQUE?

We have the unique mix of nanotechnology, engineering, physics, optics and chemistry, operations, strategy, intellectual property and science communication skills to make this happen.

Aviation and shipping produce almost 2 billion tonnes of CO2 every year and with trillions of dollars of fuel-burning assets, they aren't going to transition to renewable power sources for decades to come. We want to reduce their emissions now and help make electric air and water vehicles more efficient to compete and help accelerate the world to a fossil fuel-free future.

MicroTau is an advanced manufacturing company specialising in biomimetic functional surfaces.

Low-drag shark skin, self-cleaning lotus leaves, anti-reflective moth eyes and antibacterial pitcher plants are all the result of microscopic patterns on the surface of the plant or animal. If you replicate these microscopic patterns, you replicate these functional properties.

If you look at fast swimming sharks under a microscope, you'll find their skin is covered with thousands of microscopic ridges - called "riblets". These riblets reduce drag and sharks evolved them to become more efficient hunters. Aircraft and ships spend most of their fuel overcoming drag.

MicroTau has printed riblets with their proprietary DCM technology that reliably demonstrate 7% drag reduction. This has the potential to save billions of dollars in fuel and hundreds of millions of tonnes of CO2 emissions annually across aviation, maritime, and energy industries.

HENRY BILINSKY Founder & CEO, MicroTau

In 2015, the US Air Force held a global competition for solutions to improve fuel efficiency for their transport aircraft.

MicroTau founder Henry Bilinsky proposed the Direct Contactless Microfabrication (DCM) technology as a scalable method to print drag-reducing shark skin "riblet" microstructures for this application.

Out of 296 global applicants, a committee including NASA, the US Federal Aviation Administration, Massachusetts Institute of Technology, Boeing, Lockheed Martin, General Atomics and Northrop Grumman selected Henry's proposal and MicroTau was founded.

Henry holds a BSc (Adv.)(Hons) and a JD from the University of Sydney.



Novalith

Using CO2 to simplify lithium chemicals production

Novalith uses carbon dioxide to simplify lithium chemicals production.

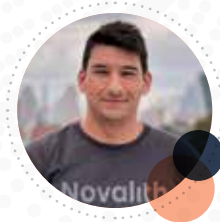
Their process directly uses carbon dioxide to extract lithium from hard-rock resources such as spodumene to produce low cost, clean, battery grade lithium chemicals.

HOW MANY FOUNDERS HAS YOUR COMPANY GOT? HOW DID YOU MEET?

3 Founders. Steven met Andrew whilst studying chemical engineering at the University of Sydney (he was his lecturer for Green Engineering) and since graduating, they collaborated on several novel technology projects together. Given Andrew's expertise in the field and their work history, he was a perfect fit as a Co-founder & CTO! Christiaan and Steven met more recently through his company (Sicona Battery Technologies, where they were helping with the engineering and development of their pilot plant). After many conversations about the battery & materials industry and how they should (and could!) be doing things better, the very exciting Novalith technology (capturing CO2 to make a lithium battery chemical) caught his interest and he jumped on board as Co-founder & CBD0.

STEVEN VASSILOUDIS Founder & CEO, Novalith

Steven Vassiloudis is an experienced chemical engineer who specialises in process scale up and commercialisation of novel technologies. In his role as director for Kemplant, he has worked with companies in multiple industries to solve engineering problems, whilst maintaining a passion for clean technology and sustainability. He has assisted several clean tech startups to develop and scale their technologies, where he maintains a close relationship with other founders.



Novalith

FOUNDERS

Dr Andrew Harris Chief Technology Officer

Christiaan Jordaan Chief Business Development Officer

Steven Vassiloudis Chief Executive Officer

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We want to make lithium sustainable & green and help realise our electric future by providing a better, cheaper, cleaner & faster way to produce bulk battery grade lithium chemicals.

Nuroflux

Illuminating clinical blind spots

nuroflux™

FOUNDERS

Dr David Cardoso CBO

Sam Van Bohemen CEO & CTO

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Nuroflux is developing an innovative wearable medical device for the continuous monitoring of stroke patients.

Co-founder Sam has an honours degree in neuroscience and is doing a PhD in Biomedical Engineering. Co-founder Dr David Cardoso has a PhD in Medicine and is doing an MBA. They are supported by a strong team of advisors with experience in medtech commercialisation, clinical care of patients, IP, regulatory affairs, and market access. Nuroflux is pre-revenue and currently getting ready for a clinical safety study which will be followed by product development and more clinical trials.

SAM VAN BOHEMEN

Co-founder, CEO & CTO, Nuroflux

Sam Van Bohemen has a first-class neuroscience honours degree with a minor in pharmacology from The University of Otago. He used electroencephalography (EEG) to classify subtypes of attention deficit hyperactive disorder in children. Sam moved to Sydney to pursue a career in biomedical engineering. He is currently doing a PhD at The University of Sydney, where he has developed a new method for monitoring changes in cerebral blood flow. Sam founded Nuroflux in September 2020.



CT scans are used to diagnose stroke. They provide imaging snapshots and due to radiation exposure are only performed every 24 hours. In the first 24 hours, patients will receive treatment and are at risk of having a secondary stroke. However, there is currently no way to continuously monitor cerebral blood flow (CBF) and brain activity, which are key indicators in stroke. Standard care relies upon follow up CT scans and nurses talking to patients, which is subjective. We are developing a wearable device that utilises a proprietary multi-modal system to provide continuous monitoring of CBF and brain activity. This will enable treatment monitoring and the detection of secondary strokes. Leading to faster detection, intervention and improved patient outcome. This will also reduce the number of CT scans required.

WOULD YOU LIKE TO CALL OUT A MENTOR WHO HAS HELPED YOUR COMPANY?

Dr Philip Boughton, one of my PhD supervisors has been instrumental in the creation of nuroflux. Philip has been active in the medtech industry for over 20 years. He has a passion for developing innovative healthcare solutions. I am very grateful for Philip's continued support as nuroflux goes continues to grow.

Psylo

Psychedelic-inspired medicine to treat mental illness

Mental illness is the health crisis of our time.

Current solutions are completely inadequate: 1 in 8 Australians take antidepressants, but only 1 in 9 of those patients see a tangible benefit. Psylo is Australia's first psychedelic biotech startup. They count themselves among a small but growing international cohort of companies focused on the development of new medicines based on first generation psychedelics. By exploring derivatives of psilocybin and other tryptamines they aim to develop an entirely new class of mental illness medications.

PSYLO

FOUNDERS

Sam Banister CSO


Joshua Ismin CEO


GET IN CONTACT

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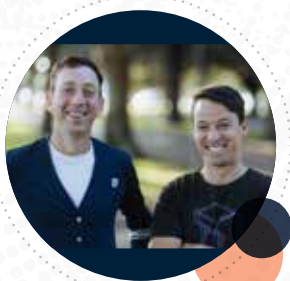
WHAT IMPACT IS YOUR COMPANY HOPING TO MAKE ON THE WORLD?

Since the 1980s big pharma has been underinvesting in solutions to mental illness - there's been a reported 70% decrease in neuropsychiatric drug development and research programmes in the last decade. New medications in the next decade will make SSRI medications obsolete, and we want to be a part of developing these solutions.

JOSHUA ISMIN Co-founder & CEO, Psylo

Joshua Ismin is a repeat Founder and tech entrepreneur who came to biotech as an alt-protein investor.

While living in the Bay Area, Josh noticed that many of his alt-protein co-investors were also backing psychedelic companies, which ignited his interest. His wife was offered a job to run the Sydney Knowledge Hub at Sydney University, which brought the family back to Sydney - and Josh used SKH as a jump-off point to network in academia. He met Sam Banister, his Co-founder and Chief Scientific Officer, at the Brain and Mind Centre at Sydney Uni.



Success looks like where we're at right now! Sam and I are so new to our journey that everything is shiny and exciting. The amount of support and enthusiasm for what we're doing has been so incredible, we feel like we are destined to win. What winning looks like is progressing our drug discovery pipeline to 3 leading clinical trial candidates.

QUASAR SAT

INDUSTRY FOUNDERS

Clearbox Systems

CSIRO





Fleet Space

Main Sequence Ventures

Saber Astronautics

Vocus

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We pride ourselves on being a sovereign company and nothing would bring us more joy and pride than seeing Australia lead the world in Space Communication Technology.

Over the next decade, more than 57,000 satellites will be launched worldwide to support a surge in demand for space-derived data, from environmental monitoring such as bushfires and floods, to connecting to sensors on 'Internet of Things' networks.

Every satellite needs a home base to communicate with on Earth but present-day satellite ground stations typically track one satellite at a time, leading to heavy congestion and limiting the successful deployment of satellites and the downstream industries they support. Quasar Satellite Technologies is set to revolutionise satellite communication, using technology developed at CSIRO to solve growing satellite congestion. Quasar is creating a world-leading ground station service capable of communicating with hundreds of satellites simultaneously, transforming accessibility to space for commercial and public sector satellite partners.

PHIL RIDLEY CEO, Quasar

Phil Ridley is a Fellow of the Institution of Engineers Australia and a Chartered Professional Engineer with over 25 years' military engineering/aerospace/telecommunications and startup experience. He has deep experience with phased array technology in aircraft radar and submarine sonar and defence/Optus satellite, and had key executive roles in the design and launch of Bigpond and Unwired Australia ISPS, and the design and operations of 4/5G terrestrial data networks. He is also a former RAAF Electronic Engineering Officer with training in cryptographic handling.

Phil is the winner of multiple Engineers Australia national awards, including the Bradfield Award for Engineering Excellence for the Ubowireless 4G network optimisation system, and is an international patent holder.



RASHMI KARANTH

Head of Products & Delivery, Quasar

Rashmi Karanth is a Digital Artisan who is completely obsessed about building customer-oriented user-centric digital products and services. Rashmi has over a decade of experience working in the United Kingdom and Australia for companies such as Airbus, Jaguar, J&J, National Audit Office, UK, Veolia, Mojo Power and Westpac. Rashmi has practical leadership experience working in diverse and complex environments with a proven track record of building complex and successful digital products and services whilst leading high performing teams, organisations, and commercial strategies across multiple industries & sectors. Outside work Rashmi has keen interest in space-related technologies and Formula 1.



RapidAIM

Taking the guesswork out of pest management

Crop protection companies (CPCs) are coming under increasing pressure to help growers reduce their use of chemical pesticides.

RapidAIM Bio-digital crop protection sells area-wide pest analytics to CPCs so that they can deliver precision pest management products and services to their grower customers.

Tracking and detecting pest insects in real time provides assurance and increases adoption by growers and improves the supply and distribution of products for more efficient and sustainable management of pests.

DR NANCY SCHELLHORN Co-founder & CEO, RapidAIM

Nancy Schellhorn is Co-founder, Co-inventor and CEO of RapidAIM bio-digital crop protection. RapidAIM's on a mission to reduce the chemical intensity of agriculture by taking the guesswork out of pest management.

Prior to launching RapidAIM, Nancy was a Principal Research Scientist with CSIRO in Brisbane Australia where she led teams of scientists to use novel tools and technologies to solve traditional problems in agriculture. Nancy took the leap into the commercial realm to have greater impact with her science, to go beyond the pen and megaphone, and create the solution for change.

Nancy has served on many national and international committees and advisory panels; has received many accolades and awards including Chairman's Medal (CSIRO's top scientific achievement accolade); and >1600 peer-reviewed citations.

WHAT MAKES YOUR TEAM UNIQUE?

Our diverse thinking. Our team consists of a unique combination of entomologists, biologists and engineers (hardware, firmware, software and machine learning) as well as business and commercialisation skills, to solve a global problem.








FOUNDERS

Laura Jones Head of Operations

Darren Moore Head of Engineering

Dr Nancy Schellhorn CEO

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Peter Isdale has given me the courage to be an innovator and to tackle a big challenge. He has immense commercial experience and business acumen and is a trusted advisor and friend.

- Dr Nancy Schellhorn

SensaWeb

*Radiation assurance.
Real-time data made simple.*



FOUNDERS

Darren Oliver CTO

Simon Turner CEO

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SensaWeb provides assurance for staff and communities by bringing radiation monitoring into the 21st century with simple transparent radiation monitoring and reporting.

Organisations can greatly decrease their risk and administrative burden through automated high resolution safety data. Setting this networked radiation solution apart is an extremely easy-to-use interface designed to make it simple for all to use. Automated radiation monitoring is managed remotely, reducing potential exposure. By making the invisible visible, organisations, and the surrounding community, have the assurance that their working environments are kept safe. This provides support for organisations seeking to move forward with positive future radiation projects.

SIMON TURNER

Co-founder & CEO, SensaWeb

Simon Turner is a passionate radiation specialist for nuclear, medical, mining and research organisations. He was actively involved with the decommissioning of two research reactors and the commissioning of the current Australian reactor. He was previously Chair of the Queensland Chapter of the Australasian Radiation Protection Society and lead detector technician on the Australian deployable nuclear-powered warship monitoring system.

Simon's drive to create assurance for staff and communities around radiation facilities led to the creation of SensaWeb. This world-leading approach earned him an invitation to be a presenter on the digital interface for nuclear activities for the International Atomic Energy Agency.



IF YOUR COMPANY HAD A THEME SONG, WHAT WOULD IT BE AND WHY?

*Timbuk 3 - The Future's So Bright,
I Gotta Wear Shades. The song's
subject matter closely addresses
the industries we assist and it
also comments on the market
potential SensaWeb
addresses.*

*As data
enthusiasts both
Darren and Simon know that
the resolution of information
from this data revolution is
going to accelerate industry
advancement and human
capability on earth and
beyond.*

Spiral Blue

Democratising Earth observation with edge computing

Spiral Blue is building the next generation of Earth observation with Space Edge Services, a platform that allows end users to process data in space to solve problems on Earth.

850,000 people today already use Earth observation data. Spiral Blue is building the technology to make this data accessible to millions more. They have launched their first Space Edge Computers to space in July, and will begin customer trials for Space Edge Services in late 2022.

SPIRAL BLUE

FOUNDERS

James Buttonshaw Co-founder & CTO

Taofiq Huq Founder & CEO

Henry Zhong Co-founder & Head of AI

WHAT DOES SUCCESS LOOK LIKE TO YOU?

Building the tech needed to keep the Earth safe while settling other planets

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TAOFIQ HUQ

Founder & CEO, Spiral Blue

Taofiq Huq is Founder and CEO of Spiral Blue, where he leads a dynamic team of space engineers and data scientists on a quest to make Earth observation more accessible. Originally founded in 2017, Spiral Blue has recently launched the first of its Space Edge Computers to orbit and is now awaiting the results of this in orbit demonstration. Taofiq is also Advisor for Sperospace, a space robotics startup, and holds a Bachelors in Aerospace Engineering from the University of New South Wales.



Through Tech23, we'd be interested in meeting investors as well as companies and organisations that could benefit from Earth observation, particularly in defence, government, agriculture, utilities, and financial services.

Synbiote

*Supporting innovation
- more biopharmaceuticals for less*

Synbiote

FOUNDERS

Alinta Furnell COO

Ismat Kabbara CEO & CSO

GET IN CONTACT



synbiote.com



@AlintaFurnell



/company/synbiote



/in/alintafurnell



/in/ismatkabbara

Synbiote is a biotechnology startup aiming to accelerate the research and development of novel biopharmaceutical products such as vaccines, chemotherapy drugs, and hormones.

They are developing a machine that will automate key production processes to save researchers both time and money in development. Accelerating the R&D of these biopharmaceuticals means that they will be cheaper to produce, and faster to get to market.

ALINTA FURNELL COO, Synbiote

With a specialisation in microbiology, Alinta Furnell has a strong understanding of both the research and commercialisation aspects of biotechnology.



Alinta has had a diverse range of both industry and entrepreneurial experience across a variety of positions involving product development, scientific research, project management, and advisory. Alinta has previously worked with HCF Health Insurance Australia, UNSW, The George Institute and the Michael Crouch Innovation Centre to both develop and commercialise breakthrough technology in the biotechnology and medtech field.

Alinta is passionate about bridging the gap between research and commercialisation and strives to bring accessible solutions into the lives of those who need them most.

WHAT DEEPTech INNOVATION EXCITES YOU?

Synthetic biology! Now more than ever, biotechnology has begun to form the foundation of many leading innovations. It's so exciting to see how inspiration can be taken from nature and applied to benefit our daily lives.

IF YOUR COMPANY HAD A THEME SONG, WHAT WOULD IT BE AND WHY?

Move on Up – Curtis Mayfield. As co-founders, resilience and the willingness to constantly learn and develop your skills is so important!

Tekuma

Improving human and technology interaction

Tekuma has developed a force-based, six-degrees of freedom control orb module for drones, robots and other devices.

It's intuitive, universal, and robust. It reduces the time, cost, personnel, and training required to get jobs done. Their technology allows users to intuitively control any device with just two fingers, freeing up one's other hand to focus on peripherals or control other devices. Over five years, Tekuma's founders Annette McClelland and Michael Griffin have bootstrapped to customers in industries such as underwater exploration, defence, and robotics. They are currently based in Adelaide, South Australia establishing local manufacturing for their technology.



FOUNDERS

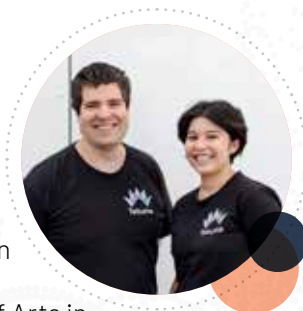
Annette McClelland Co-founder & CEO

Michael Griffin Co-founder



ANNETTE MCCLELLAND
Co-founder & CEO, Tekuma

MICHAEL GRIFFIN
Co-founder, Tekuma

Annette McClelland and Michael Griffin grew up mostly in Sydney, meeting in high school. Annette got a Bachelor of Arts in Communications from UTS, worked digital content for mental health not-for-profit Black Dog Institute, and went back to UTS to do her MBA. Michael earned his Bachelor of Engineering in Mechatronics at Macquarie University with Honours and worked in teaching robotics. The proof-of-concept for Tekuma's orb was tested during Michael's thesis. They launched Tekuma in 2016 with the UTS:Hatchery+ accelerator whilst completing their studies. Late 2018 they moved to Adelaide, South Australia to pursue longer runways, opportunities in aerospace and defence, and affordable housing. They are now based there with their dog, Tokyo.



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WHAT (AND WHOSE) PROBLEM IS YOUR COMPANY TRYING TO SOLVE?

Current two-joystick controllers are overly complex, they're fragile and confusing, take months to train, and often too many operators are needed to get the job done. NSW Police Force, Manager of Innovation tested the ROVorb and found that different devices on land, sea, or air having different controllers creates difficulties in training, retaining skills, carrying gear, power, connection standards, and maintenance. Requiring two hands to operate locks people with limited dexterity and limbs from controlling devices. We want to make technology more accessible to all users.

Tessara Therapeutics

Breaking therapeutic barriers in neurology

THE 23










FOUNDERS

Christopher Boyer Chief Business Officer, Director

Dr Christos Papadimitriou CEO & Managing Director

Dr Christian Toouli Head of Commercial Engagement

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Tessara Therapeutics is a regenerative medicine company developing RealBrain® technology; highly reproducible, synthetically produced, neural micro-tissues grown in the lab, designed to mimic the physiology of the human brain and manufactured at industrial scale.

They converge innovations in biology, robotic automation, neuroscience, AI, data and materials science to commercialise their RealBrain® technology as 3D models of healthy and diseased brain tissues so that the biopharmaceutical industry can discover better drugs. They are also developing their micro-tissues as a regenerative medicine platform to produce safe and efficacious tissue-replacement therapies to treat significant neurological diseases such as Parkinson's disease and stroke.

DR CHRISTOS PAPADIMITRIOU CEO & Managing Director, Tessara Therapeutics



Christos Papadimitriou is the CEO and Managing Director of Tessara Therapeutics. Christos is an award-winning qualified neuroscientist with solid experience in commercialisation. He has been working in the field of regenerative medicine at world-class institutes, including Johns Hopkins Medical School, ETH Zurich, EMBL Heidelberg and the German Center for Neurodegenerative Diseases, to develop regenerative medicine applications with a commercial focus.

Christos is highly skilled at identifying commercial opportunities and creating spin-out entities to commercialise new IP in the pharmaceuticals and healthcare space.

An area of innovation that excites us is the convergence of machine learning/AI into biotechnology and medicine as an exciting new frontier that we are also focused on at Tessara. Biological systems, clinical practice, biotechnology and drug development generate vast amounts of data. The potential to harness and interpret this data has the promise to lead to significant advances in how we understand medicine and its application to maintaining health and addressing diseases.

WHAT IMPACT IS YOUR COMPANY HOPING TO MAKE ON THE WORLD?

To break therapeutic barriers in neurology and realise a future in which we can protect, restore and rebuild the brain.

Tiny Bright Things

*See tiny better,
do impossible things*

Tiny Bright Things is transforming the way we see (and measure) tiny things.

Existing microscopy tools trade-off spatial resolution against slow and complicated workflows, blunting the cutting edge of research and undermining modern manufacturing. By reimagining the way a scene is illuminated, their Halo microscopy products deliver “impossible” imaging and measurements down to the nanoscale as fast as you can take a picture, enabling whole new fields of discovery and supercharging manufacturing with real-time process insights.

Their vision is to make tiny accessible to everyone so that we can all see and do more.



FOUNDERS

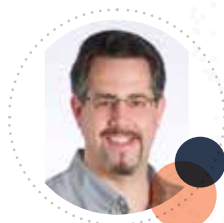
Chris Bolton Director






Prof Ray Dagastine Director

PROF RAY DAGASTINE

**Co-founder & Director,
TinyBrightThings**

Ray Dagastine and Chris Bolton founded Tiny Bright Things when they realised it was the best way to spark a revolution in microscopy. Ray is a chemical engineer with 20 years of experience doing cutting edge research in product formulation, particle technology and nanotechnology at the University of Melbourne. He has a strong track record pioneering nanoscale measurement technologies and translating research to practice through industrial partnerships. The technology behind Tiny Bright Things was different; with the potential for transformative applications across so many sectors, no one partnership could deliver the impact as fully as a company dedicated to that mission.



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We are in awe of the generosity in time and expertise we've received from people in our network, and more broadly from the startup community in Australia. There's a genuine sense of camaraderie— everyone wants you to succeed. We try to pay that forward whenever we get the chance.

Our advisory board has been hugely valuable to us. We're deeply grateful for their inputs on nuts-and-bolts things like supply chain issues or contract negotiations, but probably most importantly regarding commercial strategy. We've tried as much as possible to stand on their shoulders to get a view of what's on the horizon, and that has definitely made a big difference.

ENGINEERING FOR SURPRISES

NICHOLAS GRUEN

CEO, Lateral Economics



Today Mark Zuckerberg is a pretty bad actor in my opinion, but he did some brilliant work to get Facebook where he got it. Where MySpace was milking its site to maximise revenue, he was creating a better experience. These kinds of opportunities – which now have their very own cliché, ‘disruptive technology’ – are absolutely everywhere, just like they were after the invention of the printing press, because now we’ve invented the internet.

Now to really find what’s possible in this world, you have to engineer for surprises.

But in business, but particularly in government, managers spend a lot of their time role-playing how they’re in charge. In government that means that grant programs are predicated on the idea that those seeking the grants can tell some assessment group what it is they’re going to do. Now it’s certainly problematic what we should do, but there’s something completely nutty about what we do do, because grants for innovation are grants to do something new! Obviously those doing serious innovation can’t say what they’re going to do!

Our whole system is caked with this stuff – our research grants are run through this process. Only a small minority of applications get funded. Yet they require huge amounts of documentation. So there’s vast waste. And it’s also humiliating. The generalists sit smiling at the top of the hierarchy making policy and writing cheques about things they have no experience of while those who are dedicating their lives to trying to

make progress in the field are humiliated not just by their role as supplicants, but also because they’re forced into spin.

And spin is the antithesis of science. As the great Richard Feynman put it “the first rule in science is that you must not fool yourself and you are the easiest person to fool”.

So there are lots of problems there. One thought I had is experimenting with retrospective grants.

I’m thinking about people who have clearly achieved something extremely exciting, but don’t yet have the proof. We might hold out the prospect of healthy rewards to the best ten successes, on condition that the grant is reinvested.

I don’t think there’s too much problem at the very front end of innovation, I think the problem is all in growing and in capital formation. It’s extraordinary that Australia has the fourth-largest pool of patient capital in the world in our super system, and yet we have weak capital formation in innovative firms. We’ve got very bad Valley of Death problems in Australia and I would like to see us try to address that, rather than more programs subsidising startups and on that old chestnut of ‘commercialising’ university research.

What I do and what works out quite well for me is to back people who I judge to be:

- Decent
- Interesting
- Working on something that might do the world some good
- Have a chance of making lots of money!

And that list is in order of importance for me as an investor.

It’s extraordinary that Australia has the fourth-largest pool of patient capital in the world in our super system, and yet we have weak capital formation in innovative firms.



THOUGHTS ON GROWING AN ECOSYSTEM ED HUSIC

Member for Chifley, Shadow Minister for Industry and Innovation



PERSPECTIVES

Innovation has been in our DNA, we've had to be clever, smart problem solvers to survive in Australia over generations – from First Nations people to new arrivals. Given how isolated we are, and how removed we are from major supply chains, we've had to get things done here. We've got a good track record for smart things that are now embedded into the way the world works – from WiFi technology to making a difference in the quality of people's lives with cochlear implants, we've done it.

Today, though, we have a number of problems in the way we're approaching innovation. We seem to be going backwards on R&D. Our investment in research and development has fallen over the past eight years from just over 2% of GDP, to under that today. We need to, one, recognise the issues and, two, recognise the power of government to lead the way on a lot of this. Yes, business is going to do a lot of the heavy lifting, but government has to send a signal that this is of national importance. It's not just to improve the way our economy works coming out of the pandemic, but to make a difference in the quality of life for Australians.

It includes what we are doing in medtech, improving the way our environment works, improving the way we produce food. When you listen to people who think about future trends, the way we produce food in a climate that is changing is going to be really important and quality will be an issue as well. There are a lot of areas where government can lead the way, and it should. Bringing together business, research, universities, and people in the innovation space, is crucial to our long-term sustainability.

Labor has two big policies that we've already announced that are designed to rejuvenate activity within small, medium, and large businesses. The biggest thing we've put on the table is a \$15 billion National Reconstruction Fund. It's shaped up along the lines of what the CSIRO advises are key areas for the country into the years ahead. It would be a system of loans and equity, similar to what happens with the Clean Energy Finance Corporation (CEFC). It would be across a range of areas, from value-added resources and agriculture, to supporting medical innovation, supporting work that's happening in the defence space where you've got



AWS Activate Founders is a free program designed for self-funded, and bootstrapped startups that empowers entrepreneurs to innovate, build and grow. With \$1,000 USD in AWS Cloud Credits, \$350 USD in Developer Support Credits, and best practice architectural guidance, you can quickly get started on AWS, go to market faster, and lower your costs.

Whether you are just getting started, or already building on AWS, AWS Activate helps you go further.



a lot of spillover and commercialisation of activity that benefits the broader economy for supporting enabling technologies in AI and robotics.

We want to be able to see smart Australian startups be able to get finance particularly at the early stage, tap into government support, grow businesses that create opportunities onshore for Australia and feel the love on their home turf!.

The other thing that we're doing is advancing the Startup Year Program. Under this program, we will offer 2000 final year students and recent graduates income contingent loans. For people who are currently in university and want to stay on an extra year and work with a university accelerator, we will extend to them one year of HECS loan support.

We've got Australian know-how that we can rely upon to help rebuild the economy post-pandemic, and also build something that's a lot more durable and better than we've had before.

The Startup Year policy is for students who would be able to draw on that capital on the basis that they're working with the university accelerator, to build that startup, and advance the idea that they've come up with.

Both of these policies are really there to back Australian ideas that have got a lot of potential, at the early stage. That's what the CEFC did so successfully in renewables technology. They had an independent board, backed by an investment mandate shaped by government, that then went out and looked for great ideas. They applied commercial thinking before extending the finance. They're not just giving money away, the idea needs to have legs that it can stand on. Some of those startups backed by the CEFC, started as university accelerators.

It's really in those early stages that you've got to make a difference to get those startups to grow. Venture capital has grown phenomenally in Australia, and it's been backed up by a lot of the super firms who recognise that they can make a lot of money for members with some of the firms that are high gross, high risk. But they are handing out dollars in big amounts because there's not enough deal flow – there aren't enough firms coming through to be able to spread your risk out and to provide lower amounts of money. That's why we need to dig into the early stages and start encouraging idea growth at that

stage. If you're just shovelling money into a few big plays it's unproductive. It's better to spread the risk and nurture a much wider range of ideas to grow a lot of firms.

The easiest thing governments can do is shovel money out to big consulting firms. That's a lazy view of innovation. We want to produce companies that offer value and quality long-term and that are Australian firms that can offer something for Australian people.

If you think about public value, we currently realise about half of 1% of the battery value chain on Australian soil, and we miss out on about 35,000 jobs because we don't value add on all the minerals. We ship it all off and then we import it back in as the battery. An active government that didn't have a lazy view of innovation would be saying, 'This is something we've got to back – we're going to work with people to realise that value and make sure that it's retained on Australian soil.'

The lack of skills has been one of the big issues raised with me since coming back into the portfolio as Shadow Minister for Industry and Innovation.

The pandemic has worsened a longer-term problem of generating enough skills to meet the needs of businesses.

There is a need for government to invest in skills development.

We've had pressure on our universities through the course of the pandemic. We've seen pressure on TAFEs. We've lost huge numbers of apprenticeships in the broader economy. Before we start thinking about skilled migration to fill the gaps, we need to have a hard look at what we're doing to invest in local human capital. We can and should do more.

For instance, our Buy Australian policy that we announced in October, includes that on major infrastructure projects financed by government that one in every 10 people employed will be an apprentice. We are looking to extend that in the digital space, where for major contracts with government, that one in 10 of your employees is an apprentice. We're creating an incentive locally to train up people. Our plan is to back that better investment in skills development, and then look at what we do on skilled migration. The priority needs to be to build up local strength and capability and supplement it with overseas talent where we need it.

Our investment in research and development has fallen over the past eight years from just over 2% of GDP, to under that today. We need to, one, recognise the issues and, two, recognise the power of government to lead the way on a lot of this.

NURTURING INNOVATION FROM CONCEPT TO COMMERCIALISATION

DR CHARLIE DAY

CEO, Jupiter Ionics, past CEO, Office of Innovation and Science Australia



The deeptech commercialisation landscape in Australia has changed significantly in recent years. Even though people have been saying for as long as I can remember that Australia is “good at invention and bad at commercialisation”, the reality is that today I see a lot more activity than I saw five or 10 years ago.

That’s more activity in terms of investment from venture capital firms, more activity from universities, who are supporting startups proactively, and more activity from Founders who are exiting successful businesses and coming back for a second go or reinvesting those proceeds back into the early stage ecosystem.

Of particular prominence at the moment, the government is undertaking a review of university research commercialisation. One of the topics that they focused on is standardised agreements for university commercialisation, which I think is potentially a risky idea. Whilst it’s useful to establish some baselines and some templates, if you force the use of those templates across the board, you constrain the flexibility that the sector really needs. My concern, that I know a lot of other people in the sector share, is that the nature of early stage commercialisation is that no two deals are really the same. It can be very hard to shoehorn deals or opportunities into a limited range of structures. Template agreements could have value as setting baselines or setting common language for people, but that is as far as I believe they should go.

I should add that the scope of the review is wider than just the standardised agreements, and so I’ll be interested to see where the border review lands. For example, I’m hopeful that there’ll be some policies in there to help with that early stage funding gap that I mentioned, for really early stage proof-of-concept work.

Some of the bigger long-term challenges that could be harder to solve are around success metrics for academics and how we measure productivity and impact in research. I think it’s important that we try

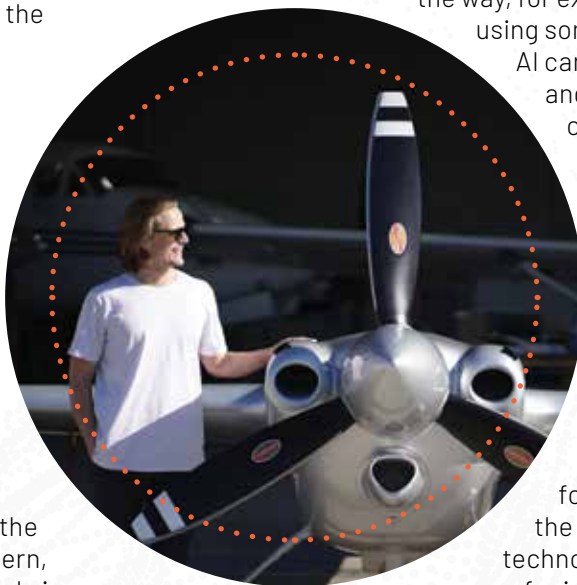
to measure these things, but I don’t think that the metrics we’ve got at the moment are where they need to be. I think that that sometimes creates perverse incentives for people in the system, which can lead to people spending a lot of time chasing research grants and writing publications to keep the numbers up, rather than trying to focus on impact.

Thinking more expansively, I find it invigorating to realise we’re in the midst of some really interesting revolutions. The digital revolution and AI adoption still has a long way to run – I think we’re still only in the early days of seeing how some of those things are going to play out. Over the next few years, we’ll see broader use of that and even changing the way, for example, people do research using some of those tools. Tech and AI can accelerate invention itself and that’s a really interesting concept.

Digital Health is also an area where I think we’ll see big changes. In the post pandemic period I think we’ll reflect on what we learned about our healthcare system over the past few years, and how we could improve it going forward. This impetus for change, combined with the growing capability in digital technologies, will provide plenty of room for innovation.

Clearly, the sector I’m in, which I broadly call ‘the energy transition’, is an enormous opportunity. I share the views of the likes of Twiggy Forrest and Mike Cannon-Brookes who see it as far more of an opportunity than a threat for Australia. I think we should be aggressively leaning in to the energy transition and taking advantage of the opportunities.

Even though people have been saying for as long as I can remember that Australia is “good at invention and bad at commercialisation”, the reality is that today I see a lot more activity than I saw five or 10 years ago.





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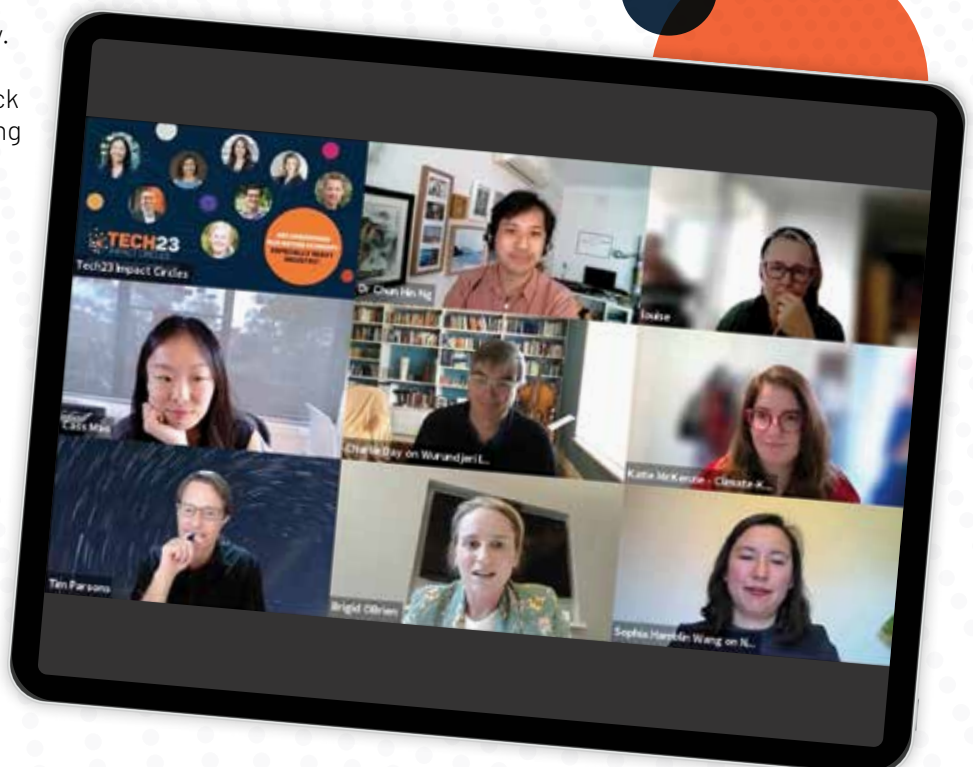
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The final sector I'd highlight is the space sector. We're already starting to see much wider use of Earth observation from space, starting to change the way things are being monitored. For example, I recently read an article where they have monitored the rollout of large-scale solar farms around the world by using satellite observation combined with AI to track activity globally. This will have broader application: if you automate the whole process, you can track and monitor what countries are really doing to tackle climate change in a much more direct and verifiable kind of manner.

Australia has quite a vibrant, nascent space industry and we've got a reasonably strong history in space, because (among other things) we're a stable democracy in the southern hemisphere. Today you've got really exciting companies like Gilmour Space Technologies and others who are in the launch space, and a lot of smart-satellite companies that

are taking advantage of those cheap satellite capabilities. There's big potential for growth and the government has recognised that with the creation of the Australian Space Agency.



WHY SYNBIO IS CRITICAL TO A SUSTAINABLE FUTURE

CLAUDIA VICKERS

Synthetic Biology Future Science Platform Leader, CSIRO



Some four and a half billion years ago, biology evolved on Earth. Through photosynthesis and other processes, energy from the sun has been converted into chemical bonds. That energy has been condensed as fossil fuels, which provide a very concentrated form of energy that we've been exploiting in the industrial revolution, for the past 100 years or so.

Human beings are using this energy orders of magnitude faster than it can be replenished. It's clear that we need to transition from an unsustainable fossil-fuel based economy to a more sustainable bio-based economy. If we don't, the consequences are quite dire, and we're already seeing them. To transition, our economy is going to be looking completely different in the next 30 to 50 years, and it has to be established and operational within that period of time. There's a lot to do to deliver that, and the consequences of not delivering are severe for humanity.

To transition, our economy is going to be looking completely different in the next 30 to 50 years, and it has to be established and operational within that period of time.

Start by asking, 'What does this sort of sustainable future actually look like?' It includes driving emissions to zero, creating a massive industry to sequester carbon, circularising material flows and food flows – essentially decriminalising our carbon economy with respect to the ecology of the Earth, for people and the planet.

To do that we need to totally revolutionise our cities, so that they are circular economies, rather than the linear economies that exist now. That includes local recycling of waste, and local production systems to produce food, materials, industrial chemicals and other bio-products. Energy sources need to be clean and renewable.

Synthetic Biology (SynBio) provides the tools that allow us to deliver on bio-based engineering solutions. The reason it's so exciting now is because we are at a unique time in history. The technology has matured to the point where it can make a difference at the scale that's required.

As a consequence of the pandemic, there is a real recognition of both our vulnerability to biological systems, and the ability that we have to engineer bio-based solutions to solve those problems, rapidly.

There is also recognition of the importance of sovereign manufacturing, the ability to deliver rapid responses, and the need for value addition to primary products.

Food, feed and the agriculture sector in general are very important areas because they contribute a lot of emissions and they also operate at massive scale. The energy side of things is really quite difficult in terms of biology. A lot of work has been put into biofuels, but delivering energy density at sufficient scale is challenging, and it's very difficult for biofuels to compete with conventional fossil fuels. At the end of the day energy can be developed renewably from other systems, such as solar and wind.

But there are lots of other areas where SynBio can help, for example, bio-based chemicals, waste management, and environmental management. There are also applications that are further on the horizon, including construction and building materials. Health products like pharmaceuticals, engineered CAR-T cells, diagnostics, and gene editing are going to revolutionise human and animal health – the RNA coronavirus vaccines are a great example. But they're often less important for sustainability than other targets.

There's a relationship between how much of a given product you can make, the size of the market, and what the market is willing to pay for the product. It's much easier to make a high-value, low volume product such as a pharmaceutical using biological systems than it is to make a low-value, high-volume product, such as a bulk chemical, material, or fuel.

We're at the stage now where we can make medium-value products: foods, feed additives, agricultural chemicals, industrial chemicals and so forth. We can make those at sufficient rates and yields to have an impact at scale. Scalability is the real issue: it's one thing doing it in the lab and another thing to get it on the market. It's really important to focus in the space where we can have an actual impact.



Australia has a really good regulatory framework, which is either in place or on the way to being in place. The frameworks are being tested now for alternative proteins, which have massive potential impact. You can engineer bacteria and yeast so they make proteins similar to the proteins found in meat. This will help us sustainably meet that increasing gap between demand and availability for high value protein.

I'm watching with interest how that goes forward. There are companies in Australia making other alternative food ingredients, including oil alternatives, such as the Omega-3 fatty acids we get from fish oils, which are really healthy but can't be sourced sustainably. A whole variety of feed and food products will come on the market in the foreseeable future. I'm excited to see how engineered biology can drive sustainability in that future.

Scalability is the real issue: it's one thing doing it in the lab and another thing to get it on the market.

PERSPECTIVES

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WE NEED TO UP THE ANTE ON SKILLS INVESTMENT

IAN BUDDERY

Chair, Maestrano, Critical Arc and 6clicks; advisory board member Groguru



The landscape has transformed in the 40 years that I've been in the software industry. We've gone from being an outpost of mainly American technology companies to having a very vibrant startup scene, access to venture capital, and global recognition for the quality of the technology that we build. That's been a remarkable achievement, and we should be very grateful for all the hard work that's been done by thousands of people over 20 years to get here.

I have a different perspective on what we can do better, because I think there's a looming problem for Australian technology, which is the shortage of talent. My first job was as a cadet with BHP. In one generation we've gone from a country which put a lot of effort into nurturing homegrown talent, and did it very well, to being a country which takes the shortcut of importing people from elsewhere. We've been taking the best and brightest people from emerging countries around the world in order to meet our needs, with minimal investment into producing more of the people we need ourselves.

We've been taking the best and brightest people from emerging countries around the world in order to meet our needs, with minimal investment into producing more of the people we need ourselves.

Post-COVID, the situation is going to be significantly worse because now we have the normalisation of remote working. You can stay in your family home in New Delhi and work for a company in New York. You no longer have to abandon your entire culture and extended family to move somewhere else in order to have a well-paid job and a comfortable life.

The technology companies that I'm involved with in the UK and the United States are quite happily employing people all over the world. The Australian model of either importing already qualified immigrants or bringing in students and then encouraging them to stay on with a residency visa won't meet the demands of our growing technology industry for the next 20 years. We've got to make some fundamental changes in the approaches to improving the training of high school students in technology areas, and encouraging them to choose a STEM career as compared to options such as law, commerce or medicine.

This particularly applies to young women in technology. There's a lot of criticism leveled against the tech industry for its terrible gender imbalance, but the reality is that there just aren't women to hire. We all go to a lot of trouble to attract and recruit female engineers. We all want to have balance in our workplace, but we just don't get the applicants. 61% of law graduates are female, compared to 17% of computer science students.

We have this terrific situation now where women outnumber men entering universities, but in the STEM disciplines, women are dramatically underrepresented. Anecdotally, we all know that if you sit at a barbecue with parents of Year 12 students, it's always announced with some pride that their son or daughter got into law or medicine. It's never announced with pride that my son or daughter got into engineering. We are not going to build a strong export economy on the back of having lots of lawyers.

Returning to remote working, there's no doubt that software engineering is the new gold rush. If you are an expert in blockchain or machine learning, you can command a global price. For the individual, the ability to work from anywhere in the world means that we are probably going to have multi-millionaire software engineers, not through starting their own company but simply by contracting themselves out to the highest bidder over the course of a lifetime.

It's good for the individual and it's very good for developing countries because rather than having to sell their skills at a massive discount in order to compete with the UK, America or Australia, they can charge out – and they already do, by the way – their people at the same rates as someone in America will charge. That's going to be good for those economies. You can make as much money today as a software engineer in Shenzhen as you do in Sydney, in fact, you probably make more.

On the topic of international students, I'm not sure we're going to get them in the same numbers in future. There's this smug arrogance about Australia, that we are the best place in the world and everyone wants to come to live and work here. It's fading, I'm afraid.

We've got to make some fundamental changes in the approaches to improving the training of high school students in technology areas, and encouraging them to choose a STEM career as compared to options such as law, commerce or medicine.

Our construction-focused economy has created this real estate bubble, which makes Melbourne, Sydney and Brisbane among the most expensive cities in the world to live. If you're a smart, university-educated person, these days you can work just about anywhere, particularly if you've got STEM skills. You can take your pick of lots of cities in the world that are nice places to live, where the cost of living is a fraction of Melbourne and Sydney. We're like frogs boiling in the pot, for people of the generation who already have a house, we don't notice it so much, but for the next generations, the possibility of owning your own home in Melbourne or Sydney is increasingly remote.

The things that used to attract high-value, highly educated and qualified immigrants to come here are gone and we're in for a rude surprise. For an entire generation, we've not been bothering to train apprentices and cadets, we've just imported more immigrants. I'm not sure that will continue to work in the future.



A MODEL FOR ENERGY AND COMMUNITY RESILIENCE

MARA BUN

Chair, Australian Impact Investments, President and Chair, Australian Conservation Fund, director, Australian Ethical Investment



PERSPECTIVES

We need integrated business model innovation, and Founders to kick the energy transition into gear.

Black Summer fires taught us so much. We learned who we are as a nation, we learned about our precious nature at risk, and we understood the horror of what unchecked climate change looks like. I live in the hinterland of the Gold Coast in a place called Tallebudgera Valley, which sits below Springbrook and Lamington National Parks. It's Gondwanaland, a global biodiversity jewel. We have clusters of trees that have been here for over 2000 years. I woke up one morning to a red sky and burning rainforest. That sounded the alarm for a bushfire hell that unfolded across Australia, my beloved California, in Greece, Spain, Siberia and the Amazon.

We are literally watching our house burn down.

One really interesting lesson around community resilience is that we realise we cannot rely on just a central energy grid. Without energy, it is very difficult for communities to make it through acute natural disasters. We must find practical models to capitalise and implement micro neighbourhood grids nestled around community batteries, models where small businesses and neighbours can come together to break through regulatory barriers, raising capital through networks and crowdfunding – it can be done in such creative ways.

It has been the Australian states that drove down the price of solar PV at exponential pace, as global manufacturers benefited from the fast learning curve catalysed by feed-in tariffs here and around the world. Our states can play a really important role in driving down the costs of batteries in the same way. As deployment grows, batteries will become economically viable.

We are so close to optimising for distributed energy solutions. Several Australian startups are harnessing micro wind technologies. In my corner of the Gold Coast, around 30 families live in a valley nestled around a hinterland escarpment. We could all benefit from having three or four small scale wind generation sites that can integrate with our existing rooftop solar. We know exactly where to put them. A community battery could leverage the local generation mix and enable energy market trading back into the centralised grid. We need to find viable ways to integrate Energex into that community centred business model.

If the shit goes down, and it will, we can lock in and keep ourselves going and create a refuge for those neighbourhoods around us that can't. We will not need to rely on diesel generators to pump water when the central grid goes down.

On one level, it's creating resilience to natural disasters, by creating a decentralised, distributed, democratised energy system that complements and feeds into the national grid – it doesn't compete against it, it makes the grid more adaptable and more flexible. The other marvellous thing that happens when you come together like this, is you get to know your neighbours. Eight years working in climate resilience taught me one critical lesson: when hell comes your way, you have to be ready to stand strong, with no one but your neighbours. Sometimes you may remain cut off for over a week.

One really interesting lesson around community resilience is that we realise we cannot rely on just a central energy grid.





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Local energy models are the new renewable innovation frontier.

These new models will connect local businesses to their communities. They too can be investors in neighbourhood-scale resilience.

IRENA, the International Renewable Energy Agency, did a report on community ownership in 2020. Australian technology use cases include new trading arrangements, peer-to-peer energy, community-led projects, how we work with retailers, allowing the regulatory capacity connection to evolve, and enabling energy auctions to have participants from the community.

One of the most exciting things I've been a part of recently is in the Northern Rivers region where a group of people came together and built the business case for Australia's first community-owned energy retailer, Enova Community Energy. Enova now has close to 11,000 customers reaching across NSW and SE Queensland who are passionate about creating the distributed energy future together. It's a genuine social enterprise – 50% of profits go back to a foundation for community-benefit projects.

Enova is an inspiration for a million enterprises to blossom on the back of technology and social connectivity. When we look back 30 years from now, we may find that Australia's energy model has shifted from a carbon intensive centralised system into one that includes a significant proportion of local distributed models that pay community dividends and innovate continuously. It's also a future about distributed jobs.

Let's be intentional about how we innovate in the face of escalating climate risks. Decentralised, distributed renewable energy models will integrate tech, regulatory reform and impact capital into scalable innovation systems. I think we are on the cusp of seeing that happen. That's in the spirit of Tech23 – pulling together the coolest universe of innovators, capital players and everything else!

GAMECHANGING MEDTECH TO CHANGE LIVES

DR ROBYN STOKES

CEO Bionics Queensland



As medtech innovation moves to centre stage, we're now seeing a very exciting marriage between bionics and regenerative medicine. We've come from exo-bionics ('add-ons') of artificial organs and artificial limbs to the magic of auto-bionics where technology and biology are really starting to merge. Bionics today spans interfaces with the body such as osseo-integrated or myoelectric limbs plus really exciting interventions or treatments. These range from neurobionic treatments such as deep brain stimulation and new 'electroceuticals' to treat inflammatory diseases to implants e.g. tissue-engineered or bio-robotic implants and organs.

When you look at bio-fabricated implants – which might be tissues, cartilage, bone – and today's 'organs on a chip', all of that is a preface to whole-organ engineering that is out there on the horizon. There's so much innovation opportunity. Neural enablement is the next level in mobility, bringing greater control over bionic limbs and devices.

Our job at Bionics Queensland is to track how far we have come across all areas of bionic innovation, whether it's implantation, intervention or interfaces, to identify bionics deeptech projects that need further support. Sometimes they are going quite slowly because they exist more in the university and laboratory environments. We want to see many more startups and more of the brilliant work being done in universities fast-tracked to market – our job is to work with startups and teams at universities and hospitals to help make it happen.

Nigel Greenwood's bionic pancreas is a great example of a university 'spinout' now at the clinical trial stage. He has an evolutionary form of AI, where two AIs battle it out to deliver a new level of precision for insulin dosage, particularly for brittle type 1 diabetes.

With Nigel's innovation, we're seeing a real integration of artificial intelligence, medical science and medtech devices coming together for greater precision.

In terms of mobility and neurotech, we're seeing a range of techniques being explored. For example, there's the Biospine Project at Griffith University on the Gold Coast. As part of Biospine, Dr Dinesh Palipana, the 2021 Queenslander of the Year who has a spinal cord injury caused by a road accident, is at the centre of new experimentation with spinal cord treatments right now.

It's exciting when you start to uncover the work being done by clinical leaders and in universities.

We've got lots of wonderful startups out there, now it's about bringing the projects that are truly gamechanging out of the university environment far more quickly.

We know there are so many steps to go through with clinical trials and \$20-\$25 million to take a device to market. Working collaboratively, continuing to grow a pipeline of bionic innovations, doing more manufacturing in Australia and celebrating and retaining commercially savvy startups is important.

We should always confirm: whether you are taking this device out to different markets and continents,

understand the market supply chains for new or improved products. In a nutshell, one should always look at that bigger picture... the global context!

When you look at bio-fabricated implants – which might be tissues, cartilage, bone – and today's 'organs on a chip', all of that is a preface to whole-organ engineering that is out there on the horizon. There's so much innovation opportunity.

We've got lots of wonderful startups out there, now it's about bringing the projects that are truly gamechanging out of the university environment far more quickly.



CAPITALISING ON THE BENEFITS OF NATION-BUILDING INVESTMENT

DR PETER RIDDLES AM

Director and Advisor; science and innovation



I think like a scientist and ask, 'What, what are we trying to improve?' The innovation system is a sort of a process that delivers outcomes. The original definition of innovation is a process for making something new and useful – that's what the word means. Up until this point in time, Australia has actually been quite good at innovation. Our economy is 65% services, about 10% commodities, which means about 80% of our economy is services and resources.

The innovation you do in those areas are often directed at markets and the cost of the goods, the cost of the services and business models. We do that very well. What people usually mean when they talk about improving innovation is actually the science piece, the bit where science is used to create new products, to manufacture new products and find markets for them. That has not been our strength for a little while – manufacturing is around 5% of our GDP.

About 100 years ago, after World War I, the then Prime Minister Billy Hughes said, well, where we're far away from the rest of the world, we've just had World War I and the Spanish flu pandemic and we realise that we can't make a lot of goods here in Australia. It was back then that the government then realised and set about changing that. That's why CSL (Commonwealth Serum Laboratories) was formed in 1916, to manufacture vaccines and other biological products.

So we're not going through something very new, we've just been reminded of the additional reasons why you might want to have a manufacturing capability, which often draws on technology. The challenge for Australia is that if you want to do that, and if the argument is valid, which it probably is, it means you've got to change our innovation system from services and commodities, to also doing the value-add piece.

If you're going to change the system, it's not going to happen by playing around the edges, there has got to be a wholesale policy setting that means we can either shift or include that value-added approach into our innovation system.

If we want to diversify our economy, and be able to make things and use science and technology to improve lives, we have to look at countries that do that, and ask the question, 'Why do they do that, and why don't we do that as well as they do?'. We have a strong economy, we have a pretty equitable society and access to health and education. We've got to ask ourselves, 'What's going to drive that change?' Because you don't change things that are working reasonably well, because it's a risk in the longer term.

To improve our sovereign capability in these areas, I don't think that simple funding – such as grants and taxation benefits – is the solution. They are a useful adjunct to a more primary policy area. I think it was Plato who's believed to have said, 'And it is necessity who art the mother of invention.' For a country like Australia to change its risk profile, when things look pretty good, is a big challenge.

This is what I'd do. In the US, for a long time, they've done innovation this way, which is not overtly stated, it's not explicit, but when you look at it, it is quite clear. Since at least World War II, the US has applied public money – taxpayer money – to solve problems in the national interest. The simplest example was after World War II, the national roads agency funded the building of freeways and motorways in the US. That wasn't about building nice roads for people to drive around as tourists, it was to ensure they had the ability to mobilise military forces quickly. But it meant that transport improved, domestic economies improved, interstate trade improved, tourism improved – so there was a huge additional economic benefit from that national security project.

If you're going to change the system, it's not going to happen by playing around the edges, there has got to be a wholesale policy setting that means we can either shift or include that value-added approach into our innovation system.



The best example is the NASA project. That also was a national security thing, because it was about building missiles and rockets. But that project drove innovation across the US because they had to build the silicon chips – that’s where Silicon Valley began – the communications, the materials, the spaceships, the rockets, the fuels – all of those things needed innovators to drive that project. That national project drove investment and drove innovation and technology development.

Let’s go back to Australia. Are there any examples in Australia that have a similar kind of imperative? My view is, if you want to change things at scale, that’s the approach you’ve got to take. Government solves a public problem, provides the funding, creates the market to make innovation a necessity.

There have been some examples in Australia that have worked really well like that, and there are some examples, which I think are a missed opportunity. Let’s look at the Snowy River Scheme. After World War II, the Victorian Government put up a proposal for using the waters from the Snowy River to drive electricity, and the New South Wales Government put up a similar proposal to drive water for irrigation. The Federal Government came in and said, we’ll do both.

That became a nation-building project – a lot of public money went into building it, and it benefited electricity, irrigation, local communities, tourism, and it brought in a lot of innovation talent – engineers and technicians who helped build this massive project. Immigration was very important in doing that. The legacy is obvious.

To look at some things where we might have done better. The National Disability Insurance Scheme (NDIS), for example, is a useful project for obvious reasons, could have been refined to help drive innovation in the healthcare sector better than it has. There wasn’t that connection.

I’m using ‘healthcare’ in a very general sense. A lot of funding went into the NDIS for the national benefit of improving the quality of life of people who might otherwise have less equity. It was supported across political parties. I recognise that the NDIS draws on lots of service providers. But we could have been more deliberate about driving all the innovations that might help overcome disabilities, for example, and really drive the growth of private sector healthcare innovation. I thought the connection was very sporadic and random. If you had a unifying government policy, or perhaps a state government policy, too, we could have connected the rise of innovation in that sector for even greater community benefit.

This is where the idea of having grants on their own don’t work, but if you had grants or incentives to drive the product for a real market, which is being created by NDIS, I think we could have seen a lot better growth in that sector. I’m not saying that’s a perfect solution, but that’s how these things are done in a few other countries, including the US and to some extent China.

Grants on their own have some effect, but they don’t necessarily lead to wholesale industry change, and that’s the aspiration for Australia: to get that bigger change to the system.

What tech is going to impact our future?

We asked Industry Leaders in our midst to share some of their personal musings about what they see on the horizon. And what a thoughtful feast of ideas, concerns, insights and hopes we received about what they expect to see emerge from innovators in the future!

If history is anything to go by then the most impactful innovations to emerge are those we don't know are coming, right? Latent capability that sits unearthed inside of Australia's research organisations is growing in sectors where sustainable funding and know-how supports its growth. Innovations across advanced manufacturing, in biosecurity, cleantech, spacetech and synbio are all making headlines now, maturing with thanks to additional funding and innovation ecosystems built around them.

But while we are all looking directly in those directions and inside those sectors, the next ResMed, Canva or Fast Wifi will probably come out of left field from somewhere else entirely. It'll come from a team with the strongest entrepreneurial mindset, a genuine passion about creating a sustainable future and a good dose of serendipity.

DR ILANA FEAIN CSIRO commercialisation specialist, founding Director of Quasar Satellite Technologies and Founder, Big Science Industry Engagement Services



I expect to see big tech innovations in the area of decarbonisation. That includes renewable energy, in particular, in energy storage (batteries, green hydrogen storage, thermal storage, and more). Wave energy remains a virtually untapped resource that is crying out for innovation.

Carbon capture is another area of decarbonisation technology where we can expect to see innovation. To date, green (land) carbon has largely been the focus but blue (ocean) carbon represents a huge opportunity, both to decarbonise and mitigate against climate change. For example, shellfish reefs can facilitate seagrass meadow restoration (=blue carbon) AND protect coasts from rising sea levels. Technology can be developed to accelerate reef restoration (which AusOcean is tackling).

ALAN NOBLE *Founder, Australian Ocean Lab*

The next frontier of the global economy is in making it sustainable within the planetary boundaries. Many industries have left environmental issues in the wake of their rapid growth and sole-focus on output and productivity. Now, science and tech has reached a point where the cost of such externalities can be easily quantified and monitored. This innovation in monitoring and verification offers opportunities for global industry transformation, and new business models in creating a new sustainable economy - which Australian innovators should have a fair share of!

ANASTASIA VOLKOVA PHD *Co-founder and CEO, Regrow*

Uptake of AR/VR technology has been slow. Meta have just cracked this market wide open. We're already seeing a lot of content development from researchers and teachers in this area and it's going to rapidly increase as the equipment and platforms improve.

ROHAN MCDUGALL *Director Commercialisation, Curtin University*

The next big deeptech innovations will come from the convergence of emerging technologies (synbio - especially mRNA, AI, network tech/UX, robotics, advanced manufacturing and blockchain) with traditional deeptech platforms. We have seen this trend emerging in the Tech23 over the past few years, with AI and blockchain tech being used to augment plant and process and this trend will continue and accelerate at an exponential rate. Access to talent in these emerging technology areas will be the rate limiting step.

Applications of these tech will likely follow the policy environment - COVID has been the recent challenge, however I expect an uptick in green energy/materials and vehicles as well as carbon sequestration technologies and agtech solutions to capitalise on the future circular carbon economy as humanity takes on the net zero challenge.

TIM BOYLE *Director, Innovation & Commercialisation, ANSTO*

I've already seen exponential growth in the level of climate related startups and innovations in my deal flow in the last 5 years, and I hope to see that trajectory continuing.

What tech on the horizon will have the biggest impact? Platforms that simplify and make cost effective, electrification of everything; New sources of, and the ability to harness, renewable energy on an industrial scale; Carbon capture/sequestration/storage and recycling technologies and platforms; Quantum computing and its ability to synthesise data at a scale we have only theorised and how this will likely revolutionise almost every discipline of technology and science.

What worries me still, on a daily basis, is social media and its impact on our culture, our psyche, our ability to distil and critically review information and the impact it has had on 'truth' in a world of disinformation. I truly worry about the long term impacts when the companies themselves refuse to acknowledge the issues, and have no accountability.

ELAINE STEAD *Human VC*

I am excited to see an explosion of tech innovations that support the adaptation of our cities and regions to better respond to the challenges of climate change – something we’re trying to support with our work at Place Intelligence.

Personally, I am closely following the emergence of synbio and gene editing. As one of millions of Australians who suffer from an autoimmune condition, I am all too familiar with the challenges of managing an illness that requires an adaptive approach to keep it benign. The opportunities for synbio to prevent and/or cure disease and improve health and performance is incredible. But like any new tool, these tech advancements present huge ethical and moral challenges as the ability to re-engineer and enhance the human body and mind opens up a world of opportunities for misuse. The potential impact – both good and bad – is enormous.

BONNIE SHAW *Co-Founder + Chief Strategy Officer, Place Intelligence*

I am incredibly excited about the next 5 years for tech innovation in Australia. In particular, I firmly believe that we are poised to see much greater impact from the \$12-13 billion that we invest in research each year across our universities, and that we will see this impact come across the spectrum. Areas that we are particularly excited about at IP Group include decarbonisation, synbio, sustainable agriculture, improved treatment options for chronic disease, and in the next wave of computing hardware from quantum to neuromorphic.

I am especially excited about the potential for hydrogen to be not just the ‘new iron ore’ as a major export, but also to underpin a renaissance in Australian industry as it creates a fundamental cost advantage for local manufacturers and heavy industry. By developing the hydrogen-based technologies that enable hard-to-abate sectors to reach zero emissions, we can position Australia for growth and economic leadership for the 21st century, and it is great to see governments across the country start to engage with the opportunity.

MICHAEL MOLINARI *Managing Director, IP Group Australia*

I’m excited about the potential of new materials to rebuild the fundamental building blocks of the world. Things like biodegradable polymers extracted from seaweed; bricks made of farm waste; leather made from mushrooms. We have the opportunity to build a world that is not only sustainable, but contributes in a positive way to people and the planet if we look to new ways to use existing materials in our biggest hierarchy of needs. This is even more important as so many countries around the world see the decline of people living in extreme poverty and the establishment of new cities and towns and a greater demand on resources to supply this growth. It’s not about building back better – it’s about building better. And starting with our foundational needs – food, clothing, shelter, water, energy.

We can rethink energy and batteries without rare earths or minerals. We can rethink textiles and building materials. We can rethink food sources and food as health. Instead of looking at how we can improve existing processes and products, we have the ability to reimagine them from the ground up. Looking to nature, but also using both science and engineering to create something new through cross disciplinary expertise will be the norm.

We need to align policy, capital and invention to the challenging problems we face in the world. Bringing a new solution to market requires a village of support and it’s important to recognise the levers we can pull to align priorities and accelerate opportunities.

SALLY ANN WILLIAMS *CEO, Cicada Innovations*



The health sector has been moving towards Precision Medicine for an individualised approach to our healthcare. Telix Pharmaceuticals has a pipeline of clinical-stage products which address unmet needs in oncology and rare diseases. With the focus on reducing emissions off the back of COP26 - the time seems right for the takeoff of Mineral Carbonation International (MCi) - which has been an overnight success (lol with the idea beginning in 2006!)

Tech that has the greatest impact are those that dramatically cut carbon emissions for our current processes or those that can pull CO₂ out of the atmosphere to stabilise the levels and the temperature.

Food security will become an increasing issue as temperatures and sea level rises and storms become more frequent and powerful. Those that are able to replace meat with plants. e.g. CSIRO's V2Food, and reduce methane emissions from livestock are growing. e.g. FutureFeed - a CSIRO, MLA and JCU seaweed feed ingredient for livestock that reduces their methane emissions.

There are lots of advances in space with reusable rockets, lasers that will clean up space junk, space tourism becoming normal and the possibility of mining for new materials in space becoming closer to reality.

NATALIE CHAPMAN *Managing Director, gemaker*

Entrepreneurs and inventors are inherently attracted to big, hairy challenges because that is where the biggest opportunity for innovation and impact can be found. In the next decade, climate change provides the biggest challenge - and conversely opportunity - of our lifetimes. If we are to solve this intricate and complex puzzle in the urgent timeframe we have now, then entrepreneurs, researchers and inventors alike will need to use the smartest tools available. Tech like data analytics and machine learning have to be adopted faster in every industry working towards net zero. Let's take renewables for example - including solar, hydrogen and biogas solutions. To become a critical part of the planet's energy mix, we'll need to optimise energy generation, automate reliable energy distribution, and accelerate innovation in battery storage from mineral extraction to chemical composition. You can accelerate solutions across all those fields by leveraging vast amounts of data and running simulations at speed and scale in the cloud - so instead of running individual experiments one after the next, you can leverage data and machine learning to run thousands of experiments in parallel. That's the sort of speed we need to be innovating at!

COLETTE GRGIC *Head of Startup Ecosystem (ANZ) at AWS*

We see technology innovation worldwide progressing on three main fronts simultaneously: health science, digital sciences and materials science. And for me, some of the most interesting domains where we'll see the fastest growth over the next decade are at the intersections of these domains in areas such as quantum machine learning, quantum sensors and neuroscience.

In Australia and New Zealand specifically, there's some great emerging areas of media technology where we have global strengths in 3D technologies such as AR, Simulation and Digital Twins. Telehealth and other online health services are only going to grow further and could present unique future export opportunities - we've mastered the challenges of remote health previously with the Flying Doctors service and so this is a natural fit and already we have advanced players in telehealth software such as Coviui. EdTech is another area again where we've some previous form in the School of the Air but more recently with Mathletics, Reading Eggs and Education Perfect.

PROFESSOR PAUL X. MCCARTHY
CEO & Cofounder, League of Scholars

Universities and social entrepreneurs, having purpose in what they do, are creating innovative solutions to solve the UNSDG gaps and problems here in Australia. We at ImpaQt are seeking out transformative opportunities that help underserved individuals to thrive, especially where target beneficiaries are those experiencing acute poverty, inequality or exclusion. A key area of our focus is the emergence of social solutions that make money AND provide great social impact. In the past it would have been government or philanthropy that were funding the solutions.

We are excited about the solutions but we could leave the vulnerable and excluded clients/customers behind when we don't include them in the design, it is unaffordable or inaccessible for them or they don't have the latest version of the iPhone. We can't afford to lose the human touch of voice, empathy and connection.

LISA SIGANTO *Managing Director, ImpaQt QLD*

The mRNA vaccines are only the beginning of what is set to be a nanotech revolution in medicine. We are now seeing growing examples of its use such as food packaging that can detect the presence of pathogens etc. In silico drug development (the process of discovering new targets via bioinformatic tools) and in silico clinical trials promise to speed up the drug development process exponentially. In late 2019, the first-ever AI-discovered drug was moved into clinical development, with preclinical development shortened from four years to just 18 months! Personalised Medicine is getting ready to show impact; genetic sequencing, coupled with personalised empowered patients, will lead to many new, personalised therapies, such as genetic profile archetypes. Thanks to COVID-19, patients have become comfortable with telehealth, which in turn will lead to more digital health solutions that can work alongside it. Decision Support tools especially within oncology will continue to get better, with products able to predict the responsiveness of certain tumours to chemotherapy based on genomic mapping. Also, ML has now started to prove itself as a promising technology used to decipher trends from imaging. Emerging evidence suggests that AI can detect certain types of cancer and determine whether expensive immunotherapies are working on patients. Finally, with COVID-19, we see increases in mental health issues, opioid addictions, and insomnia. An emerging area to watch here, offering a lot of promise is psychedelic derived therapeutic treatments.

It is not going to be one technology that will have the biggest impact, it is going to be a convergence of different technologies that is going to lead to the biggest leaps forward.

PETRA ANDRÉN *Tattarang*

Climatetech, climatetech, climatetech. It will be different to the promise of the initial cleantech boom 10+ years ago. The economics of renewables are better and better, corporations and investors are serious about their actions towards carbon footprints and there is a growing majority who are pressing for urgency. We need multi-disciplinary, multi-sector, multi-lateral cooperation to solve the biggest challenge of our generation. And I firmly believe the best innovations and real break-throughs happen at the intersections.

What tech on the horizon will have the biggest impact? Healthtech. Emerging from the social isolation of COVID-19 and the growing evidence of negative correlations between social media and mental health lies an opportunity to redefine the role of technology as a positive force for health. As much as we strive to be more sustainable in actions for planetary health we should strive to be more sustainable in our health systems. Let's keep healthy people - healthier for longer.

I'm seeing interesting ideas globally in wearables that could democratise early diagnosis of health issues, AR/VR used for well-being experiences and a number of scientifically validated digital tools to support virtual consultancy and treatment.

And of course, the convergence of AI and biomedical sciences to innovate in diagnostics and therapeutics - particularly for rare genetic conditions - is incredibly exciting.

LIZA NOONAN *CSIRO - In January 2022, Liza will be joining the Greater Sydney Commission as Executive Director, Westmead Health and Innovation District*

Over the next five-ten years we will see new medtech solutions that reduce avoidable patient health deterioration and presentations to emergency departments, and improve the management of medical conditions, health literacy, improved access to care, quality of life and wellbeing. New machine learning technologies will replace the current era of digital transformation in which organisations are digitising their businesses. We will see the translational research impact outcomes through transformations occurring as machine learning technologies are matched by new business model transformations.

Board directors are concerned about ESG sustainability, Cyber, supply chain and labour shortages. Frontier tech that helps organisations meet their future obligations and secure their business operations will increasingly be in greater demand, as Boards embrace and seek strategic frontier tech investments.

GARY MORGAN



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The big tech innovations will arise from the engineering of biology to substitute the polluting and energy demanding chemistries, which support our lifestyles and consumer products, to harmonised biologically-based alternatives.

This includes companies like 8Bio which suppresses methane emissions from livestock and increases food assimilation efficiency. Or, Hydgene who have engineered the decomposition of farm waste into the production of hydrogen gas.

To increase productivity of agriculture from the farm gate there will be a raft of tech employed from enhancing mineral uptake by crops with enhanced microbiomes, crops developed for Australian conditions and pest control which exploits the pheromones of amorous insects.

To boost food production without increasing farmed lands we can replicate the nutritious proteins from dairy in fermentation as developed by Eden Brew, or of tasty animal fats and oils as seen by Nourish.

All of this tech in the engineering of biology is also set to revolutionise healthcare through gene and cell therapies. Engineered immune cells will specifically destroy damaged or tumour cells. Friendly viruses will deliver gene editing to diseased tissues and where your gut microbiome profile will be a consideration in your pharmacological treatment regime.

Underpinning biology is an ever-increasing incorporation of computational design and AI which can interpret multi-omic physiological data to enrich the predictive powers of scientists for translation in the laboratory.

DR NATALIE CURACH *Strategic Partnerships, Bioplatforms Australia; Chief Scientific Officer, Eden Brew; President, Synthetic Biology Australasia*

I am excited by the commitment to sustainability. Sustainability in travel and infrastructure will be well supported by the use of emerging technologies and help drive a shift towards net zero emissions. Our zero emission bus trial is just one example of this. Support for electric passenger and freight vehicles, and exploration of hydrogen technologies, particularly for long haul freight is also exciting. The use of smart sensors and intelligent systems powered by artificial intelligence and machine learning will also support rich real-time customer information, service management, dynamic prioritisation and incident management.

SUE WIBLIN *Executive Director, Emerging Technologies, Transport for NSW*



Our life scientists produced big tech innovations in response to the shock of the pandemic. They produced vaccines, anti-virals and data models in record time. Their work was supported by investors, governments, regulators and the public. We will see similar "crisis innovation" in response to climate change. We can start now or continue to wait until we burn or are swept away by floods or famine.

The biggest impact will come from tech that gives everyone on the planet a good life without destroying the planet: food, shelter, transport, power, health. However, we need to think about the economics of abundance rather than economics of scarcity if we want both the developed and developing world to buy these products. How do we create a better life, not a more constrained one?

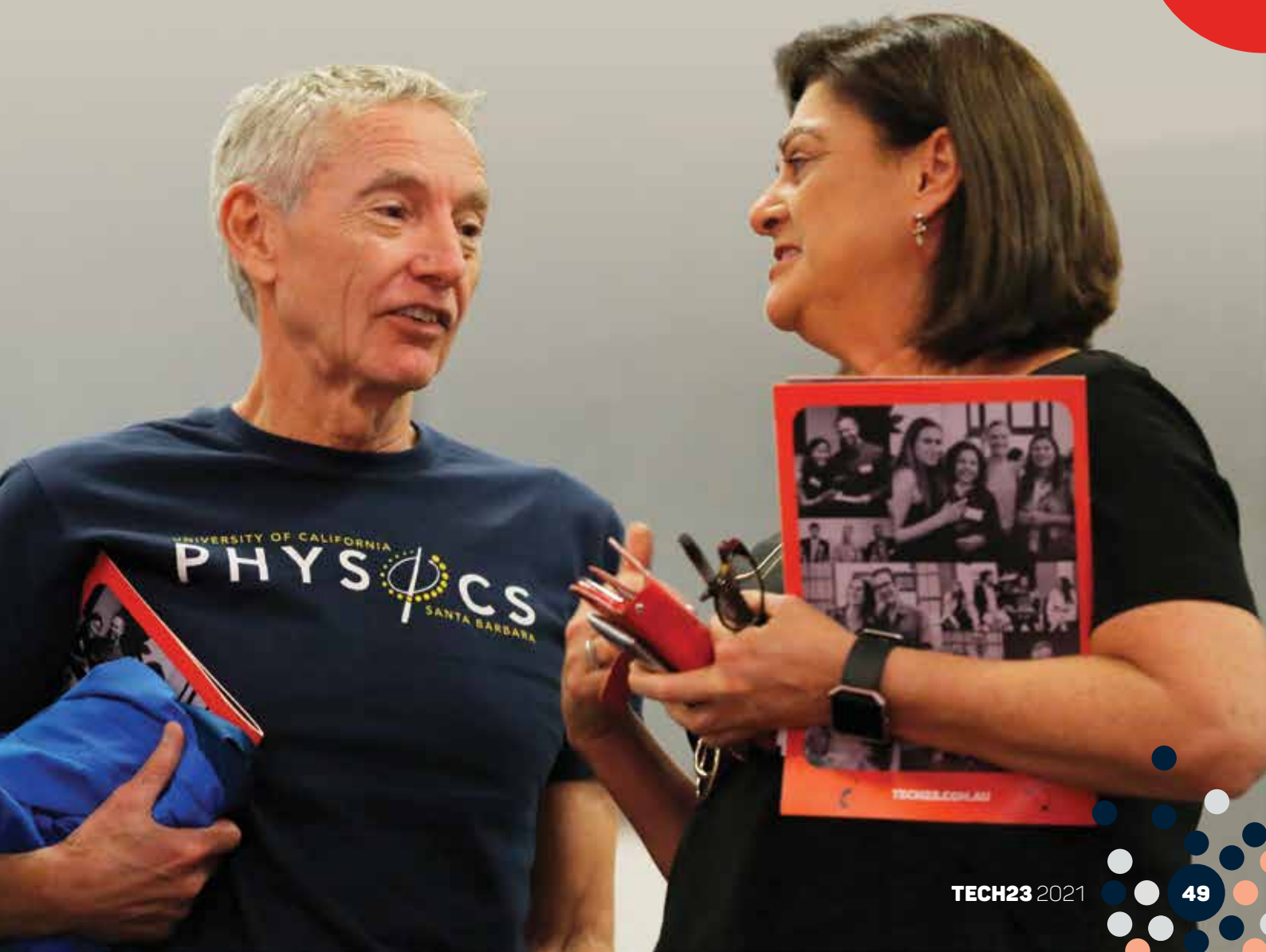
I'm excited about the potential for crypto-economics to not only rewrite the internet but to also reorganise the way people govern themselves and collaborate to produce all kinds of goods. This will be as big as the invention of double entry accounting or the joint stock company. I'm worried that without good policy and education we'll end up with the same abuses of public, political and personal information that we have today.

PAUL FOX *Corran Toohill Capital*

Combined, innovation in AI and IoT shows no signs of slowing down. As it becomes more and more mainstream, and as super-fast networks open-up, it will push the boundaries of processing and learning. For industry, smart devices promise to improve efficiencies, yet benefits will extend beyond logistics and supply chain. Data generated from these devices will help industries foresee and resolve serious real-world challenges such as workplace injuries.

Wireless and IoT sensors hold particular promise. Innovation in this area, especially in nano and wearable technology, is already spearheading a new era in healthcare. IoT sensor technologies are highly relevant during a global pandemic, and the race is on to find alternatives to cold-store vaccines that require armies of trained healthcare workers. The University of Queensland, for example, has already developed a needle-free patch (or nanopatch), and is now exploring the potential of a patch coated in a COVID-19 vaccine. While it is still being tested, it looks promising and would be a game-changer in the global fight against COVID-19, particularly for vaccine-hesitant and hard-to-reach communities.

JESSICA GALLAGHER *Deputy Vice-Chancellor (External Engagement), University of Adelaide*



2021 books

for problem solvers to consider reading over summer

WHY YOU SHOULD GIVE A FCK ABOUT FARMING Gabrielle Chan

There is no farmers and others. If you eat or wear clothes, the decisions you make influence farming...

DARKNESS IS GOLDEN Mary Hoang

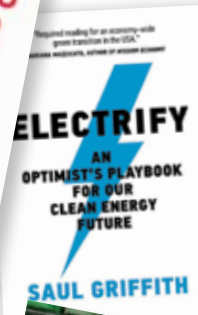
Understand the hidden gold that lies in your darkness, showing you how exploring your shadows can give you a new sense of direction for the future.

ON LIFE'S LOTTERY Glyn Davis

With one in eight adults and one in six children living below the poverty line in Australia, Glyn Davis asks the question: If life is a game of chance, what responsibility do those who are given a head start have to look after those less fortunate?

OUR SUNBURNT COUNTRY Anika Molesworth

Full of hope, this book outlines there is a way to protect our land, our food and our future, and it is within our grasp.



ELECTRIFY Saul Griffith

A detailed blueprint—optimistic but feasible—for fighting climate change while creating millions of new jobs and a healthier environment.

RESET: RESTORING AUSTRALIA AFTER THE PANDEMIC RECESSION Ross Garnaut

The COVID-19 crisis offers Australia the opportunity to reset its economy and build a successful future.

WE, THE ROBOTS? REGULATING ARTIFICIAL INTELLIGENCE AND THE LIMITS OF THE LAW Simon Chesterman

Arguing for a new global agency to regulate the development of artificial intelligence - one that would also ensure an equitable distribution of its benefits.

FOR YOUNGER INNOVATORS IN OUR MIDST

THE FIRST SCIENTISTS Corey Tutt

Deadly Inventions and Innovations from Australia's First Peoples

LITTLE BOOK - BIG UNIVERSE Lisa Harvey Smith

A practical guide to exploring our southern night skies, pitched at curious explorers.





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For 13 years, Tech23 has celebrated and amplified the impact of homegrown young deeptech companies that have the potential to create new industries, smarter solutions, and a better world.

Inside, we are proud to announce and spotlight this year's 23 gamechanging companies and share the perspectives of some of Australia's innovators.

Here's to all the conversations that are about to spark and the magic to be made!

