IMPACT

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ATSE

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The Academy acknowledges the Traditional Owners of the lands on which we meet and work and we pay our respects to Elders past and present. We recognise the deep knowledge and practices embedded in the oldest continuous culture on the planet. Australia's history of engineering, technology and applied science spans more than 60,000 years.

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We are a Learned Academy of independent experts. We bring together Australia's leading experts in applied science, technology and engineering to provide impartial, practical and evidence-based advice on how to achieve sustainable solutions & advance prosperity.

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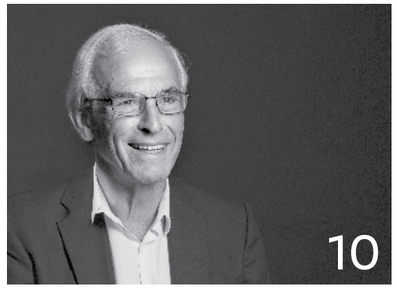

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Navigating challenges and celebrating talent

This is my first Foreword as President of ATSE! I'm so delighted and amazed to have been elected as President of the Academy, taking over from Professor Hugh Bradlow FTSE, who has done an amazing job during six years of service to ATSE. Big boots for me to fill!

Dr Katherine Woodthorpe
AO FTSE FAICD

Dr Woodthorpe is President of the Australian Academy of Technological Sciences and Engineering and a Fellow of the Australian Institute of Company Directors. She holds a PhD in Chemistry (Manchester) and an Honorary Doctorate from the University of Technology Sydney. In 2017, she received an Order of Australia for her ongoing service to research and technology innovation in Australia. Dr Woodthorpe has a strong track record of achieving outcomes in a range of technology-oriented industries, including medical devices and health services, and a deep knowledge of governance, leadership and the private equity and financial sectors.

I'm looking forward to helping Kylie and the Board wherever I can to support their work. In particular, my priorities are:

- Enhancing the prominence and visibility of ATSE as an authoritative, evidence-based and independent advisor to government, industry, and academia;
- Increasing ambition for climate action and expanding the role technology can play to accelerate the transition toward net zero emissions;
- Enhancing the connection between the Academy and Industry, including increasing the number of Fellows who have an industry background;
- Supporting the Academy's mission of fostering greater diversity in STEM with an emphasis on boosting women in decision-making roles.

This issue of IMPACT focuses on the ACTIVATE symposium which was held last October, sharing its outcomes and aspirations as we start 2023.

There was a palpable sense of joy at getting back together again after all the disruptions of the last nearly three years. That delight reached its zenith at the ATSE Awards Gala Dinner where Fellows and guests could catch up with friends and colleagues they might not have seen for some time.

And as always, the awards themselves enabled us to recognise the enormous talent we have in Australia, often underappreciated by the wider community.

We had a new format this year for introducing the new Fellows to the Academy, and I found it hugely informative: rather than each Fellow sharing a couple of minutes introducing themselves and their career impact thus far, they were divided into a number of panels, each tackling critical current topics like climate change mitigation, then discussing how their expertise can help with that issue.

The moderators kept a lively conversation flowing about each problem, weaving in the new Fellows' expertise and discussing necessary ongoing research and solutions that could be implemented.

The format brought to life the role our new Fellows can and do play in tackling many of the challenges we face. Thanks to all who took part in all three days of the symposium, but especially thanks and welcome to our 2022 New Fellows.

Collaboration and conversation

The 2022 ATSE Fellows share their vision

What struck me most as the Australian Academy of Technological Sciences & Engineering's 2022 new Fellows shared their work and passion at our ACTIVATE event was how much common ground there is – regardless of discipline, sector, or personal attributes.

Scientists, engineers and innovators are fundamentally driven by a desire to do things better; to make things better.

Our new Fellows hail from a huge range of backgrounds and have an impressive array of professional achievements under their belts. And they're united as we face the massive challenges of climate change: on the need to learn from the past as we build the future; on the urgent necessity of building a much more diverse and inclusive STEM sector; and on the importance of leading respectfully, with consultation and conversation, rather than blasting information out in a one-way transmission.

ATSE's 2022 Honorary Fellow, Professor the Honourable Kim Carr FTSE, made an impassioned and articulate call to action. The new government brings new opportunities – and Kim asked us to use our authority and expertise to drive public benefit, and to hold our political leaders to account.

As a species, Fellows agree we're undertaking the biggest change since the industrial revolution, and a comprehensive, inclusive and holistic approach is absolutely vital if we're to have a hope of tackling our species' and our planet's biggest challenge yet.

The impacts of climate change are not equitable – so we have a challenge within a challenge. The new Fellows signalled strongly that it is our job, as change-makers, and as leaders, to tackle this inequity.

Of course one of the fundamental starting posts is education. Our education system was designed during the industrial revolution, and it's no longer fit-for-purpose. It's failing our kids and our problem-solving capabilities, with Australian educational outcomes sliding by international comparison. We need to evolve our education – to make it more flexible, personalised, and inter-disciplinary – if we want to move on from that factory model.

Mentors, role-models, inclusive leaders, and good teachers can make all the difference. Whatever any of us do, we rely on relationships. We get the best results not from one-way information transmissions, but from collaborations and conversations.

As we support Australia's transition to a clean energy economy with a thriving modern manufacturing sector; as we work through our education and careers programs and through our advice to government to boost Australia's skills and capacity to lead; and as we work across sectors to lift the nation's innovation commercialisation capacity both domestically and through international connections, I look forward to working with ATSE's Fellows – both new and ongoing – to lead those crucial conversations and collaborations to build a more inclusive, more sustainable Australia.

Kylie Walker
Chief Executive Officer

Kylie Walker is the CEO of the Australian Academy of Technological Sciences & Engineering.

News from the Academy

Above: The Elevate Advisory Group Members: Dr Marlene Kanga AO FTSE, Dr Adi Paterson FTSE, Professor Lisa Harvey-Smith, Shanan Gillies, Luke Sheehy, Dr Frazer Thorpe, Professor Sumeet Walia, Natalie Chapman, Beata Khaidurova, Dr Scarlet Kong, Dr Morley Muse, Dr Udani Reets, Ingrid Marsh, Jan Mason, Kylie Walker and Dr Marguerite Evans-Galea AM.

Industry and academic leaders appointed to steward game-changing program to boost women in STEM

JUNE 2022

ATSE announced the appointment of 16 STEM champions from across the breadth of industry and academia to lead an Advisory Group for the $41.2 million *Elevate: Boosting women in STEM* program. The program is funded by the Australian Government.

The Elevate Advisory Group is co-chaired by non-executive director, engineering leader and former President of the World Federation of Engineering Organisations (WFEO) Dr Marlene Kanga AO FTSE, and Dr Adi Paterson FTSE, an international leader in nuclear science and technology, and a Champion of Change.

Learned Academies and ARDC join forces to strengthen data-enabled research

JUNE 2022

Australia's five Learned Academies, the Australian Council of Learned Academies (ACOLA) and the Australian Research Data Commons (ARDC) launched a report series: Australia's Data-Enabled Research Future.

Within this report, ATSE focused on on the role of data in the climate change challenge.

ATSE CEO Kylie Walker said, "For Australia to be prepared to properly meet complex and growing challenges such as climate change and water availability, we need to start our data revolution. We need to make sure that we are not only collecting the right data, but that it's being stored and accessed in a way that supports growing resilience and appropriate planning for the future."

ATSE Report calls for rapid deployment of renewable technology

JULY 2022

Several prominent Fellows of ATSE have stated that Australia must capitalise on its renewable technology advantage and invest in rapid deployment to decarbonise energy systems.

In a news briefing responding to the current energy crises, the experts said Australia will need a portfolio of low emissions technologies which act in concert, supported by a clear research agenda and policy framework to provide an environment for industry to act with confidence.

At the briefing, ATSE launched their new short report: *Here & Now – the state of low emissions technology in Australia.*

STEM Equity monitor shows urgent need to support women in STEM

SEPTEMBER 2022

The 2022 edition of the Australian Government's STEM Equity Monitor illustrates the dual importance of widening the pipeline of women studying and working in STEM, and supporting them to progress and thrive throughout their STEM careers.

The data illustrates a positive upswing in the proportion of women studying and working in STEM, but the percentage of women in senior management and the continuing gender pay gap are reminders that systemic and cultural biases which inhibit diversity in STEM need to be addressed.

"The 2022 STEM Equity Monitor highlights the persistent leaky pipeline, where women are graduating from STEM studies at higher rates than before, but there is a major exodus as they pursue non-STEM occupations at higher rates than men," said Kylie Walker, CEO of ATSE.

Australian Agriculture robotics innovator wins global tech and engineering prize for communication

SEPTEMBER 2022

A video entry submitted by ATSE featuring the pioneering agriculture robotics work of Professor Salah Sukkarieh FTSE has won a prestigious global prize for communicating an engineering success story.

Professor Sukkarieh, who leads Robotics and Intelligent Systems at the University of Sydney, won the CAETS Communication Prize for a video which showcases smart farming robotics which improves business outcomes, food quality and environmental sustainability.

ATSE welcomes timely review of diversity in STEM program

SEPTEMBER 2022

ATSE welcomed the announced review by Minister Ed Husic of Government programs as well as efforts underway which are supporting greater diversity in science, technology, engineering and mathematics (STEM).

Kylie Walker, CEO of ATSE said that diversity in STEM remains a critical and under-addressed issue. This review is timely and welcome, and has the potential to help Australia fill its skills gap across sectors and industries which are vital for shaping the future.

Technologies for responsive data collection needed to improve regional water management

OCTOBER 2022

Emerging data collection technologies can help manage water challenges in real time and mitigate the worst effects of drought, flood, and shifting water patterns.

A report by ATSE found that emerging technologies for data collection must harness contextual, real-time data to ensure farmers, local councils, Traditional Custodians and other water resource managers can make more evidence-based water management decisions.

Budget a welcome starting point for energy transition and boosting Aussie STEM jobs

OCTOBER 2022

The Federal Government's first budget included welcome measures focused on supporting a diverse, home-grown science and technology workforce and measures to support the low-emissions energy transition.

ATSE welcomed the allocation of $47.2 million over six years to encourage young people, especially women, to forge brighter careers in science, technology, engineering and mathematics (STEM) professions.

ATSE also welcomed the $13.5 million for developing Australia's critical technology capability as part of the National Reconstruction Fund, as well as continued funding for the National Science and Technology Council.

Leading companies partner on ATSE's new STEM careers initiative

SEPTEMBER 2022

ATSE launched a new industry internship program for STEM graduates, in partnership with leading Australian medical-tech, energy, intellectual property and accounting companies.

Host companies for ATSE's high-capability interns include FB Rice, Mathews Steer, Global Health Neurology Lab, Energy Synapse and SpeeDx, with more to be announced shortly.

The program – IMNIS Ignite – connects exceptional PhD students, graduates, and early-career researchers with paid industry internships designed to ignite their careers in science, technology engineering and mathematics (STEM) sectors.

ATSE CEO Kylie Walker said ATSE has seen the transformative potential of mentoring, with over 1,700 IMNIS mentees graduated from the program, and is poised to build on this success by opening up a wealth of career opportunities.

Australian science champion named President of Australian Academy of Technological Sciences & Engineering

OCTOBER 2022

Scientist, industry leader and climate champion, Dr Katherine Woodthorpe AO FTSE FAICD w as named the next President of ATSE, Australia's premier organisation for engineers, technologists and applied scientists.

"It is an honour and a privilege to be elected President by over 900 of Australia's brightest minds in science, technology, engineering and mathematics," said Dr Woodthorpe. "At a time when more ambitious climate action is crucial and building a skilled workforce fit for an uncertain future is urgent, ATSE and its Fellows are in prime position to foster evidence-based action between government, industry and academia.

Dr Woodthorpe will become the first woman to lead the Academy in its 47-year history. She took up her tenure on 1 January 2023. She succeeds Professor Hugh Bradlow FTSE, whose six-year Presidency of the Academy has seen a growth in its capacity to provide evidence-based advice, and across a strong suite of programs designed to nurture a diverse Australian STEM-skilled workforce.

Resilience must be built into all infrastructure to avert climate risks

OCTOBER 2022

As Australia grapples with widespread flooding and increased risks of tropical cyclones and heat waves, ATSE has called for resilience to be built into planning for all future Australian infrastructure.

In a statement, the Academy has officially taken the position that urgent planning across transport, energy, water, social, waste and digital infrastructure is needed to future-proof supply chains, national security, environmental sustainability and economic prosperity.

(Then) ATSE President, Professor Hugh Bradlow FTSE said, "The location, timing and severity of bushfires, cyclones, storms, floods and heat waves are highly uncertain – and the degrees of uncertainty and severity are set to increase due to climate change."

"Our goal must be to establish resilient systems. Therefore, a more comprehensive approach to infrastructure system adaptation is necessary and the best chances for doing so are at the design stages of infrastructure projects."

New report shares roadmap to boost Aussie STEM careers

OCTOBER 2022

Australia needs to urgently rethink its approach to encouraging careers in science, technology, engineering and mathematics (STEM) in order to tackle the growing national skills crisis. That's the case made by a major new report produced by ATSE – *Our STEM skilled future: An education roadmap for an innovative workforce.* With major challenges to skilled migration, coupled with rapid business digitisation and decarbonisation – the report calls for a step change to make crucial STEM skills accessible, attainable, and aspirational to all Australians.

ATSE Chief Executive Office Kylie Walker said, "Australia needs 100,000 more digitally skilled workers and 40,000 more engineers in the next two years alone. We need decisive action to attract and retain the workforce Australia needs to become a STEM-empowered force on the global stage."

The report, which draws on the knowledge of over 400 experts across sectors and disciplines as diverse as mathematics, agriculture, digital skills, engineering and entrepreneurship, calls for all levels of government, industry, unions, peak bodies, educators, and individuals to collaborate and urgently support life-long learning initiatives, and offers ATSE's unique network and expertise to catalyse the transformation.

First 50 scholarships awarded to elevate women into STEM leadership

NOVEMBER 2022

ATSE announced the first 50 scholarship recipients for the $41.2 million *Elevate: Boosting women in STEM* program.

The inaugural scholarship recipients were celebrated at a launch at Parliament House hosted by Industry and Science Minister the Hon. Ed Husic MP, and Minister for Women, Senator the Hon. Katy Gallagher.

The scholars will commence study in early 2023. They include: 30 women pursuing postgraduate studies in applied STEM research, from aerospace engineering to cybersecurity; five mid-career women in STEM who will undertake career-boosting leadership qualifications, and; 15 women who will commence STEM undergraduate degrees, setting them on paths to rewarding careers.

ATSE CEO Kylie Walker said she was pleased to see the huge demand for the program, with more than 1,000 applications from diverse women across the nation received in this first round.

Above: Alicia Payne MP; Kylie Walker, ATSE CEO, Minister the Hon. Ed Husic MP; Kiowa Scott-Hurley, Elevate scholar; Tahereh (Sara) Yazdanparast, Elevate scholar; Yingxin (Selina) Li, Elevate scholar; and Susan Templeman MP.

HONOURING SIX YEARS OF SERVICE

ATSE President Professor Hugh Bradlow FTSE

Professor Hugh Bradlow has completed his tenure as President of ATSE after six impactful years. During this time the Academy has seen a growth in its capacity to provide evidence-based advice and has developed a thriving suite of programs designed to nurture a diverse Australian STEM-skilled workforce.

KEY HIGHLIGHTS FROM PROFESSOR BRADLOW'S PRESIDENCY

2016-2019

- Development of a new Strategic Direction that included:
  — Amplifying the impact of the Academy by enhancing ATSE's media presence and increasing engagement with the general public
  — A policy platform aimed at preparing Australia for a future of disruptive technological change
  — Strengthening ATSE's Diversity and Inclusion policy and practice including the first-time appointment of a Vice President of Diversity and the establishment of Science in Australia Gender Equity (SAGE).
- Instigating a vibrant discussion within the Academy of the role of a Learned Academy in shaping a modern and sustainable Australia.
- The national launch of the flagship Industry Mentoring Network in STEM (IMNIS) program which connects PHD students with industry mentors to support thriving and supportive STEM career pathways.
- A three-year Industry Technology Readiness Research project with a focus on Transport, Heath and Circular economy sectors (funded by the Australian Research Council).
- Enhancing ATSE's international influence by securing the Academy a Board position with the International Council of Academies of Engineering and Technological Sciences (CAETS).
- Introducing a new suite of Awards for emerging leaders and young scientists and engineers:
  — The Batterham Medal (engineering)
  — The Solomon Award (research translation and innovation)
  — ICM Agrifood Award (agriculture and food technological advancement)
  — Ezio Rizzardo Polymer Scholarship (polymer science and engineering)

2020-2022

- A complete review of ATSE including its strategy, operations, governance, and Fellowship engagement, and showing the bravery and grace to openly acknowledge the challenges and allow others to bring forward the solutions.
- A new statement of Values, Code of Conduct, and the strength to ensure they are implemented.
- Consolidating ATSE's leadership at CAETS, with chairs and deputy chairs of the Communications Committee, the Sustainable Development Goals (SDGs) working group, the Diversity and Inclusion Committee – and establishment of the CAETS Communication prizes, and boosting their international communications broadly.
- Evolving ATSE's engagement with school education; taking a chance on a new computer science education program, and prompting a deep review and re-think of ATSE's school program – Science and Technology Education Leveraging Relevance (STELR).
- Guiding the growth of IMNIS, out to a complete and complementary suite of programs that support the professional development and career options for young engineers and applied scientists.
- Consolidating ATSE's reputation as a leader in diversity and inclusion for Australian STEM, leading to the Academy winning the largest allocation of Government funding for women in STEM to date, to implement the Elevate: Boosting Women in STEM scholarship program.
- Leading the Australian Council of Learned Academies (ACOLA) decision to support the Uluru Statement from the Heart.
- Initiating ATSE's first Reconciliation Action Plan.
- Inspiring change to proactively and deliberately increase the number of women, Aboriginal and Torres Strait Islander people, and people from industry and government in the ATSE Fellowship.
- Revitalising the role of ATSE's Assembly as a genuine fellowship consultation and strategic guidance body in support of the work of the Board.
- Initiating a major event (the ACTIVATE STEM Symposium) to showcase ATSE's activities, and spark action on improving education and workforce in STEM.

To commemorate Hugh's six years as President, the Secretariat presented Hugh with a book of farewell letters and photos from his time in the role. A selection of these photos are shown on the right.

Professor Bronwyn Fox FTSE being welcomed into the Academy by Professor Hugh Bradlow FTSE in 2017.

Professor Hugh Bradlow FTSE on a visit to NAEK in Korea 2018.

Professor Hugh Bradlow FTSE presenting at the launch of the Learned Academies Special Projects (LASP) report on Health Technology in 2019.

Professor Hugh Bradlow FTSE; Professor Alan Finkel AC FTSE FAA; Professor Robin Batterham AO FTSE FAA; Professor John Zillman AO FTSE FAA in Melbourne, November 2022.

Professor Hugh Bradlow FTSE at the ATSE Awards 2022.

Dr Margaret Hartley FTSE, ATSE CEO 2009-2019 with Professor Hugh Bradlow FTSE and ATSE CEO Kylie Walker in Melbourne, November 2022.

ATSE was represented at CAETS2022 by a delegation of four (L>R): Dr Cath Latham, ATSE Director, International Affairs; Kylie Walker, Chief Executive Officer, ATSE; Dr Carrie Hillyard AM FTSE, Chair, ATSE International Strategy Group; and Professor Hugh Bradlow FTSE, ATSE President.

VERSAILLES
FRANCE
2022

CAETS conference

ATSE joins first international meeting of technology and engineering academies in three years

ATSE's policy priorities are not just about Australia's challenges – they are the key issues to address globally. This was the take-home message for the ATSE delegation who participated in the CAETS2022 conference in September.

ATSE joined with 200 representatives from 24 of 31 member academies of the International Council of Academies of Engineering and Technological Sciences (CAETS) for the 2022 annual conference held in Versailles, just outside Paris. Hosted by the National Academy of Technologie France, this was the first opportunity for member academies of this global network to meet in person since the COVID-19 pandemic.

"Coming together in person was invaluable for reconnecting and discussing the issues we're all facing as organisations leading tech and engineering across the world," ATSE CEO Kylie Walker said.

"It was clear from our discussions that our Fellowship's policy priorities aren't just issues we're dealing with in Australia, they are global."

ATSE has three main strategic priorities, identified by the Fellowship, that drive the academy's policy and programs, underpinned by best practice in diversity and inclusion.

ATSE'S POLICY PRIORITIES FOR TECHNOLOGY AND ENGINEERING

1. Climate change mitigation and adaptation
2. Enhancing research collaboration, translation and commercialisation
3. Exciting and educating young people in STEM

It was no surprise that climate change is very front of mind for the international CAETS community, with a strong focus on sustainable development.

But there was an urgency in discussions about how best to support, retain and engage younger generations in STEM fields – particularly engineering – that I hadn't expected.

ATSE will be hosting the CAETS annual conference in Australia in 2025 with planning anticipated to begin in early 2023.

CAETS will be held Croatia in 2023, and in Finland in 2024.

ATSE'S ENGAGEMENT IN THE CAETS2022 CONFERENCE

ATSE was represented at CAETS2022 by a delegation of four:

- Professor Hugh Bradlow FTSE — Then ATSE President
- Dr Carrie Hillyard AM FTSE — Chair, ATSE International Strategy Group
- Kylie Walker — ATSE CEO
- Dr Cath Latham — ATSE Director, International Affairs

ATSE's Fellows and Secretariat led discussions and presentations throughout the conference:

- Professor Hugh Bradlow FTSE presented the CAETS Communication Prize, as chair of the CAETS Communications Committee.
- I presented at the CAETS public symposium on technology readiness in the Australian healthcare sector and how to assess tech-readiness in other national settings.

The symposium theme for 2022 was 'Breakthrough technologies in healthcare'.

- ATSE CEO Kylie Walker presented to the CAETS Board on effective communication and co-led the CAETS Diversity and Inclusion Committee meeting with colleagues from the Royal Academy of Engineering.
- John McGagh FTSE, chair of ATSE's working group for the UN Sustainable Development Goals (SDGs), presented (online) to the CAETS SDGs committee about how ATSE was approaching better engagement and communication around the SDGs in the academy's policy and programs.
- ATSE's delegation held bilateral meetings with delegations from the Royal Academy of Engineering (UK), National Academy of Engineering Korea (Republic of Korea), Royal Swedish Academy of Engineering Sciences, and the Canadian Academy of Engineering.

ABOUT CAETS AND THE ANNUAL CONFERENCE

ATSE is a founding member of CAETS and one of the larger academies in the CAETS network.

The CAETS annual meeting is an opportunity to bring members together on key issues through Board, Council and Committee meetings, as well as share the latest developments in cutting edge topics through a public symposium.

Details of previous CAETS conferences can be found on the CAETS website:
newcaets.org

Dr Carrie Hillyard
AM FTSE
Carrie Hillyard is a Director on the ATSE Board. She has mentored entrepreneurs, assisted with commercialisation and licensing and served on a number of government, public and private company boards, including membership of the former Industry Research and Development Board and ANSTO.

Building international bridges through space engineering

ATSE brings together satellite experts from Australia and Korea in Sydney.

Dr Cath Latham
Director, International Affairs, ATSE

ATSE continues to establish its position as a leader in Australia's international science and technology partnerships. In October, ATSE brought together researchers in Cube Satellite technology from Australia and the Republic of Korea for the Australia-Korea Technology Bridge. 'Tech-Bridge' is a pilot program co-funded by the Australian and Korean governments, aimed at building people-to-people links in science and technology research fields of mutual national interest. ATSE delivered the event on behalf of the Australian Government's Department of Industry, Science and Resources (DISR), the Defence Science and Technology Group, along with several other government agencies in both nations.

Cube Satellites (or CubeSats) are a class of miniature satellite with a range of applications including research, data gathering, low earth observation, communications, and remote sensing. CubeSats offer a low cost and independent means to deliver a payload into orbit, significantly reducing the barriers to space flight.

ATSE hosted the Tech-Bridge workshop at the National Space Industry Hub at Cicada Innovations, where 16 Australian and Korean experts engaged in technical workshops and explored potential collaborations. The delegation visited two sites in Sydney - the UTS Tech Lab, a leading advanced manufacturing research facility, and the space technology start-up incubator at the Wolfpack Space Hub. Delegates and guests came together after two days of high-tech discussion sessions for an evening of networking and refreshments, hosted by ATSE's International Strategy Group Chair, Dr Carrie Hillyard AM FTSE.

Participants at Tech-Bridge represented a diverse field of delegates ranging from Professorial Chairs to early-career-researchers, lifelong academics and space physicians, to start-up company executives and specialists in cybersecurity. To further build Australia and Korea's technology and engineering partnerships, the workshop was aimed at building strong personal linkages between of forward thinking people with a wide variety of skills and experience.

The Tech-Bridge CubeSat workshop continues to build upon ATSE's reputation as a trusted partner for delivering international programs and events, and contributed to the longstanding relationship between Australia and the Republic of Korea.

As part of the broader Tech-Bridge program, ATSE worked with Korean partners to deliver an online workshop in 2021, which focused on the Application of Artificial Intelligence to Counter Infectious Diseases. Two bilateral research projects emerged from this workshop, with grants and funding managed by ATSE for the Australian research partners.

ATSE INTERNATIONAL

New Fellows 2022

27 tech trailblazers and influential innovators honoured by Australian Academy of Technological Sciences and Engineering.

NEW FELLOWS 2022

A parliamentary science champion, an international force for tackling climate change, solar panel innovators and computer science advocates are among the game-changing group of Fellows elected in 2022 to the Australian Academy of Technological Sciences and Engineering (ATSE).

ATSE's 2022 new Fellows are leaders in their fields, spanning structural engineering, research commercialisation, sustainable technology and mining, marine modelling, and cutting-edge health systems.

Professor the Hon. Kim Carr FTSE, former Senator from Victoria, has been named as Honorary Fellow for championing the vital need for, and possibilities of science over many years in federal politics, and his unstinting advocacy for Australian innovation and industry.

Health technology innovators Professor Madhu Bhaskaran FTSE and Professor Mary Foley FTSE are transforming the healthcare landscape. Professor Bhaskaran's life-saving work can be integrated into mattresses for improved monitoring in aged care, intensive care, and for SIDS. Professor Foley led the National Cancer Screening Register and innovative virtual care during the pandemic.

Renowned climate change researcher and advisor, Professor Mark Howden FTSE, has been a member of an extraordinary 20 Intergovernmental Panels on Climate Change processes since 1991, sharing the 2007 Nobel Peace Prize with other IPCC participants and Al Gore.

Distinguished Professor Dietmar W. Hutmacher FTSE FAHMS has changed the way young children and babies are treated for skull injuries and congenital deformities, with his revolutionary approach to 3D printed scaffold-guided tissue regeneration.

The new Fellows also count trailblazers in technology education, which is essential to building Australia's skilled workforce of the future. Professor Katrina Falkner FTSE is a top 100 innovator completely transforming computer science education. Her work directly addresses inequities in access to technology, helping to build a fairer Australia. Richard White FTSE has over 30 years' experience in software development, including global logistics software servicing 18,000 customers across 170 countries. He has recently announced the establishment of his STEM Education Foundation to make quality computer education available free of charge to Australian school students.

Then ATSE President Hugh Bradlow said the new Fellows are shaping Australia's technology-powered human-driven future.

"Elected by their peers, ATSE Fellows are leaders in applied science, technology and engineering and we celebrate their exceptional professional contributions to Australian STEM innovation," Professor Bradlow said.

"While the 2022 new Fellows span multiple critical industries, we are pleased to welcome so many at the forefront of tackling climate change. They are creating better batteries to support renewable energy supplies, increasing efficiency and flexibility of solar cells and panels, and sustainable mining practices.

"As we face the repeated effects of increased flooding events, they are shaping the way humanity monitors water quality, models marine environments for food and agriculture, advances water catchment policy, and develops best practices for dam and bridge construction."

Dr Nicholas Austin FTSE

Chief Executive Officer, Watertrust Australia Ltd. (ACT)

Dr Nick Austin is a hydrologist by training, bridging agriculture and engineering in the critical area of water. From his earliest appointments in water policy reform, Nick has shown an exceptional ability to build partnerships between government, businesses and society for the common good.

Professor Kylie Catchpole FTSE

Deputy Director, School of Engineering, Australian National University (ACT)

Professor Kylie Catchpole is a global expert in solar energy. Her pioneering work demonstrating new approaches to increase the efficiency of solar cells and solar hydrogen technology has shaped the field.

Professor Katrina Falkner FTSE

Executive Dean, Faculty of Science, Engineering and Technology, University of Adelaide (SA)

Professor Katrina Falkner is a top 100 innovator completely transforming computer science education. Her work directly addresses inequities in access to technology, helping to build a fairer Australia.

Professor Madhu Bhaskaran FTSE

Co-leader, Functional Materials and Microsystems Research Group, RMIT University (VIC)

Professor Madhu Bhaskaran is an engineer who has developed stretchable skin-like electronic devices for better health care. She has broken boundaries in commercialising this technology.

Professor Michelle Colgrave FTSE

Future Protein Mission Leader, CSIRO Agriculture and Food (QLD); Professor, Food and Agricultural Proteomics, Edith Cowan University (WA)

Professor Michelle Colgrave is internationally known for her cutting-edge work in proteomics – the study of proteins – used to improve agriculture and food for the benefit of human health.

Professor Mary Foley AM FTSE

Special Adviser and Non-Executive Director, Telstra Health (NSW)

Professor Mary Foley has made an extensive contribution to health systems leadership and policy development in Australia. She was Director General and Secretary of NSW Health overseeing a period of substantial reform of a $22 billion health system and 135,000 staff.

Professor Michael Breadmore FTSE

Director, Australian Centre for Research on Separation Science (ACROSS), University of Tasmania (TAS)

Professor Michael Breadmore is an outstanding analytical chemist. His 'lab-on-a-chip' technology separates complex mixtures of chemicals on miniature scale enabling users to test samples and get results on the spot.

Dr Elizabeth (Beth) Ebert FTSE

Senior Principal Research Scientist and Head, Forecast Quality Research, Bureau of Meteorology (VIC)

Dr Elizabeth Ebert is a meteorologist with extensive experience working in governments. She holds a science leadership role in the World Meteorological Organization and has had considerable influence on international research in high impact weather.

Professor Maria Forsyth FTSE FAA

Chair in Electromaterials and Corrosion Science, Deakin University (VIC)

Professor Maria Forsyth has been at the forefront of global research and collaboration in energy storage for decades. Her work on battery technology has consistently achieved breakthrough results.

Dr Elizabeth (Beth) Fulton FTSE FAA

Senior Principal Research Scientist, CSIRO Oceans and Atmosphere (TAS)

Dr Elizabeth Fulton is a trailblazer in the sustainable management of marine environments. Her whole-of-system modelling tools are considered world-best by the UN Food and Agricultural Organization.

Professor Mark Howden FTSE

Director, Australian National University's Institute for Climate, Energy and Disaster Solutions (ACT)

Professor Mark Howden is an international force in climate change science. He's been a member of an extraordinary 20 Intergovernmental Panel on Climate Change processes since 1991, sharing the 2007 Nobel Peace Prize with other IPCC participants and Al Gore.

Professor Michael Milford FTSE

Joint Director, QUT Centre for Robotics; Australian Research Council Laureate Fellow, Queensland University of Technology (QLD)

Professor Michael Milford is a leading researcher in neuroscience-based robotics navigation. He works closely with industry and government developing high-performance positioning systems for robotics and autonomous vehicles.

Professor Xiaojing Hao FTSE

Professor, School of Photovoltaic & Renew-able Energy Engineering, UNSW Sydney (NSW)

Professor Xiaojing Hao is a world expert in solar technology and has helped establish Australia's global leadership in this field.

Distinguished Professor Dietmar W. Hutmacher FTSE FAHMS

Chair in Regenerative Medicine, Queensland University of Technology; Co-Director, Max Planck Queensland Centre for the Materials Science of Extracellular Matrices (QLD)

Distinguished Professor Dietmar W. Hutmacher is a global leader in scaffold-guided tissue regeneration (SGBR), repairing badly damaged bone.

Professor Ann Nicholson FTSE

Dean, Faculty of Information Technology, Monash University (VIC)

Professor Ann Nicholson is a computer scientist specialising in artificial intelligence. She is a respected international expert in Bayesian networks, the dominant technology used to support rational decision-making under uncertainty in complex situations.

Janine Herzig FTSE

Executive President and Director, CEEC International (SA)

Janine Herzig is a metallurgical engineer with 30 years' experience in the resources sector, community relations, and environmental, social, and governance (ESG). She has inspired, mentored and developed countless young professionals, facilitated career roadshows, university and high school engagements and community outreach.

PSM Professor and Scientia Professor Nasser Khalili FTSE

Head, School of Civil & Environmental Engineering, UNSW; Director, ARC Industry Transformation Research Hub for Resilient and Intelligent Infrastructure Systems (RIIS) (NSW)

Professor Nasser Khalili is an international leader in geotechnical engineering, computational geomechanics and unsaturated soil mechanics. His work ranges from roads to groundwater.

Professor Thas Nirmalathas FTSE

Deputy Dean (Research), Faculty of Engineering & Information Tech. University of Melbourne (VIC)

Professor Thas Nirmalathas is an expert in communications technologies and networking for optical distribution of broadband wireless signals. He is academic lead at the Wireless Innovation Lab, aiming to improve accessibility throughout Australia via next-generation solutions.

Kirsten Rose FTSE

Executive Director Future Industries, CSIRO (WA)

Kirsten Rose is a respected leader in technology and innovation with a career spanning 30 years. She is a member of CSIRO's executive team overseeing a portfolio encompassing over 2,000 research scientists and engineers and more than $500 million in annual research investment. She champions commercialisation to create true impact at scale.

Richard White FTSE

Chief Executive Officer and Founder, WiseTech Global

Richard White founded WiseTech Global in 1994, growing it into a $19 billion ASX listed company that is a leading global supplier of logistics execution software, servicing over 18,000 customers across 170 countries.

Professor Huijun Zhao FTSE FAA

Director, Centre for Catalysis and Clean Energy, Griffith University (QLD)

Professor Huijun Zhao is an eminent researcher in sensing technology. He has developed innovative chemical, microbiological and nano-technological approaches to understanding pollutants in aquatic environments and soils.

Dr John (Jack) Steele FTSE

Director, Science Impact and Policy, CSIRO (NSW)

Dr Jack Steele has driven national initiatives to commercialise scientific research for decades. From 2015, he led the establishment of CSIRO's Main Sequence, an innovation fund commercialising 'deep technology' public sector research.

Merryn York FTSE

Executive General Manager System Design, Australian Energy Market Operator (QLD)

Merryn York trained as an electrical engineer and has worked in Australia's energy sector for more than 30 years. She focused on electricity because the combination of its technical complexity and community service appealed to her.

FOREIGN FELLOW

Dr Rajendra Paroda FTSE

Chair, Trust for Advancement of Agricultural Sciences (Delhi, India)

Dr Rajendra Paroda is an acclaimed agricultural scientist specialising in plant genetics and breeding. His contributions to plant breeding and genetic resource management are globally recognised and include establishing the first modern national genebank in India.

Professor Brian Uy FTSE

Head, School of Civil Engineering, University of Sydney (NSW)

Professor Brian Uy is an international authority on steel and composite structures. His research covers all facets of building and bridge construction, seeking more efficient safer designs, while moving closer to net zero emissions.

Professor Wei Zhang FTSE

Research Director, Marine Bioproducts Cooperative Research Centre; Founding Director, Centre for Marine Bioproducts Development, Flinders University (SA)

Professor Zhang is an inspiring leader in marine biorefinery and bioproduct development technologies, and he has passionately pursued an overarching career driving translational research with industry impacts.

HONORARY FELLOW

Professor the Hon. Kim Carr FTSE

Former Senator for Victoria (VIC)

Professor the Honourable Kim Carr was a Senator for 29 years. Kim has been one of the strongest supporters of Australian manufacturing, technology and science in the history of the Australian Parliament.

New Fellows Welcome

The New Fellows Welcome was held on Tuesday 25 October 2022 at the Sydney Masonic Centre. Welcoming them into the Academy were Kylie Walker, Chief Executive Officer, ATSE and Emeritus Professor Doreen Thomas AM FTSE, ATSE, Vice-President Membership.

2022 new ATSE Fellows. Absent: Professor Michelle Colgrave FTSE, Professor Maria Forsyth FTSE and Professor Rajendra Paroda FTSE

Catalysing a comprehensive review of Australia's innovation system

Professor the Honorable Kim Carr
FTSE

Professor the Honourable Kim Carr was a Senator for 29 years. A former tech-school teacher, he was drawn to politics by the transformational possibilities of science and education. Kim was appointed Minister for Innovation, Industry, Science and Research in 2007, a cabinet post he held for most of Labor's previous six-year term in government. He has been one of the strongest supporters of Australian manufacturing, technology and science in the history of the Australian Parliament.

Our task as Fellows of ATSE is to influence policy and the directions of the country during these unsettling times. We can help reshape nation, help rebuild its economy and help restore public trust by being agile and effective in our communications with leaders and the public at large.

With a new government, we have new opportunities for the advancement of science and technology-based solutions.

The authority and expertise of scientists and technologists offers our people the opportunity to:

- Build capacity to mitigate sovereign risk
- Develop our natural assets for public benefit
- Lift living standards and social well-being by contributing to technical and material progress
- Reduce inequality and expand cultural understanding by expanding opportunities for social justice, and support human rights.

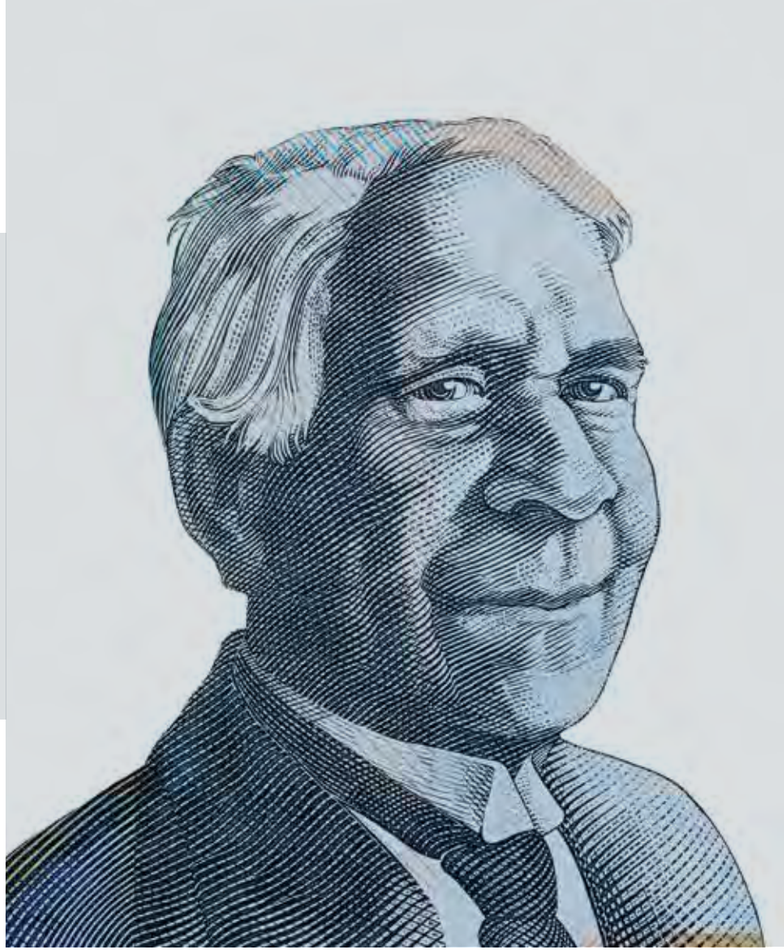
The research that we champion can foster social cohesion, improve the natural environment, increase psychological wellbeing, encourage tolerance and advance democracy.

We can counter misinformation. Good information, presented clearly, concisely, and persuasively remains critical to good decisions.

The Learned Academies have an important opportunity to help restore confidence in finding solutions to our acute social, economic and environmental challenges. This can be done by authoritative, evidence-based, real-world solutions that restore faith in society's ability to build anew and give voice to those who currently believe that the system does not work for them.

The evidence is overwhelming. Across the globe, public confidence in institutions and traditional sources of information and advice has plummeted. All too often the survey results tell us that people simply do not believe the media, business, politicians, or public servants.

This is not just a matter for the government — the effects run through all spheres including business, the media and private organisations. Even scientists, who are generally understood to be objective and trustworthy, are not immune from this trend. According to some surveys, (such as the 3m State of Science Index 2022), up to a third of respondents say they have lost some degree of confidence in what scientists say.



Left: Inventor David Unaipon (1872-1967) as appears on the Australian $50 note. Unaipon made significant contributions to science and literature and to improvements in the conditions of Aboriginal people. Some of Unaipon's inventions include an improved hand tool for shearing sheep, a centrifugal motor, a multi-radial wheel and a mechanical propulsion device; he was unable, however, to get financial backing to develop his ideas. He gained a reputation at the time of being 'Australia's Leonardo' for his promotion of scientific ideas. Source: banknotes.rba.gov.au

Despite this decline in public trust, I firmly believe that science, technology and engineering continue to have a key role to play in rebuilding a healthier level of public confidence.

It has not been sufficiently acknowledged in public debate that science and technology are key elements in advancing our national productivity, and the base support is there to argue that case.

Therefore, a proper study of how we might build our science, innovation and research system is long overdue. The fact remains that research and development expenditure in this country has been declining for the last ten years while in other countries, it has been growing prodigiously.

While both the Margaret Shiel-led review of the Australian Research Council (ARC) the Cathy Foley-led review of Australia's national science and research priorities are welcome, these exercises by definition are insufficient to deal with the parlous state of Australia's innovation, science and research system. The system's performance must improve if we are to meet the challenges of the current generation.

Australia's innovation, science and research system lacks the cohesion, co-ordination, or program scale, of other advanced industrial economies.

Our research effort is fragmented across 202 programs in 13 portfolios. And if we turn to business support, the Council of Australian Governments (COAG) has identified 552 business initiatives that aim to stimulate private investment.

The Department of Industry, Science and Resources tells us that industry simply does not know what programs are available to them. The administrative processes are, to use a quaint public service expression, 'burdensome', and businesses are 'unsure' of the co-ordination between commonwealth and state grants. (*Driving effective government investment in innovation, science and research*)

There are at least 12 active ARC schemes, 34 National Health and Medical Research Council (NHMRC) schemes, 34 rural research and development (R&D) and other schemes. Then there are Cooperative Research Centres (CRCs), trust and international grants, all with separate guidelines and application processes.

We have the National Collaborative Research Infrastructure Strategy (NCRIS) with $2.3 billion over ten years. We have the Medical Research Future Fund (MRFF) with $5 billion over ten years.

We have the Defence Integrated Investment program, which by 2025/26 will be some $58.7 billion.

Then there are the issues of research training, funding of research infrastructure, the role of basic and applied research, and the role of non-R&D innovation. Let's not forget the Public Funded Research Agencies such as CSIRO, Australia's Nuclear

Science and Technology Organisation (ANSTO), the Australian Institute of Marine Science (AIMS), etc.

Australia's industry, science and resources performance lags behind our competitors, not just in terms of total investment, but in terms of scale of investment, on individual project investment and business coordination. The OECD in 2015 called on Australia to develop system level ability to independently evaluate the performance of public investment or to assess data. They are still waiting.

Universities fund 34% of our research. Business funds 53%, 16% of which is offset by the R&D tax incentive. The states and territories, and private non-profits fund 3% each. Commonwealth departments fund 7% in their own right.

Basic research funding has slipped to 22% of total funding. I maintain that without new knowledge, there is no commercialisation.

Yet in terms of commercialisation, it is all too often argued that responsibilities for Australia's poor performance rests with academics. This is not an adequate explanation for the shallowness of our relationship between our different elements of the innovation system. Academics are not failed entrepreneurs. They have by and large chosen to pursue university life, and perform a broader function than just to provide cut price R&D departments for the private sector.

The 2016 three F's review's (Bill Ferriss, Alan Finkel, and John Fraser) findings that the use of a collaboration premium through the taxation system (the R&D incentive scheme) would do more for changing the culture than a forest of entrepreneurial sensitivity courses. Giving both industry and the universities skin in the game could dramatically affect the culture of research collaboration.

The ARC review will no doubt acknowledge what the British system emphasises — that science and engineering policy does not operate in a vacuum, but is related to other realms of public policy. But the ARC review is in itself limited by its nature. What is required is a much broader assessment — a root and branch or whole of government assessment — not just one agency.

That was the position that was taken by the British with the establishment of the nurse review, and the Canadians with the basic science review, and the Americans with their national academy of sciences, national academy of engineering and the institute of medicine in the National Academies review 'Rising Above the Gathering Storm.'

Australia needs such a review.

The physical sciences underpin the development of new technologies. Those technologies, however, go nowhere if they are not tailored to the real world, if they don't meet concrete needs of our people, or we don't have the skills to use them. We have to understand how innovation works, and look not just to the machinery and technological systems, but to the social uses to which they are put.

During the pandemic, our education spending actually fell.

Our R&D performance needs to lift. The United Kingdom has an R&D target of 2.4% of gross domestic product (GDP) by 2027. Germany has a target of 3.5% by 2025. Labor has committed since 2014 to a target of R&D of some 3% of GDP by 2030.

A comprehensive national whole of government review of our entire nations' innovation system can help us get there.

Reconciliation Action Plan

Our vision for reconciliation is that all Australians recognise and value Aboriginal and Torres Strait Islander custodianship as one of the oldest knowledge systems on the planet. Through respectfully working with, listening and learning from current Traditional Knowledge holders and practitioners in science and engineering, we will build a better nation and a healthier, more sustainable world.

Knowledge Systems and Holders

ARTIST
Lynnice Letty Church

TRIBES
Ngunnawal, Wiradjuri and Kamilaroi (ACT and surrounding region / NSW)

The artwork tells the story of two knowledge systems. These are the knowledge systems of Aboriginal and Torres Strait Islander peoples that acknowledge the importance and validity of cultural practice and knowledge that has been passed down from our Elders and Senior Knowledge holders for thousands of years over many generations. This knowledge system has played a significant role in the responsibilities of caring for each other, our cultural practices and country. These knowledge systems helped us to understand the land, sea, rivers, sky, plants and animals important to our survival and connection.

This created our collective knowledge system where each person played a role and part. We listened, observed and put into practice what we were taught and then shared with others and our younger children and generations.

This is the same for other knowledge systems. We have knowledge holders and senior people who are experts and teachers who play an important role in sharing and helping others to learn and understand. Through their guidance and support we learn the ways of caring for each other, our environment and using science, technology, engineering and maths to help us to solve new and emerging challenges. Each person is a knowledge holder with diverse skills, experiences, knowledge and expertise that play an important role.

Together these two worlds and knowledge systems are important and of equal value.

Evidence and ways of doing things may look different but they are just as valid and credible.

Providing those opportunities to develop relationships between Aboriginal and Torres Strait Islander people and the science, technology, engineering and maths spheres and experts is key to creating a collective knowledge system where we value these differences and see them as a strength. This creates a collective knowledge system built on respectful relationships, diversity and reciprocal opportunities to engage. This provides the platform for collaboration and a shared journey and understanding.

Read our Reconciliation Action Plan: atse.org.au/about-us/reconciliation-action-plan/

Submissions from the Academy

Australia's Data Strategy

JUNE 2022

Our submission to the Department of the Prime Minister and Cabinet highlighted that data sharing remains a challenge in many organisations. The submission states that the real concerns relate not only to data privacy but also to sensitivities of the data itself, such as data quality and the impact of decisions made from insights generated with the data. Given these concerns, we recommended that the Australian Data Strategy should include a nationally consistent approach to metadata requirements, the assessment of data quality measures, definitions relating to personal data, and the use of terminology.

We also recommended that Australia develops and adopts consistent patterns of data sharing, whilst moving away from the Five Safes framework in favour of more sophisticated data sharing/data use risk frameworks. The submission also recommended that the Strategy encourages organisations to follow best practice in securing customers' personal data and establishes Indigenous Data Sovereignty over certain data about Indigenous peoples.

Australian Code of Practice on Misinformation and Disinformation (ACPDM) – 2022 Review

AUGUST 2022

The joint submission by ATSE and the Australian Academy of Science (AAS) to the Australian Code of Practice on Disinformation and Misinformation (ACPDM) highlighted the challenge of addressing misinformation and disinformation on social media platforms.

The Academies recommended that the Code clearly defines issues-based advertising, includes misinformation from professional news content, and incorporates an expanded definition of "harm" to include cumulative harms. In addition, the submission recommended that platforms should consider mechanisms for the proactive promotion of trusted information. The Academies also recommended that an opt-out approach is applied to optional commitments under the Code.

Climate Change Bill (2022) and the Climate Change (Consequential Amendments) Bill 2022

AUGUST 2022

Our submission on the Climate Change Bill (2022) and the Climate Change (Consequential Amendments) Bill 2022 recommended the development of a comprehensive plan for emissions reductions to net zero, centred on increasing the share of renewable energy and investment in the workforce. It also stresses the importance of increasing dedicated funding for renewable energy technologies and supporting high-emitting sectors to make emissions reductions.

We also recommended that the Australian Government establishes a greenhouse gas accounting framework and funds a service for small private companies and registered charities to calculate their emissions. The submission also highlighted the importance of engagement from state and territory governments and advised strengthening the requirement for the publication of information regarding targets and progress.

Jobs and Skills Australia Bill

AUGUST 2022

Our submission to the Senate Education and Employment Legislation Committee outlined the need to create and administer a national skills register, conduct research on workforce diversity, and undertake forecasting for longer periods of up to fifteen years. It is also recommended that the legislation explicitly includes learned academies as bodies that Jobs and Skills Australia must consult with.

We also highlighted the benefits of enshrining a board of Jobs and Skills Australia, with industry representatives, in the legislation.

Consultation on options to reach gender equity in the Investigator Grants Scheme

AUGUST 2022

Our submission to the National Health and Medical Research Council (NHMRC) outlined the need to improve retention of women in STEM throughout their career progression and recommended changes to NHMRC grant allocation in order to help facilitate this. We proposed that at least 40% of Investigator Grants at each grant level be reserved for female researchers, at least 40% reserved for male researchers, and 20% left unspecified. It was also recommended that this 'elastic' 40:40:20 model is used for Chief Investigators, at each level, by 2030.

The adequacy of Australia's biosecurity measures

AUGUST 2022

Our submission outlined the importance of Australia's biosecurity measures and response preparedness, particularly considering the international foot-and-mouth disease (FMD) and varroa mite outbreaks.

We recommended the application of a One Health approach to understanding and preventing FMD in Australia while also providing on-ground assistance to Indonesia to manage its FMD outbreak.

The submission also highlighted the importance of investment in biosecurity and agricultural research to improve preparation for future outbreaks. In addition, the ability of biosecurity workforce planning to improve capacity to respond to future outbreaks is outlined.

This submission built on our March 2022 submission on the National Biosecurity Strategy which recommended a One Health approach and the inclusion of Traditional Knowledge, both of which were reflected in the final released strategy.

Independent review of Australian Carbon Credit Units

SEPTEMBER 2022

Our submission to the Independent Review of Australian Carbon Credit Units (ACCUs) made several recommendations to strengthen the governance and integrity of the framework. The submission outlined the need to separate the verification and auditing of awarded ACCUs into different agencies; publicly release performance data from ACCU recipients to enable independent verification; and align the Emissions Reduction Fund (ERF) with international standards to ensure that it remains appropriate and fit for purpose for future advances in emissions controls.

Safeguard Mechanism Consultation

SEPTEMBER 2022

Our submission to the Safeguard Mechanism Consultation highlighted that while the Safeguard Mechanism has been in place since July 2016, it has not been impactful in reducing carbon emissions. In order to improve the Safeguard Mechanism, the submission recommended that the purchase of international carbon credit units is permitted, provided they are audited to the same standards as Australian Carbon Credit Units (ACCUs). The submission also highlighted the benefits of independent and consistent auditing, along with the need to allow some tolerance for higher emissions from existing facilities, while providing co-investment for efficiency upgrades.

Critical Technologies List – 2022 update consultation

SEPTEMBER 2022

Our submission to the Department of Industry, Science and Resources highlighted the need for a critical technologies list that fosters a human-driven, technology-powered future. The submission recommended revising technology categories to influence technology development. We advised that this can be achieved by allowing some technologies, such as those in health, to be assigned to multiple categories in order to reflect their interdisciplinary nature. In addition, the submission recommended the elevation of certain technologies to their own category in order to signal their anticipated importance, such as Critical Minerals Extraction and Processing. It is also recommended that the Critical Technologies List is strengthened with a range of emerging technologies, including 'organ-on-a-chip technologies', 'carbon capture and storage', and quantum computing.

5 Year Productivity Inquiry: Australia's data and digital dividend

OCTOBER 2022

Our submission to the Productivity Commission highlighted the need to coordinate the policy and regulatory environments. The submission recommended that the Australian Government develop a new regulatory framework that supports new digital technologies and provides clarification on data sharing regulation between States and the Commonwealth.

We also outlined the need for a framework to provide greater data access for researchers to facilitate research on data sharing privacy. The submission recommended the incorporation of cyber security into technology procurement in order to foster cyber resilience and, in addition, the development of a regulatory framework that supports victims of data breaches.

5 Year Productivity Inquiry: Innovation for the 98%

OCTOBER 2022

Our submission to the Productivity Commission emphasises the need to support the measurement and uptake of innovation diffusion in Australian businesses. It highlighted that comprehensive metrics are essential, as they lead to the optimisation of innovation activity. We also recommended the establishment of a definition of Small and Medium-sized Enterprises (SMEs), in line with international definitions. The submission also outlined the need to invest in workplace learning incentives, fund collaborations between academia and industry, and incentivise the industry to invest in research and development.

National Electric Vehicle Strategy

OCTOBER 2022

Our submission to the Department of Industry, Science and Resources highlighted the need to drive a rapid increase in demand for Electric Vehicles (EVs) while also increasing their availability and accessibility. The submission recommended the use of both demand and supply-side policies to address the electrification of all vehicle segments and outlined the need to support a second-hand market by developing benchmarks on parts and transparency. We also recommended that the National Electric Vehicle Strategy includes a roadmap for establishing an EV charging network with a common standard of charging infrastructure. The submission also outlined the benefits of a circular economy approach, investing in upskilling an EV workforce, and implementing fuel efficiency standards.

National Quantum Strategy

NOVEMBER 2022

Our submission to the National Quantum Strategy highlighted the need to cultivate a successful quantum industry in Australia. The submission acknowledged that previous investment in basic, curiosity-driven research enabled the development of quantum technologies that are currently being scaled and applied. As such, we recommended that the development of a whole-of-pipeline quantum research funding strategy be elevated to its own objective under the Strategy. The submission also outlined the need to include dedicated support for collaborative research on ethical issues related to quantum technologies, such as cyber-security and potential harms caused by defence applications. We recommended the use of school programs to build the workforce, including programs to target under-represented groups, and the prioritisation of a skills taxonomy.

MORE

Details
Read our recent submissions online at atse.org.au/research-and-policy/publications

Events

From mitigation and adaptation to preparing Australia's workforce for the future, climate change continued to be a thematic priority for ATSE events.

In line with the Academy's commitment to our Net Zero Emissions Position Statement calling for stronger emissions reduction commitments and the rapid deployment of renewable technology, we proudly hosted over 11 climate change mitigation and adaptation-related events between April and October 2022.

On 14 September 2022, former ATSE President and past Chief Scientist Dr Alan Finkel AC FTSE FAA, presented a national oration to discuss the policies, scale and pace of technology deployment needed to meaningfully reduce atmospheric emissions of greenhouse gases. Dr Finkel's main message was clear: with ambition, political will and urgent action, Australia can be a leader and set a global example on how we can use zero emissions electricity, hydrogen and derivatives to reduce reliance on coal, oil and gas. The 'hydrogen revolution' was also addressed in another webinar on 7 April 2022 by Adjunct Professor Richard Bolt FTSE and Australian Hydrogen Council Chief Executive Officer Dr Fiona Simon. Professor Bolt and Dr Simon shared their insights on the National Hydrogen Strategy and examined the opportunities, stakeholder readiness and future of hydrogen. They agreed that collaboration between industry, government and the community, as well as strategic planning are key to transform global energy production, use and storage.

In another webinar 'Adapting coastal cities for climate resilience' on 4 May 2022, moderator Leeanne Bond FTSE spoke with aquatic innovator and SeaCities Lab Director Professor Joerg Baumeister, on how an inter-disciplinary research approach that synergises engineering, architecture and environmental sciences enables the development of new and better design solutions needed to adapt to the current climate challenges. Echoing Professor Baumeister's views, City of Gold Coast urban planner Pradesh Ramiah, who develops climate adaptation policy to promote hazard resilience, also advocated for more nature-based solutions that advance urban resilience and the mitigation of future climate risks.

Research from Deloitte Access Economics estimates over 250,000 jobs can be added to Australia's economy by 2070 from shifting to a net zero economy. In a Towards Net Zero webinar moderated by Cicada Innovations CEO Sally-Ann Williams on 12 April 2022, we heard from mining, decarbonisation technology and wind energy experts about the economic growth and job opportunities that come with a net zero economy. In another event on 2 June 2022, a 2021 Fellow and Aurecon Chief Operating Officer Louise Adams FTSE emphasised the deep responsibility scientists, technologists and engineers hold to help Australia's governments, industries, businesses and communities make choices that will lead to a sustainable, liveable future. She stressed how the sustainability challenge and critical STEM skills shortage facing all businesses can provide the momentum and incentive for novel innovation to take place across the engineering industry.

Expanding on the topic of Australia's STEM skills shortage, in May 2022, Australian thought leaders in digital technologies Professor Iven Mareels FTSE and Professor Aleks Subic shone a light on the skills needed to support Australia's digital revolution. 6.5 million additional digital workers are needed by 2025 to keep pace with technological change. Drawing examples from Australia's National Industry 4.0 TestLabs and RMIT Online and Amazon Web Services' digital health course, Professor Subic presented case studies on how we can improve Australia's industry competitiveness. In a joint event with the Royal Society of Victoria on 7 July 2022, CSIRO Chief Scientist and former Chair of the ATSE Victorian Division Professor Bronwyn Fox FTSE joined Victoria's Lead Scientist Dr Amanda Caples and President of the Royal Society of Victoria Rob Gell AM, as they shared their visions on how we can apply Australia's digitisation and automation mining technology to create a world-leading manufacturing sector.

On 11 October, Western Sydney University Vice-Chancellor and President and 2022 Chaikin Orator Professor Barney Glover AO FTSE FRSN presented on why the university sector must urgently seize the opportunity to be ahead of the curve and fulfil the ambitions of the communities that they serve. Professor Glover shared examples of successful research translation and examined high potential sectors in the rapidly developing technical world. Similar to the education sector, the agricultural and food sector also faces the challenge of attracting more young leaders. In a panel discussion chaired by 2022 Eureka Prize winner Professor Paul Wood AO FTSE featuring recent winners of the ICM Agrifoods Award Dr Angela Van de Wouw, Professor James Hunt and Dr Lydia Ong, the speakers shared how the sector should respond to critical labour shortages and the increasing supply chain threats of climate change on agriculture and food production.

MORE

Details
See all our past and future events
atse.org.au/news-and-events


Alan Finkel


Richard Bolt


Fiona Simon


Leeanne Bond


Joerg Baumeister


Pradesh Ramiah


Iven Mareels


Aleks Subic


Bronwyn Fox


Amanda Caples


Rob Gell


Barney Glover


Paul Wood


Sally-Ann Williams


Angela Van de Wouw


James Hunt


Lydia Ong

Reflections from our new Fellow panel discussions

Professor Mark Howden FTSE, Director, Australian National University Institute for Climate, Energy and Disaster Solutions

Dr Beth Ebert FTSE, Senior Principal Research Scientist and Head, Forecast Quality Research, Bureau of Meteorology

Professor Xiaojing Hao FTSE, Professor, School of Photovoltaic and Renewable Energy Engineering, UNSW Sydney

Professor Kylie Catchpole FTSE, Deputy Director, School of Engineering, Australian National University

Dr Alex Wonhas FTSE, Advisory Board Member, EnergyCo

Mitigating climate change

Climate change is arguably one of the biggest societal, economic, political, and technological challenges of the 21st century.

At its core, it has been caused by technology. Technology now also offers many solutions. We must act now to resolve this difficult, important, and urgent issue.

The new Fellows panel provided a timely review of the current state of climate science and explored some priority areas that can mitigate climate change across key sectors of Australia's economy. It consisted of Dr Beth Ebert FTSE, Prof Xiaojing Hao FTSE, Prof Kylie Catchpole FTSE, Prof Mark Howden FTSE and myself as moderator.

Dr Ebert, Senior Principal Research Scientist and Head of Forecast Quality Research at the Bureau of Meteorology, highlighted how Australia's climate has already warmed by about 1.4 degrees. In turn this led to an attributable increase in the intensity and frequency of extreme events. Collaboration and partnerships will be required to better forecast extreme events and help communities prepare ahead of time. Observation systems will benefit from Australia's growing space commitment and capability. And numerical models, the linchpin of current prediction systems, can be enhanced through machine learning to better extract the impacts that matter to people.

With stationary energy alone contributing over half of Australia's emissions, and even more if transport is included, mitigating them is a must.

Professor Xiaojing Hao from the School of Photovoltaic and Renewable Energy Engineering at UNSW is a world expert in solar technology and has helped establish Australia's global leadership in this field. She explained how we can further improve Australia's world leading position, for example through tandem cells that can more efficiently convert a broader part of the solar spectrum. But just as important will be to grow PV applications such as building integration, enabled through new materials.

As the cost of solar continues to decline, the challenge is shifting from producing to storing energy. Professor Kylie Catchpole, Deputy Director of the School of Engineering at the ANU has pioneered new approaches to increase the efficiency of solar cells. She is now also shaping the field of solar hydrogen and explored how we might reach the magic $2 per kg hydrogen cost, which would not only increase energy storage but also other important applications such as replacing coal in steel making.

We must continue solar cost reduction and start installing hydrogen to reach the necessary economies of scale. This will require the kind of support wind and solar has enjoyed that led to their phenomenal cost reduction.

While energy often dominates the debate, mitigating emissions from other sectors is just as important. Professor Mark Howden, Director of the Institute for Climate, Energy and Disaster Solutions at the ANU, who, among many other achievements, has been a member of an extraordinary 20 Intergovernmental Panel on Climate Change processes, argued that we need more whole of system solutions. This means we must bring together technology, social science, political science, psychology, social psychology, and various other disciplines to conduct the transparent and reflective discussions needed to navigate the complex interdependencies.

Genuine system solutions will eventually help us tackle some of the big outstanding issues, such as methane from livestock, improved landscape management and efficiency improvements, which are important even if they are not sexy.

There is clearly much to do. It is extremely urgent and will not be easy. However, with the calibre of talent, as exemplified by our new Fellows, there is certainly hope we can make progress and maybe even avoid some of the worst impacts of climate change.

Dr Alex Wonhas
FTSE

Alex is one of Australia's leading energy experts and passionate about enabling a smooth net zero transition. He is currently on the Board of the Energy Corporation of NSW that is orchestrating NSW's rapid energy transition. As EGM System Design at the Australian Energy Market Operator (AEMO), Alex oversaw the development of the most recent Integrated System Plan (ISP), Australia's national energy transition blueprint. Prior to his role at AEMO, Alex held a number of senior executive roles at the CSIRO, where he led the energy and resources research, and at Aurecon, an international engineering firm.

Dr Nicholas Austin FTSE, Chief Executive Officer, Watertrust Australia

Merryn York FTSE, Executive General Manager System Design, Australian Energy Market Operator

Professor Huijun Zhao FTSE FAA, Director, Centre for Catalysis and Clean Energy, Griffith University

Dr Beth Fulton FTSE FAA, Senior Principal Research Scientist, CSIRO Oceans and Atmosphere

Dr Katherine Woodthorpe AO FTSE FAICD, ATSE President

Adapting to climate change

Following on from the panel discussing mitigation of climate change, the next panel discussed the issue of adapting to the climate change that is already beginning to be evident. The panel featured Dr Beth Fulton FTSE, Dr Nicholas Austin FTSE, Merryn York FTSE and Professor Huijun Zhao FTSE FAA and myself.

We discussed the need to better understand the opportunities for Australia in both reducing its emissions while adapting to changing climate and looking at new ways of manufacturing that are less dependent on fossil fuel. It was clear from the discussion that adaption is now urgent and that although efforts to mitigate our emissions remain critical, adaptation to the inevitable changes that will face Australia and neighbouring countries must also be accorded a higher priority than ever before.

Dr Beth Fulton, an expert in marine ecosystems modelling explained how we need to understand the processes in the ocean to better prepare for climate change. By improving our knowledge of the ocean's impact on carbon uptake, oxygen production and production of biomass, we can more readily prepare for the changes that are coming.

Professor Zhao described how changing feedstock of our chemical production will reduce our dependence on fossil fuel inputs and how it could potentially reinvigorate manufacturing onshore in Australia.

Merryn York, an energy systems leader, explained the complexities that face our current energy system configuration to prepare for a reduction in fossil fuel power stations — from the need for dispatchable energy, to how to manage a grid that will be an order of magnitude more complex that the current system.

And to circle back to water, Dr Nick Austin talked about the systems that underpin our agriculture and also took the discussion offshore. He talked about Australia's responsibility to our neighbouring countries in the Pacific region, and our responsibility to help them adapt to climate change — which is already impacting them more greatly than here in Australia.

The discussion then ranged across the interaction and interdependence of all these systems, our ocean, atmosphere, water systems, fisheries and agriculture, whilst reconfiguring our energy production, our grid and then finally, seeing opportunities for our manufacturing to take advantages of these changes.

We all agreed, ATSE has both the ability, and the obligation to use our wealth of bright minds to tackle these problems for the benefit of Australia and our neighbouring countries so that we can adapt to the inevitable climate change challenges that we will face in the not-too-distant future.

Dr Katherine Woodthorpe
AO FTSE FAICD

Dr Woodthorpe is President of the Australian Academy of Technological Sciences and Engineering and a Fellow of the Australian Institute of Company Directors. She holds a PhD in Chemistry (Manchester) and an Honorary Doctorate from the University of Technology Sydney. In 2017, she received an Order of Australia for her ongoing service to research and technology innovation in Australia. Dr Woodthorpe has a strong track record of achieving outcomes in a range of technology-oriented industries, including medical devices and health services, and a deep knowledge of governance, leadership and the private equity and financial sectors.

Developing digital literacy

Digital literacy has been an important topic in modern times, but is almost unarguably more important now than it has been at any time in the history of humanity. I enjoyed joining a fantastic panel of new ATSE Fellows – Professor Ann Nicholson FTSE, Dean of the Monash Faculty of Information Technology, Professor Mary Foley FTSE, a leader in health systems and policy in Australia, Richard White FTSE, founder and CEO of WiseTech, a $19 billion-dollar ASX-listed company, and myself, Joint Director of the QUT Centre for Robotics, chaired by Professor Eleanor Huntington FTSE, Executive Director at CSIRO.

There is some wisdom in avoiding being weighed down with the "perfect" definition, but led by Ann, the panel described the required nuance and richness of digital literacy not just being a skillset, but rather, a combination of knowledge, skills and behaviour required to prosper and participate in a society and workforce increasingly defined by digital technologies of all varieties. On a related note, Mary noted how a deep technical knowledge of coding, for example, is not necessarily realistic or required for many to prosper in this digital space.

The education piece was discussed at length, with four key themes. The first was the observation from Mary that the modern classroom is surprisingly, and perhaps not reassuringly, similar to a classroom described in a Dickens novel. In an age where competition for attention is tight with the carefully crafted technological distractions of modern social media, as noted by Richard, this type of education system is unlikely to create sufficient engagement with students. These technologies and entertainment modalities are not going away anytime soon, and perhaps can also form part of the solution, a process I've been exploring through edutainment for kids as young as pre-school age.

Relating to this point, our second discussion theme highlighted that modern education, especially as pertains to digital literacy could still be better individualised, from customised learning rates, to active versus passive learning, to tailoring learning to the particular strengths of an individual student.

The third key concept explored in the education space was the continuing need for it: whilst improvements in school level education will help, ongoing, lifelong education as pertains to digital literacy will be crucial. Richard noted there is much cause for optimism here, about what could be done, noting the ease with which large numbers of staff in his organisation can be upskilled on their in-house digital training platform at relatively low cost.

Finally, we discussed the widespread diversity challenges in the sectors most responsible for driving digital technologies, and how much of this differentiation is embedded from an early age, a challenging phenomenon that we can change.

There was cause for cautious optimism in this space: we know well the opportunities and challenges, and if we work backwards from the positive changes we want to achieve to drive the development of the mechanisms we use to do so, the future is bright.

Professor Michael Milford
FTSE

Professor Michael Milford is a leading researcher in neuroscience-based robotics navigation. He works closely with industry and government developing positioning systems for robotics and autonomous vehicles. Michael's world-first advancements translating abstract neuroscience into technology for real-world commercial applications were recognised by ATSE in 2019 in awarding him the Batterham Medal for Engineering Excellence.

Below L>R: Professor Michael Milford FTSE, Joint Director, QUT Centre for Robotics; Australian Research Council Laureate Fellow, Queensland University of Technology

Richard White FTSE, Chief Executive Officer and Founder, WiseTech Global

Professor Mary Foley AM FTSE, Special Adviser and Non-Executive Director, Telstra Health

Professor Ann Nicholson FTSE, Dean, Faculty of Information Technology, Monash University

Professor Elanor Huntington FTSE, Executive Director CSIRO & Visiting Professor, ANU

Developing a skilled STEM workforce

The new Fellows panel discussion entered into an exciting and insightful conversation around how to develop a skilled STEM workforce, a key issue within our society. The panel comprised academics and experts from various backgrounds who work closely with the provision of tertiary education relating to the engineering and IT sector. The panel were asked several questions in relation to the education of the next generation of engineering and IT professionals.

The first issue addressed the skill shortages within Australia for the telecommunications, construction, and resources sectors. This was followed by a reflection on the new ATSE Report, *Our STEM skilled future: An education roadmap for an innovative workforce* and its five recommendations. I highlighted a recommendation to raise the profile of STEM careers in Australia by showcasing their attractiveness and accessibility, and posed a question to the panel asking how we should go about highlighting the opportunities and impacts of STEM careers to society. This question was discussed amongst members of the panel with several points being made. A suggestion was to build awareness of STEM careers by providing a clear career pathway and progression opportunities. This was complemented by the idea that STEM graduates not fully understanding the breadth of options available to them – for example a degree in chemistry can open doors well beyond that field.

The panel conveyed a shift in values of the next generation of students particularly in relation to the decarbonisation of the planet and achieving net zero in terms of carbon emissions. This therefore suggested that a change needs to be made in STEM career pathways that better align with the values of our future STEM leaders.

The second issue that was addressed was the decreasing rate of students electing to go to university from high school, despite the demand for the skills within society. The panel considered the question of how tertiary education institutions are going to address the issue to raise the skills of people who aren't seeing relevance of the transition straight from high school. The panel provided some input into the discussion, such as the change in structure of learning with refresher courses for upskilling purposes. This was complemented by the idea that there is a need to revisit how we can provide faster access to shorter periods of education, targeted more toward more frequent career changes.

Further questions asked by the audience to the new Fellows panel included:

- The role/importance of 'Education Adjacent Institutions' in inspiring students into STEM
- Reasons why students don't take certain STEM subjects in senior high school (subject scaling and assumed knowledge)
- Most problematic aspects of narratives around STEM, as well as the greatest opportunities to change the topics we communicate
- How can tertiary study within STEM become more focused on curiosity, creativity, and joy as a learning outcome rather than just the facts.

Professor Mark Hoffman
FTSE

Professor Mark Hoffman is an experienced senior leader in the higher education sector who values a collaborative and global focus. He believes that universities are a catalyst for social and economic advancement, of both individuals and society; universities' primary purpose is to educate and graduate students equipped to lead that advancement, regardless of background, through a seamless interface with industry and society. As Deputy Vice-Chancellor (Academic) and Vice-President of the University of Newcastle, Mark Hoffman is leading a transformation of the academic programs of the University focused on ensuring the University's highly regarded graduates are life-ready.

Kirsten Rose
FTSE

Kirsten Rose is a respected leader in technology and innovation with a career spanning 30 years in the US, UK and Australia. She is a member of CSIRO's executive team overseeing a portfolio encompassing over 2,000 research scientists and engineers and more than $500 million in annual research investment. She champions commercialisation of CSIRO science through her support of start-ups and spin-outs to create true impact at scale.

Creating conditions for translation, commercialisation and collaboration

Our new Fellows panel, 'creating the conditions for translation, commercialisation and collaboration,' was a great way to end a day of fascinating ATSE ACTIVATE sessions. The wide ranging discussion touched on everything from the way we fund research in Australia to the challenges of connecting with industry. And as one panellist eloquently summarised, translating, and commercialising research is 'enjoyable, challenging and frustrating, and all at the same time.'

One key theme the panel agreed on is the need for a shift in culture and much greater collaboration between research and industry sectors to develop solid foundations for knowledge sharing and create more opportunities for innovation and commercialisation. The panel discussed the possible connections between Australia's economy, including our lack of export diversity, and a 'demand-side' challenge with low industry investment in research.

Commercial potential certainly exists for Australian research in the manufacturing and technology sectors, and this is already being capitalised on – we discussed the opportunities for new and sustainable products from Australia's vast marine environment, for example. But to scale these ideas and their development and ultimate commercialisation depends on strong collaboration between the different sectors.

Comparisons were drawn between Australia and other countries; in the US, for example, many industries have their own research and development arm, whereas in Australia, many of our industries rely on the academic sector for R&D. This may contribute to the gap between research and commercialisation, and encourage PhD students to continue their careers in academia, rather than in industry.

We raised the need to create structures, networks, and programs for students and early career researchers, particularly those from culturally diverse and non-English speaking backgrounds, to promote entrepreneurial skills and the importance of responding to market needs – of seeking opportunities to tailor research to solve industry's problems. This aligns with a shift in government research funding for programs that address high priority areas for the country. Some of the panel expressed a need to strengthen our commercialisation teams in universities to help achieve this goal.

We discussed also the equally important need for structures to support greater industry involvement and investment in research, such as Main Sequence Ventures as a vehicle to commercialise research and science. We also noted the early opportunity to capitalise on government programs such as the University Research Collaboration Scheme and the National Reconstruction Fund.

Key takeaways for me were: the need to remain open to opportunities; the value of focusing on the real industry and market requirements; to consider how we better utilise and connect all our talent; and that the research system itself may need disruption in the near future.

Above L>R: Distinguished Professor Dietmar W. Hutmacher FTSE FAHMS, Chair in Regenerative Medicine, Queensland University of Technology; Co-Director, Max Planck Queensland Centre for the Materials Science of Extracellular Matrices

Professor Wei Zhang FTSE, Research Director, Marine Bioproducts Cooperative Research Centre; Founding Director, Centre for Marine Bioproducts Development, Flinders University

Dr Jack Steele FTSE, Director, Science Impact and Policy, CSIRO

Professor Madhu Bhaskaran FTSE, Co-leader, Functional Materials and Microsystems Research Group, RMIT University

Kirsten Rose FTSE, Executive Director Future Industries, CSIRO

Professor Michael Breadmore FTSE, Director, Australian Centre for Research on Separation Science (ACROSS), University of Tasmania

Distinguished Professor Chennupati Jagadish AC FTSE FRENG PresAA, President, Australian Academy of Science

Professor Tisha Morrell
Head of School of Education,
University of Queensland

Patricia (Tisha) Morrell has had a diverse teaching background, starting as a high school science teacher in a large, urban, private school in Brooklyn, New York then moving to be a middle and high school science and mathematics teacher in a small, public school district in rural Scio, Oregon. She spent over twenty years working with preservice and inservice teachers at the University of Portland where she also created and directed the University's STEM Education and Outreach Centre. The mission of the Centre was to assist in strengthening STEM education for the university students, K-12 students, and community teachers.

REPORT AUTHOR INSIGHT

Our STEM skilled future

An education roadmap for an innovative workforce

We all acknowledge Australia is experiencing a STEM skills shortage, which is of deep concern to industry, government and the broader community. Many measures show that this shortage is increasing and there are concerns regarding pipeline — it is both a short- and long-term challenge.

To explore and examine this problem, ATSE brought together leading experts from a broad range of sectors and industries, focusing specifically on mathematics, engineering, digital skills, agricultural innovation and entrepreneurship. In July and August of 2022, ATSE held a series of roundtables to explore the key issues in each of these five domains. Over 120 leaders from industry, academia, and government participated in these brainstorming sessions. It is laudable that such a significant group of STEM leaders came together to address this challenge. We need to acknowledge the considerable time and energy, and most distinctively, expertise which were contributed.

Each domain suggested a number of immediate and longer-term steps that could be undertaken to improve the shortfalls in each area. ATSE examined the collective recommendations for commonalties for immediate remediation. The result is a set of four overarching concrete policy recommendations aimed at improving STEM education in Australia and focusing on skills to transform our future leaders.

While the report provides a summary of each of the roundtables as well as the overarching recommendations, what follows is a brief synopsis.

The first is the need to develop COMMON LANGUAGE. We must establish a National Skills Taxonomy to streamline consistent communication about needs and pathways among Australia's organisations and individuals so they can communicate clearly with each other about needs and pathways. The National Skills Commission on the Australian Skills Classification has begun to undertake this work, but a skills vocabulary that builds on and accelerates this work is needed. This will provide the articulation necessary for identifying pathways for upskills, re-skilling, and transferring skills between comparable roles across sectors and to help with matching supply and demand in the workforce, while more accurately forecasting industry-specific skill demands.

The second recommendation is to focus on EVIDENCE-BASED decisions. We must prioritise and invest in evidence-based approaches to STEM program development and assessment to ensure training is fit-for-purpose and provides value for money. This requires developing a way to assess STEM resources and training programs to ascertain their quality. A self-assessment and quality framework to use in evaluating the ever-growing collection of training programs and materials would allow individuals and organisations to better select resources and programs that are fit for purpose. The establishment of a centralised repository of STEM resources would also assist in this endeavour, to build on previous initiatives, and connect what is currently fragmented collections.

The third recommendation is to encourage LIFELONG STEM LEARNING to promote and promote and support this culture in the workforce and ensure Australia has the skills it needs now and into the future. The particulars of STEM careers are continually evolving. We can see that most readily in the technology and entrepreneurship sectors. It is essential that the Australian workforce learns to embrace a culture of lifelong learning. By creating and incentivising participation in learning Initiatives, we can highlight the value of ongoing learning to build capability and career prospects.

Finally, the fourth recommendation is to create a MINDSET SHIFT, raising the profile of STEM careers in Australia to showcase their attractiveness and accessibility. The opportunities and responsibilities of STEM careers need to be made transparent so the general population can develop a better understanding of what these careers entail. They also need to see them as accessible and attainable. Instead of promoting Australia as a vacation destination, we need to showcase Australia as the place for cutting-edge careers. These shifts will help us to diversify and strengthen our STEM workforce.

The full report expands on each recommendation and includes sector-specific recommendations, unique to each of the working group domains. We urge you to read through the entire report. It was a huge undertaking, and we feel the resulting roadmap will appropriately guide action among government, industry, education, unions, peak bodies, and individuals to drive rapid and sustainable action.

MORE

Download the full report
atse.org.au/our-stem-skilled-future

How to boost women in STEM: Elevate

The ‘Elevate: Boosting Women in STEM’ program is unique in the STEM landscape. Elevate combines support for women who aspire to successful careers in applied research and industry.

Dr Marlene Kanga AO FTSE

Dr Marlene Kanga AO FTSE
Dr Kanga is a recognised leader of STEM organisations in Australia and internationally and is currently a non-executive director of Sydney Water Corporation, Air Services Australia, Standards Australia and BESydney and other boards involving innovation and the commercialisation of new technologies.

Dr Adi Paterson FTSE

Dr Adi Paterson FTSE has a strong public science and senior management background. He has extenstive operational and strategic management expertise, in particular in nuclear programs and in the commercialisation of scientific research. He co-authored the post-Apartheid National R&D Strategy in South Africa and was Chief Operating Officer in the national Department of Science and Technology. Prior to this he was a foundation Member of the Academy of Science of South Africa, the first non-racial Academy.

The ‘Elevate: Boosting Women in STEM’ program is unique in the STEM landscape. Elevate combines support for women who aspire to successful careers in applied research and industry. Successful candidates will obtain world-class education in science, technology, engineering, and mathematics (STEM) and undertake world-leading STEM research. The program introduces Elevate scholars to diverse STEM career pathways through industry-academia collaborations, mentorship, and industry-led professional development.

In January of 2022, the Australian Government announced that ATSE would anchor the 7-year $41.2 million Elevate: Boosting Women in STEM program as the sole implementing partner. Elevate will award up to 500 undergraduate and postgraduate scholarships to women in STEM. Elevate scholars will be given the opportunity to gain an understanding of the broader STEM ecosystem, engage in industry and research collaborations, increase their business acumen and become the next leaders in industry, academia, and government.

Elevate is funded by the “Boosting the Next Generation of Women in STEM” fund of the Department of Industry, Science and Resources (DISR).

Elevate aligns with the Academy’s strategic objective of Fostering diversity and excellence in the next generation, and operates at the interface of industry, academia and government. The program will drive positive change across all professional sectors that educate and employ Australia’s highly skilled STEM workforce.

Elevate is the first program of its kind that goes beyond supporting women in education and research, to enabling women in STEM to develop extensive networks and progress toward leadership across all sectors.

Above: Smrithi Gireesh Babu, Dr Katherine Woodthorpe AO FTSE FAICD, Minister the Hon. Ed Husic MP, Adele Greedy-Vogel, Kiowa Scott-Hurley, Charlize Liebrand, Yingxin (Selina) Li, Peta Estens, Veronica Karakousis, Senator the Hon. Katy Gallagher, Lily Attwood, Jodie Beitzel and Tahereh (Sara) Yazdanparast

The Elevate: Boosting Women in STEM program will:

- Encourage women to pursue education and careers in STEM
- Foster industry-academia collaborations in applied research and business
- Extend qualifications and professional skills in STEM and business
- Propel women into senior leadership.

ATSE ELEVATE ADVISORY GROUP

ATSE has established the Advisory Group to champion the program and Elevate’s sector-wide partnerships, and guide the strategy of the program. The Elevate Advisory Group is co-chaired by Non-Executive Director, engineering leader and former President of the World Federation of Engineering Organisations (WFEO) Dr Marlene Kanga AO FTSE, and Dr Adi Paterson FTSE, an international leader in nuclear science and technology, and a Champion of Change.
Dr Kanga said, “I am proud to lead this incredible project which we hope will shift the dial in the level of participation of women in STEM. Elevate will provide new opportunities, especially for those who are in regional areas, who are Aboriginal or Torres Strait Islander, with multicultural backgrounds or who may be first in family to study at a tertiary level. This is vitally important to secure Australia’s future as a technologically advanced nation. The Elevate Advisory Group comprises 17 of Australia’s most experienced STEM ambassadors who will collectively transform our assumptions about who can work in STEM.

“The Elevate Advisory Group will champion diversity and inclusion, and help shape an immersive program for scholarship recipients, exposing them to inclusive leaders, programs, networks and organisations, that nurture and support their professional development and future careers.”
Elevate Advisory Group Co-Chair Dr Paterson is committed to ensuring Elevate enables increased Australian capability, resilience, and breadth of research and innovation.

“Elevate in action is a springboard to launch women into the next stage of their careers across STEM. Diversity underpins and enables the best possible future for people involved in STEM.

As a nation, and across the globe, we need Elevate and similar programs to empower a new generation to take on the task of leadership and transformation. Elevate scholarships will provide the leap forward we need for access and excellence in Australian STEM, Paterson said.

The Australian Government’s Women in STEM Ambassador, Professor Lisa Harvey-Smith, joined the Advisory Group and added, “The power of this Advisory Group is the broad range of expertise of its members and their profound interest in the issues faced by women in STEM. Their collective vision and focus on solutions will drive real change in STEM disciplines.”

ELEVATE'S FIRST SCHOLARS

The inaugural scholarship recipients celebrated at a launch at Parliament House on Thursday 24 November 2022 hosted by Industry and Science Minister the Hon. Ed Husic MP, and Minister for Women, Senator the Hon. Katy Gallagher.

These scholars will commence study in early 2023. They include: 30 women pursuing postgraduate studies in applied STEM research, from aerospace engineering to cybersecurity; five mid-career women in STEM who will undertake career-boosting leadership qualifications, and 15 women who will commence STEM undergraduate degrees, setting them on paths to rewarding careers.

ATSE CEO Kylie Walker said she was pleased to see the huge demand for the program, with more than 1,000 applications from diverse women across the nation received in this first round.

"The demand demonstrates that a huge range of Australian women are keen to study STEM and embark on, or grow, rewarding careers, tackling modern challenges and solving problems through a STEM lens. We are proud to be able to support the Elevate scholars – not just to study but also by immersing them in an inclusive network, connecting them with leaders in a range of sectors, and offering professional development in enabling and business skills. Elevate is

built in collaboration across the STEM sectors, and supports the scholars themselves to build relationships across the breadth and depth of Australian STEM. We are excited to enable every scholar to shape their future in STEM."

"It was terrific to receive applications from a genuinely diverse range of women - our inaugural scholars represent the breadth of Australian society. We are particularly delighted to be able to award a number of Elevate scholarships to Aboriginal and Torres Strait Islander women: recognising the value of Traditional Knowledge and encouraging increased representation in STEM are key values for the Elevate program and for ATSE," Walker said.

ELEVATE SCHOLARSHIP PROGRAM

Starting in 2023, up to 500 scholarships will be awarded over the six years of the program (2023-28) across three scholarship categories. Up to 80 undergraduate, 370 postgraduate and 50 leadership scholars will be supported to study

ATSE and the Department of Industry, Science and Resources acknowledge the invaluable support of the Elevate partners

:The Hon. Ed Husic MP, Minister for Industry and Science; Kylie Walker, CEO ATSE; Kiowa Hurley, Elevate scholar; Senator the Hon. Katy Gallagher, Minister for Women; Dr Marguerite Evans-Galea AM, ATSE, STEM Careers Director, ATSE.

at an Australian university to gain, extend, or build on STEM education and qualifications.

The Elevate program is open to all women in STEM and particularly supports those individuals who identify as Aboriginal or Torres Strait Islander; LGBTQIA+, from culturally or linguistically diverse backgrounds, from regional or rural areas, with low socio-economic status or those living with a disability. Diversity, inclusion, and achievement relative to opportunity are important considerations for selecting scholars.

UNDERGRADUATE SCHOLARSHIPS

Undergraduate scholarships will support women who want to complete a Bachelor degree in a STEM field. These scholarships are designed both for school-leavers who want to begin STEM study at the tertiary level, and for women who may have other qualifications or life experience and want to start a new career trajectory with a science, technology, engineering, or mathematics degree.

POSTGRADUATE SCHOLARSHIPS

Postgraduate scholarships are designed for students commencing a PhD or Master by Research and prioritise students whose research is an industry collaboration or links with industry.

The priority areas for the scholarships align with Australia's research and industry priorities and the need for skills in advanced manufacturing, agriculture, digital futures, energy resources and renewables, health, minerals and mining equipment, technology and services and water resources.

Postgraduate Scholarships provide financial support, along with opportunities for professional development, industry engagement, networking and mentoring.

The goal for these scholars is to foster more women-led industry-academia collaborations in applied research and business.

LEADERSHIP SCHOLARSHIPS

Leadership scholarships will support women who have already completed a prior STEM qualification to study either a Master of Business Administration or Master by coursework in areas of high job growth that address nationally important industry sectors with STEM skills gaps.

These skills gaps are defined by Australia's National Manufacturing Priorities and include resources technology and critical minerals processing; food and beverage; medical products; recycling and clean energy; defence and space.

Additional priority areas, that were identified as part of the Elevate consultation process, include natural sciences (agriculture, environmental sciences, climate sustainability and adaptation, geology and entomology), engineering (materials engineering, chemical engineering, minerals, energy, transport and circular economy) and technology (cybersecurity and data skills).

Leadership Scholarships will provide financial support, along with opportunities to develop board and executive leadership skills including governance and strategy.

The goal is for these scholars to lead and excel in the STEM ecosystem and to propel an increased number of women in senior leadership and decision-making positions in industry, research organisations, government and business.

Reflections from our scholarship recipients

ATSE IMNIS Program Manager Scott Cummins speaks with LGBTQIA+ scholarship recipient Lamia Harper

Kiowa Scott-Hurley

Attending the ACTIVATE conference in 2022 has left an indelible mark on me as a young Dja Dja Wurrung technologist. One of my moieties is Waa the crow – many Dreaming stories link Waa to fire, including some explaining his blackened feathers. Like Waa, I feel I've been marked as different, thrown into the flames.

Attending technological and academic conferences means I am always struck by this difference – the lack of women, First Nations people, those with chronic illnesses. I wonder how many standard deviations away I am from everyone else in attendance – a flaming wall stands between the bell curve and me. When I speak up in these settings, my words are smouldering embers, restrained flames waiting to engulf the conversation and burn it to the ground. If I'm not careful as I pass through the flaming walls, I just might combust.

At ACTIVATE, I saw gender diversity – the many women in attendance were scientists and technologists just like me. Many of them were senior leaders in industry and academia, kindling my imagination for the careers I might have. I met not only one other Aboriginal scientist – but several. I watched two of those scientists, Corey Tutt OAM and Associate Professor Brad Moggridge, give presentations, voices proudly burning up the stage. I even met Susan Beetson, another Aboriginal woman in computing – she was a walking inferno of identity and activism, completely uncontained.

At ACTIVATE, I heard Dr Verity Normington speak about her unconventional educational path through academia, and the impact of chronic illness on that journey, scorching the existing landscape; building a new one where she would fit.

Where there was smoke, I found fire – I wasn't merely promised I belonged here, I was shown it. The bell curve had turned to ashes, and I was setting conversations alight after every talk – my embers had become a bonfire, sparking discussion, and forging new ideas with other attendees.

Returning home, I no longer felt blackened by flames, othered. I felt like Waa the trickster crow, stealing the fire for myself, and igniting the world around me.

Kiowa was an Aboriginal and Torres Strait Islander scholarship recipient.

Lacey Lowe

Firstly, I would like to start by thanking ATSE, the Fellowship, DeadlyScience, the University of Newcastle and all associated sponsors for selecting me as one of the four recipients of the Aboriginal and Torres Strait Islander Scholarship, which allowed me the amazing opportunity to attend ATSE ACTIVATE 2022, to unite, celebrate and activate.

I owe many thanks to all the speakers that shared knowledge, experiences and ideas about how Australia can move forward, in cutting edge sustainable development.

Walking into such an intimidating Masonic institution, experiencing feelings of imposter syndrome, however, I was accepted and treated as an equal by these professionals, even though I am at the start of my STEM journey. This made engaging much easier by the feeling that I belonged.

Highlights include being exposed to new ideas, career options, mitigation of current ecological and economical issues from leading professionals, being accepted and having a voice in the space and meeting some of my idols.

Professor Veena Sahajwalla FTSE FAA and Corey Tutt OAM were on my list of inspirational people to meet, which I did. Looking up to these people like celebrities of STEM, I was stoked having the opportunity to have a yarn with Veena and even discussed us collaborating in the future. Corey Tutt and I caught up and he linked me up with NISTEMPN (National Indigenous STEM Professional Network) which has led to me creating a larger circle of contacts in STEM, and I have already caught up with and attended the 2022 gathering.

The ATSE Awards dinner on Wednesday night was incredible, the staff were amazing, the venue Doltone House at Jones Bay Pier, the view of the Harbour Bridge was also outstanding. I checked my seating and was placed at the best table in the house, front and centre surrounded by the likes of Professor Hugh Bradlow, Dr Joanne Daly, Professor Veena Sahajwalla, Bernie Hobbs, Professor Tisha Morrell, it was like a dream.

I feel so honoured to have been given the opportunity to sit, share stories with and be accepted by such humble inspirational individuals.

Lacey was an Aboriginal and Torres Strait Islander scholarship recipient.

Lamia Harper

How do we create sustainable change and position Australia as a global leader in STEM? Moreover, how do we ensure our approach reflects the diversity and intersectionality of the challenges we face, the people tasked with solving them, and the wider community? The ACTIVATE symposium has shown to be an excellent start. Local and national leaders gathered to embark on a journey to address Australia's (but ultimately the world's) most pressing issues including the STEM skills shortage, climate change, and sustainability.

Sustainable action and collaboration were core considerations throughout ACTIVATE. The Honourable Kim Carr opened the symposium by addressing Australia's need to develop a more cohesive and decisive system around resources, funding, and policies. Professor Mark Howden highlighted the value of a more holistic, comprehensive approach to tackling the climate challenge. For Merryn York, it's not about only adapting to the current needs but simultaneously anticipating the needs of the future so we aren't blindsided by changing times.

From a business perspective, Dr Gayan Benedict noted, "The future is confronted by a multiplicity of challenges and those challenges are intersectional. There's a shock effect. We see a major challenge in one area and the shock to the other areas is disruptive…" (paraphrased). His point? We can no longer take a granular bottom-up approach to risk management because the risk factors are no longer linear and independent. Much like we see with the skills shortage and the climate challenge, it's all confounded and requires resilience.

So what happens now? My hope is that the discussion doesn't stop there. These conversations must continue in cabinet meetings, government offices, boardrooms, businesses, universities, and schools until we gather again to develop a strategy from which we can build a cohesive action plan. I'm looking forward to seeing how diverse voices take a lead in the brainstorming, planning, and execution of such a plan and where we've gotten by the ACTIVATE symposium.

Lamia was an LGBTQIA+ scholarship recipient.

Kelli Schmidt

My attendance at the 2022 ATSE ACTIVATE workshops in Sydney was a thrill. At the workshops I enjoyed hearing from the variety of people across government, business, and academia on what a tech-powered, human-driven future looks like and how we get there, I walked away enthused, inspired and encouraged.

There were many interesting discussions around increasing those taking up STEM careers. For me, I believe we need to focus on the role that Indigenous Australians have in STEM. With over 60,000 years of knowledge, this is a resource that has not yet been realised. With my background in education, I see the need to support the younger generation into taking up STEM and the system needs to adapt and grow so that our Indigenous youth can be involved and showcase their cultures in a STEM setting.

Kelli was an Aboriginal and Torres Strait Islander scholarship recipient.

ACTIVATE reflections from our IMNIS Catalysts

Adam Johnston

The most important thing any of us can do is transfer an energy and urgency for what we do to the next generation.

A professor of frontier materials, an entrepreneur who had worked for ANSTO, and the President-elect of the Australian Academy of Science joined me on stage. Professor Sally McArthur FTSE, Natalie Chapman and Distinguished Professor Chennupati Jagadish AC FTSE FRENG PresAA all emphasised how life and career never took a linear path, how stepping out on your own can bring both personal and financial rewards, while the influence of key friends and mentors was essential in all situations.

Particularly in Jagadish's situation, coming from poverty in India, the support and encouragement provided by a school mathematics teacher has given Australia a leading scientist in physics, engineering and nanotechnology. Similarly, Natalie was able to launch her home garage-based business because a couple of former colleagues were prepared to award her contracts. Meanwhile, Professor Sally McArthur exuded the wonder and excitement about science that you would expect from a youngster. She also emphasised how many of her interests had developed unexpectedly and how much of her work with minerals is connected to products everybody uses every day.

Events like ACTIVATE bring together the people who are undertaking the vital research, while the event itself aims to be the incubator for the next generation of scientists, researchers and entrepreneurs.

Dr Tian Nie, Dr Lauren Jones, Dr Malene Ahern

As Early Career Researchers we took advantage of the networking opportunities at the ATSE conference, with highlights including the Tuesday night networking session and the Conference Gala Dinner.

Sessions such as Shape Your Future, Fantastic Mentors and Elevate: Lifting You to the Next Level comprised engaging speakers who shared their journeys navigating a STEM career with refreshing honesty and humour. We heard about the value of great educators from a young age, mentors and colleagues who believe in you when you doubt yourself, and how the pathway to success requires immense dedication and an adaptive approach to overcome challenges.

As the many sessions and panels indicated, the opportunities in Australia are only bound by what and how we invest into the future of Australia. As leaders in our various communities, it is our duty to reimagine the potential, and drive a healthy, sustainable, and prosperous society.

IMNIS Catalyst Adam Johnston moderating a panel session with Distinguished Professor Chennupati Jagadish AC FTSE FRENG PresAA, Natalie Chapman and Professor Sally McArthur FTSE.

IMNIS Catalysts: Dr Lauren Jones, Dr Tian Nie and Dr Malene Ahern

Primary and high school students watching another of the panels.

Corey Tutt OAM presenting during his panel on Addressing the STEM skill shortage: Stories of how to break the mould.

Sydney Secondary College Balmain students engaging with ATSE's STELR kits.

Reflections from ACTIVATE speakers

Diversity in STEM: From rhetoric to reality

Engineers Australia CEO Romilly Madew says that shifting the dial on diversity in STEM requires a holistic and coordinated approach.

Romilly Madew
AO FTSE

Romilly Madew AO FTSE was appointed as Chief Executive Officer of Engineers Australia in May 2022, after three years overseeing Infrastructure Australia's critical role in helping governments prioritise projects and reforms that best serve our communities. Before joining Infrastructure Australia, Ms Madew was CEO of Green Building Council of Australia (GBCA) for 13 years. In acknowledgment of her contribution to Australia's sustainable building movement, Ms Madew was awarded an Order of Australia in 2019.

We've heard a lot of talk in recent times around the skills crisis in Australia – indeed it was a central theme in the recent federal budget.

Total investment in transport infrastructure in the federal budget is $55 billion over the forward estimates for new and existing projects. This investment is welcome and is important for our economic recovery, but we need to be frank in acknowledging that we have a very large infrastructure pipeline at a time when we need so many more skilled workers.

I acknowledge the government's recent decision to raise Australia's permanent migration cap by 35,000 and to increase funding to allow the processing of those migrants to be performed in a more coordinated and seamless way. We need to do this.

We also must make better use of our existing skilled migrant workforce to address the immediate constraints on the sector.

Longer term, we need more young people to join the profession, as demand for engineers will grow.

Over the coming decade, we'll see the combination of a unique set of challenges for the infrastructure sector. We'll need to meet changing consumer needs and demand for services. We will need to enable a record 255 billion investment pipeline to support the decarbonisation of our economy to achieve net zero emissions by 2050.

As a sector we also are tasked with responding to rapid technological change, supporting multiple industries in transition, and increasing Australia's resilience as the impacts of climate change are felt more frequently. And none of this will be possible without STEM skills, particularly engineers.

It's critical that our workforce reflects the diversity of our communities. Engineers Australia promotes the pursuit of workforce diversity and inclusivity; both because it's the right thing to do, and because it will unlock the talent, innovation, and workforce that the industry needs.

Currently, just 13% of qualified engineers in Australia are female. In electrical engineering, it's 5%. We need to change that, and we need to start in schools.

Our research on women in engineering released in July 2022, found the single biggest barrier to girls choosing to study engineering is a lack of familiarity with what engineering is, and what engineers do.

More than 90% of girls indicated they were set - or moderately set - on a field of study before year 11. And few reported attending engineering-based university excursions or school information sessions.

Raising awareness of an engineering career as an option for girls and school starts with storytelling. We clearly have a branding problem, and we have a role to play in trying to fix this. This includes everything from female engineers giving presentations - which has been happened at ACTIVATE - to schools and organisations using social media platforms like TikTok to reach younger audiences.

We're working to raise awareness of engineering as a viable career option among teachers, career advisors and the broader community. But it starts with all of us actively talking about the opportunities out there for young people of all backgrounds.

Australia is not keeping up with the need for STEM skills. And this is a serious challenge in an increasingly digital interconnected world. Governments have been working with the industry to turn this around for several years. However, the Department of Education reports that the number of school students studying STEM in year 11 And 12 has flatlined at around 10% or less.

Interestingly, the 2022 STEM equity monitor - which is produced by the Australian Government - shows that in years 9 and 10 the choice of STEM electives already become skewed by gender; girls were significantly more likely to choose biology and chemistry. Boys were significantly more likely to choose physics, design and technology, information and digital technology, industrial technology and engineering.

These differences have remained consistent over several years, so there is much to do to break these biases.

Our research has also shown that one of the most common sources of exposure to engineering for both women and men is having an engineer in the family. You and your colleagues are our strongest allies in the campaign to encourage young people, particularly girls, to pursue careers in STEM.

One of the real privileges of my role in Engineers Australia has been to travel around the country and meet the absolute best and brightest that our sector has to offer. I have met remarkable young women and remarkable skilled migrant engineers. So, the diversity and inclusion are out there. We just need to amplify it.

The future of technology: Shaping the human story

The panel on the Future of Technology was focused on how technology is shaping the human story. The panel was moderated by Professor Shazia Sadiq FTSE and featured Professor Toby Walsh FAA, Professor Fang Chen and Dr Linda McIver.

Professor Walsh positioned the latest scientific and industrial advancements in emerging digital technologies such as AI, in the context of previous AI Winters and helped separate the hype from the real opportunities. According to Toby, AI has left the lab, and although there is much to be done before AI can even come close to human intelligence, the use of AI is rampant. Experts in areas such as physics, materials science, chemistry, biomedicine and many others are heavy users and the adoption of AI in business, government and education is accelerating. He explained this significant progress in terms of four exponentials: computational power, big data, advancements in models and algorithms, and billion-dollar investments from both large tech and venture capital.

Professor Chen elaborated on the pivotal role of research-industry partnerships for solving these grand challenges, with examples drawn from her award-winning work on water infrastructure and maintenance of ageing assets. She outlined the importance of deep engagement between computer scientists and domain experts in order to overcome socio-technical barriers to advancement of technologies that genuinely contribute to public good.

Dr McIver highlighted the role of education in creating the skill base for responsible and innovative technology development. Her points resonated with ATSE's Education Report on a STEM skilled future as she reiterated the need for a diversity of skills from digital literacy and awareness to specialise skills. She emphasised the need for radical creativity which can be achieved by ensuring tech design teams include representation from women, non-binary, Indigenous, mobility impaired and culturally diverse people. Linda explained that by involving the youngest members of our society, we can reimagine the way we approach technology design, and instead of current frustrating experiences, turn it into a glorious thing that brings great joy.

A robust Q&A discussion followed, that highlighted the critical role of human-centred design, deep challenges in data quality and the role of information resilience in overcoming those challenges, identification of many killer applications with a need to rethink our approach from being commercially driven to societal benefits, and the critical role of education, especially the empowerment of teachers to ensure that the future of technology will be a story of amplified potential.

Professor Shazia Sadiq
FTSE

Professor Shazia Sadiq FTSE has made lasting contributions to responsible and integrated solutions for effective information processes and data quality management. These contributions have substantially influenced international research activity in the field. She is a champion of trans-disciplinary work and through her foresight and capacity for collaboration, she has repeatedly encouraged and managed successful outcomes from diverse teams. Shazia is a keen proponent of ICT careers and has led and developed a range of programs such as national competitions and women-in-computing initiatives, which have engaged and benefited thousands of young people.

Advancing a sustainable future: Skills for net zero industries

Professor Lachlan Blackhall
FTSE

Professor Lachlan Blackhall FTSE is Entrepreneurial Fellow and Head, Battery Storage and Grid Integration Program at The Australian National University. Previously, Professor Blackhall led the development of capabilities to monitor, optimise and control residential solar generation and battery storage, as well as the development of virtual power plant technology to aggregate energy storage to deliver services to energy networks, markets and utilities.

It is now well understood that the consequences of anthropogenic climate change are an existential threat to humanity. Alarmingly, we are now regularly observing the impacts of anthropogenic climate change on the environment around us.

However, there remains hope that humanity will identify and enact the social, political, economic and technological transformation that will allow us to achieve our ambition of a sustainable, resilient and decarbonised future. The Advancing a Sustainable Future plenary session at the ACTIVATE Conference was all about what that future looks like, how we can get there and the skills that are needed to get there.

Whilst recognising the importance of energy transition in achieving a sustainable, resilient and decarbonised future, the panel felt that this topic was well covered in other plenary sessions. Instead, this session focused on broader technological opportunities, the importance of incorporating diverse knowledge systems, and the critical role of engaging with the community.

The panel discussed the important role that technology will play in realising our future ambitions. In particular, the panel discussed opportunities for innovation in materials and manufacturing, and the critical role of the broader software and innovation ecosystem. This discussion led naturally to identifying the importance of boosting education in the broad areas of STEM, digital and innovation.

Indigenous communities have been contributing to sustainability and resilience practices on country for millennia. Recognising these contributions, the panel emphasised the need to ensure that diverse knowledge systems are recognised when articulating our pathway to the future. Recognising diverse ways of knowing, being and doing are also vital to support diversity and inclusion more broadly. Fundamentally, if we are going to solve problems for all humanity, we need to ensure that all humanity can contribute to the solutions. This discussion also naturally led to a recognition that whilst STEM and technology skills are vital, the pathway to a sustainable, resilient and decarbonised future will also require broad skills in the social sciences and humanities.

The panel continually emphasised the importance of engaging with the community to inform pathways to a sustainable, resilient and decarbonised future that met the needs and expectations of the community. It was noted that the mechanisms for engaging with the community are diverse but that being able to engage is a critical skill that must be incorporated into STEM curricula.

Ultimately, the path to a sustainable, resilient and decarbonised future will not be easy but Australia can make significant contributions to realising this ambition globally through leveraging our diverse skills, capabilities and capacity.

The ATSE Awards 2022 gala dinner was held at Doltone House, Jones Bay Wharf in Sydney on Wednesday 25 October. Shown on the podium is Brendan Kerin, Metro Land Aboriginal Land Council (Metro LALC) giving the Welcome to Country.

ATSE Awards 2022 — winners

World-class innovators win Australia's top prizes for engineering, technology and applied science

Some of Australia's leading engineers and inventors have been recognised for building a better Australia through technological innovation. Solving sustainability problems, protecting healthcare providers from COVID-19, and using technology to train next-gen pilots are among the achievements of award-winning STEM innovators recognised at the Australian Academy of Technological Sciences and Engineering's (ATSE's) annual Awards.

Scientia Professor Veena Sahajwalla FTSE FAA won the Clunies Ross Innovation Award for her globally recognised waste transformation technologies. Professor Sahajwalla invented a patented Polymer Injection Technology known as Green Steel™ where waste rubber can be used instead of coke and coal, for a better, more environmentally sustainable steel making process. Professor Sahajwalla and her team are also commercialising their breakthrough MICROfactorieTM Technologies that transform diverse wastes – including textiles, glass and plastics – into products such as high-grade filaments for 3D printing and Green Ceramics for the built environment.

Clunies Ross Knowledge Commercialisation Award winners Professor Jason Monty and Dr Forbes McGain could see that intensive care workers were at great risk of COVID-19 exposure as early as March 2020, weeks, if not months, before many Australians began to feel the impact of the pandemic. Dr Forbes had the idea that a pram-like hood placed over the head and torso of a patient would contain the virus particles and limit its spread. The Medihood is the result of this unique collaboration between Professor Monty and Dr Forbes – combining their fluid dynamics expertise and intensive care ward experience. Infectious air is contained and filtered through the Medihood, providing a safe working environment for healthcare workers and protecting patients. The multi-award winning Medihood has created safer conditions in more than 145 hospitals across Australia and has been adopted internationally.

Professor Saeid Nahavandi FTSE won the Clunies Ross Entrepreneur of the Year Award for his exceptional work on the universal motion simulator – a two-story world-first haptically-enabled robot motion platform that functions as a vehicle and flight simulator. Allowing pilots, drivers, and other users to experience the full range of motion as part of virtual reality training, this technology has medical, engineering, military, and education applications.

Airport safety requires efficient approval for flights of all shapes and sizes, including an increasing amount of drone traffic. Batterham Medal for Engineering Excellence winner Dr Aaron McFadyen has developed air traffic management technology that helped drop approval times for drone flights from weeks to minutes, enabling the safe expansion of drone flight numbers over urban areas. Dr McFadyen worked closely with Airservices Australia and the Civil Aviation Safety Authority to create key enabling technology for an automated approval system for drone flights in the highly controlled airspace around airports.

Solar panels are an essential element of the transition to renewable energy and a net zero energy economy. Ezio Rizzardo Polymer Scholarship winner Jefferson Lam is a solar engineer taking cues from nature and the original solar energy harvesting experts – plants – to develop lightweight panels with better performance. Lam's polymer science and engineering mimics the structures of plants to create solar panels that can be deployed across Australia and the world at ultra-low cost.

One in five adults suffers from dry eye disease – a common condition that is difficult to diagnose. David and Valerie Solomon Award winner Associate Professor Laura Downie, an international leader in vision care, has co-invented a device that could revolutionise dry eye diagnosis. The Acoustically-Driven Microfluidic Extensional Rheometry (ADMiER) device enables subtype specific diagnosis from a patient's tear droplet, which means more well-informed treatment and better outcomes.

Australia's multi-billion-dollar seafood industry is threatened by seafood fraud and illegal fishing. To combat this, ICM Agrifood Award winner Dr Zoë Doubleday has combined her expertise in marine ecology and geochemistry to develop a method to trace the origins of seafood. This technology will increase consumer confidence in high quality seafood products from sustainable sources.

Every year Australia manufactures over 220,000 tonnes of milk powder to support the production of chocolate, ice cream and infant milk. ICM Agrifood Award winner and chemical engineer Dr George Chen found a 20 per cent energy saving by using the salty whey from cheese-making. Reducing the waste and energy use from milk powder manufacturing will increase sustainability in the dairy industry.

Australian Academy of Technological Sciences and Engineering (ATSE) President Hugh Bradlow said the award winners demonstrate the cutting-edge creativity of Australian innovators.

"Nominated by their peers, ATSE Award winners are tech and innovation game-changers at all career levels and show the breadth of Australian talent in the fields of engineering, technology and applied science," Professor Bradlow said.

"From innovating in the skies, where the best training is given to the next generation of our pilots, and drone flight monitoring is streamlined, to down under the sea, where we can trace the origins of our food to ensure sustainability and best practice approaches to fishing.

"These award winners demonstrate the potential of brilliant Australian R&D," said Professor Bradlow.

"As we move towards a net zero emissions future, their inventions are paving the way for increased solar panel efficiency and affordability to meet demand; and helping end waste by bringing new life to materials, and new approaches to sustainable resource processing and production."

Professor Hugh Bradlow also presented the inaugural ATSE President's Medal to Dr Joanne Daly PSM FTSE in recognition of her extraordinary commitment and exceptional contribution to the Academy.

Dr Daly has served as Chair of ATSE's Assembly and Chair of the ACT Division. As a member of the Agriculture and Food Forum, she has contributed to major policy reports on climate change and agricultural futures. Dr Daly is a champion for change in ATSE's governance and membership strategies, and her contributions have shaped ATSE for the better.

The ATSE Awards celebrate the outstanding achievement of Australians across five award categories, working in applied science, technology and engineering.

The prestigious annual ATSE Awards showcased the winners at a gala dinner on October 26 at Doltone House, Jones Bay Wharf in Sydney as part of ACTIVATE 2022.

ATSE Awards 2022 attendees














Winners

Jefferson Lam, Monash University, plant-to-panel solar engineer
Dr Zoë Doubleday, seafood safeguard specialist, University of South Australia
Dr Joanne Daly PSM FTSE, ATSE Change Champion
Professor Saeid Nahavandi FTSE, Deakin University, Haptic systems pioneer
Professor Jason Monty, University of Melbourne, COVID-19 healthcare game-changer

Dr Forbes McGain, Western Health, COVID-19 healthcare game-changer
Professor Veena Sahajwalla FAA FTSE, UNSW Sydney, Sustainable systems innovator,
Dr George Chen, University of Melbourne, Dairy Industry Innovator
Dr Aaron McFadyen, QUT, Drone automation accelerator

ATSE Awards 2022 — winners

CLUNIES ROSS INNOVATION AWARD

Professor Veena Sahajwalla

FAA FTSE

Sustainable systems innovator
University of New South Wales

Professor Veena Sahajwalla is known globally for inventing a patented Polymer Injection Technology known as Green Steel™ where coke and coal are partially substituted with waste rubber tyres in electric arc furnace steel making, not only delivering a more environmentally friendly outcome but improving and enhancing the steel making process.

Veena is the Director of the UNSW Sustainable Materials Research and Technology (SMaRT) Centre creating innovative solutions for the world's biggest waste challenges. The Centre is now doing its next generation of Green Steel research involving using additional waste resources usually destined for landfill, including coffee grounds and problematic plastics, as coke and coal alternatives that also contribute hydrogen to further enhance the steel production process.

Veena and SMaRT are also commercialising their breakthrough MICROfactorie™ Technologies transforming diverse wastes – including textiles, glass and plastics – into value-added products such as high-grade filaments for 3D printing and Green Ceramics for the built environment. MICROfactorie™. The ceramics technology was one of only ten innovations globally featured at UNESCO's 2020 Netexplo Forum.

A hallmark of Veena's stellar career has been her ability to collaborate with a wide range of industry, government and research partners, resulting in many breakthroughs that are fit for purpose and are being commercialised to meet real world challenges.

CLUNIES ROSS ENTREPRENEUR OF THE YEAR AWARD

Professor Saeid Nahavandi

FTSE

Haptic systems pioneer
Deakin University

Professor Saeid Nahavandi is recognised internationally for his work on intelligent systems and simulation technologies, including haptics. Haptic technology creates an experience of touch by applying forces, vibrations, or motion to the user.

Saeid's research has been translated into defence and civilian applications. He is particularly well known for his brainchild, the universal motion simulator, a world-first haptically-enabled robotic motion platform that functions as a vehicle or aircraft simulator for contested environments.

The simulator allows users to experience situations in their entirety, including full range of motion that can be adjusted to suit many forms of training that aren't possible in reality. Training using advanced virtual reality technology is useful for engineering, military, medicine, and education applications.

Saeid heads Deakin University's Institute for Intelligent Systems Research and Innovation. He consults to government, and civilian and defence industry in Australia, the USA, and Europe and has previously consulted to NASA and NATO.

Founded in 1959 to perpetuate the memory of Sir Ian Clunies Ross, the Ian Clunies Ross Memorial Foundation promoted the development of science and technology in Australia's beneficial interest. The Clunies Ross Foundation established the Clunies Ross National Science & Technology Award in 1991. In November 2002, the Foundation was brought under ATSE's umbrella, securing the long-term future of the Awards. The Foundation was disbanded in 2004 and the Awards are now administered by ATSE in three categories: Entrepreneur of the Year, Innovation, Knowledge Commercialisation.

CLUNIES ROSS KNOWLEDGE COMMERCIALISATION AWARD

Professor Jason Monty and Dr Forbes McGain

COVID-19 healthcare game-changers
University of Melbourne and Western Health

Associate Professor Forbes McGain is an intensive care physician and anaesthetist at Western Health. Professor Jason Monty is head of the University of Melbourne's Department of Mechanical Engineering and an expert on fluid dynamics, with specific expertise in aerosol transport.

In March 2020, Forbes contacted Jason asking for assistance in protecting the safety of healthcare workers attending to patients infected with COVID-19. Forbes' idea was for something like a pram's rain hood that could be placed over the head and torso of an infected patient to contain the virus particles.

The Medihood is the result of this unique collaboration. It protects healthcare workers and nearby patients from COVID-19, and other infectious respiratory diseases, by containing and filtering the infectious air expelled by a patient, while also improving patient outcomes.

Despite the timeframe of less than 12 months, the scientific rigour expected of high quality technological science and engineering research projects was maintained.

Forbes and Jason directed a team including colleagues from the University of Melbourne departments of Mechanical Engineering, Earth Sciences, and Infectious Diseases, along with medical, nursing, and physiotherapy specialists from Western Health, and additional experts from CSIRO's Oceans and Atmosphere team and the Doherty Institute for Infection and Immunity.

Melbourne-based flag manufacturer Evan Evans was appointed product development and commercialisation partner, convinced of the efficiencies it could achieve by re-purposing its flag-making technology to manufacture the Medihood.

The multi-award-winning Medihood is already being used in more than 145 hospitals around Australia and has also been adopted internationally.

BATTERHAM MEDAL FOR ENGINEERING EXCELLENCE

Dr Aaron McFadyen

Drone automation accelerator
Queensland University of Technology

Dr Aaron McFadyen is an early career researcher who has developed air traffic management technology enabling the safe expansion of drone flight numbers over urban areas.

The rapid expansion of the drone market required transformative change as the previous process for approving flights in controlled airspace was manual and could take weeks.

In close collaboration with authorities, Aaron led development of key technology now underpinning Australia's automated approval system for drone flights.

His focus on creating autonomous technologies that balance regulatory, safety, and commercial imperatives drew on his research innovation, aerospace engineering skills, and practical aviation experience as a pilot.

Aaron's game-changing technology has helped reduce drone flight approval times from weeks to minutes, saving operators and authorities hundreds of thousands of dollars while increasing opportunities for Australian industry.

The system focuses on drone use in highly controlled airspace around airports but it can be scaled up to cover all Australian airspace.

The Batterham Medal for Engineering Excellence is funded by the Group of Eight Deans of Engineering and Associates.

ICM AGRIFOOD AWARD

Dr Zoë Doubleday

Seafood safeguard specialist
University of South Australia

Dr Zoë Doubleday has used her combined expertise in marine ecology and geochemistry to develop a method to trace the provenance of seafood. Her aim is to help combat seafood fraud and illegal fishing; practices that threaten Australia's multi-billion-dollar seafood industry.

Seafood fraud occurs when consumers are deceived about where seafood has originated. Lesser quality seafood from areas with limited regulation is labelled falsely, enabling unsustainable fishing to flourish.

Zoë's technology measures the chemical composition of seafood's bones and shells. Certain chemicals are absorbed by marine animals as they develop, with levels differing depending on where the animal has lived. By comparing the seafood's chemical composition with chemical maps of the ocean, the industry can identify the waters from which that seafood has come. This unique method can be used for many marine species.

Zoë's work increases the integrity of the global seafood trade and provides greater confidence for consumers.

ICM AGRIFOOD AWARD

Dr George Chen

Dairy Industry Innovator
University of Melbourne

Dr George Chen is a chemical engineer specialising in membrane technology. He has led the development of several breakthrough techniques enabling the dairy industry to reduce waste and energy usage while enhancing sustainability and turnover.

One breakthrough has made milk powder production less energy intensive. Dairy powders are used in commercial baking and to manufacture chocolate, ice cream and infant milk. Australia manufactures more than 220,000 tonnes of milk powder a year. To produce the powder, however, significant energy levels have been required for water evaporation and drying.

George's team, in collaboration with the University of Surrey, discovered that a by-product of cheese-making (salty whey) can be used instead, more efficiently concentrating milk for powder production and reducing energy use by up to 20 per cent.

Collaborating with industry, George has successfully demonstrated the technical feasibility of several new technologies at bench and pilot scale, and evaluated their financial viability.

The ICM Agrifood Awards are sponsored by ICM Agribusiness, one of Australia's major agribusiness groups.

EZIO RIZZARDO POLYMER SCHOLARSHIP

Jefferson Lam

Plant-to-panel solar engineer
Monash University

Jefferson Lam is a PhD student engaged in developing the next generation of solar panels.

Technology has a history of taking cues from nature. Jefferson's vision of ubiquitous solar energy available at low cost inspired him to examine anew the solar energy harvesting systems of plants, developed over millennia.

His research proposal places polymer science and engineering at the forefront, replicating structures seen in plant biology and applying them onto polymers for use in lightweight solar panels.

Jefferson is intent on achieving an important step in the evolution of next-generation solar devices. He wants to contribute to a revolution in the development and widespread deployment of solar energy at ultra-low cost.

Jefferson has built a solid foundation for his continued work towards this vision. He has two STEM degrees, in materials engineering and chemistry, a strong grounding in polymer sciences and renewable energy, and three Dean's List awards.

The Ezio Rizzardo Polymer Sscholarship was made possible by a donation of funds from the CRC for polymers. Its Chair (Peter Coldrey) conceived of the idea, and it was very ably implemented by the CRC's CEO (Ian Dagley), who proposed it be named in honour of Ezio Rizzardo.

DAVID & VALERIE SOLOMON AWARD

Associate Professor Laura Downie

Vision health innovator
University of Melbourne

Associate Professor Laura Downie is recognised internationally for her leadership in evidence-based vision care, particularly in the area of dry eye disease for which she has engaged with leading international bodies, including the World Health Organisation (WHO).

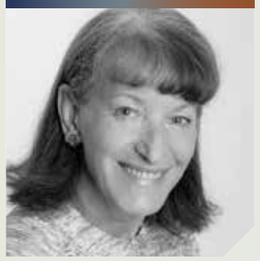
Dry eye disease is a common eye condition in developed countries, affecting about 20 per cent of adults. Accurate and early diagnosis is a major clinical challenge because many current tests are invasive, time-consuming and inaccurate.

Laura co-invented a device that has capacity to revolutionise dry eye diagnosis. The Acoustically-Driven Microfluidic Extensional Rheometry (ADMiER) device enables eye care practitioners to gently take a patient's tear droplet and test it immediately to determine if the patient has dry eye disease and, if so, which subtype.

Patients will benefit from enhanced diagnosis and more well-informed treatment, leading to improved outcomes. Laura received the 2019 American Academy of Optometry Foundation's Korb-Exford career development grant to support the ADMiER device's clinical validation. Laura is now leading a comprehensive cross-disciplinary development team to progress the technology towards clinical translation.

The David and Valerie Solomon Award honours David Solomon, who is a Foundation Fellow of ATSE and who has been supported in his career by his wife, Valerie. The award is made available through a generous donation from David and Valerie Solomon.

ATSE PRESIDENT'S MEDAL



Dr Joanne Daly

PSM FTSE

ATSE Change Champion

Professor Hugh Bradlow presented the inaugural ATSE President's Medal to Dr Joanne Daly PSM FTSE in recognition of her extraordinary commitment and exceptional contribution to the Academy.

Dr Daly has served as Chair of ATSE's Assembly and Chair of the ACT Division. As a member of the Agriculture and Food Forum, she has contributed to major policy reports on climate change and agricultural futures. Dr Daly is a champion for change in ATSE's governance and membership strategies, and her contributions have shaped ATSE for the better.

Movers & shakers


1. Alexander (Jack) McLean


2. Joanne Daly


3. Veena Sahajwalla


4. Saeid Nahavandi


5. Wei Zhang


6. Andre Luiten


7. Benjamin Eggleton


8. Martin Green


9. Hala Zreiqat


10. Anna Lavelle

1. Alexander (Jack) McLean
Professor Alexander (Jack) McLean AO FTSE has been recognised with the Officer of the Order of Australia in the Australia Day 2023 honours for his distinguished service in the field of road safety.

2. Joanne Daly
Dr Joanne Daly PSM FTSE received the inaugural ATSE President's Medal.

3. Veena Sahajwalla
Professor Veena Sahajwalla FAA FTSE received the 2022 ATSE Clunies Ross Innovation Award. Veena Sahajwalla

The Professor also joined the panel on the new ABC show India Now, talking about world and India affairs, sustainability and how various UNSW SMaRT Centre innovations can deliver the technology needed so waste can be used as a resource of raw materials.

She has been named one of The Australian's Top 100 Innovators of 2022.

And Professor Sahajwalla has also been awarded the 2022 Celestino Eureka Prize for Promoting Understanding of Science.

4. Saeid Nahavandi
Professor Saeid Nahavandi FTSE received the 2022 ATSE Clunies Ross Entrepreneur of the Year Award.

Professor Nahavandi was named Professional Engineer of the Year by Engineers Australia in recognition of his work on world-first haptically-enabled robotic and virtual-reality systems for real-world application.

5. Wei Zhang
The Marine Bioproducts Cooperative Research Centre (CMBD) has won the 2022 SA Science Excellence and Innovation Award for Excellence in Science and Industry Collaboration. Professor Wei Zhang FTSE is the Research Director for the CMBD, working collaboratively with South Australian industry to transform sustainable materials into high-value products such as medicines, biodegradable plastics, bio-inks, nutrition drinks, and eco-friendly fertilisers.

6. Andre Luiten
Professor Andre Luiten FTSE has been named Innovator of the Year at the South Australia Science Excellence and Innovation Awards for his leading work and strategic leadership to help shape South Australia as a hub for photonics and quantum innovation.

7. Benjamin Eggleton
Professor Benjamin Eggleton FTSE FAA has been appointed as Pro-Vice-Chancellor (Research) at the University of Sydney.

8. Martin Green
Scientia Professor Martin Green AM FRS FTSE FAA has won the prestigious Millennium Technology Prize.

9. Hala Zreiqat
Professor Hala Zreiqat AM FTSE FAA FAHMS has received the TAKREEM Science & Technology Achievement Award.

Professor Zreiqat has been conferred as a Fellow of the International Association of Advanced Materials, in recognition of her contribution to Biomedical Applications.

10. Anna Lavelle
Dr Anna Lavelle FTSE has been inducted into the 2022 Victorian Honour Roll of Women.


11. Ranjith Pathegama Gamage


12. Doreen Thomas


13. German Spangenberg


14. Salah Sukkarieh


15. Chennupati Jagadish


16. Louise Adams


17. Kadambot Siddique


18. Yi Min 'Mike' Xie


19. Marlene Kanga


20. Sue Barrell


21. Michelle Simmons


22. John Anderson


23. Anne Green


24. Tanya Monro


25. Suresh Bhargava

11. Ranjith Pathegama Gamage
Professor Ranjith Pathegama Gamage FTSE has been elected as a Foreign fellow of Indian National Academy of Engineering

12. Doreen Thomas
Professor Doreen Thomas AM FTSE has been named as an Honorary Fellow of Engineers Australia.

13. German Spangenberg
Professor German Spangenberg PSM FTSE has been appointed an Emeritus Professor by La Trobe University.

14. Salah Sukkarieh
Professor Salah Sukkarieh FTSE has won the CAETS Communication Prize for a video which showcases smart farming robotics which improves business outcomes, food quality and environmental sustainability.

15. Chennupati Jagadish
Distinguished Professor Chennupati Jagadish AC FTSE FREng PresAA has been elected as an International Fellow of UK's Royal Academy of Engineering.

16. Louise Adams
Louise Adams FTSE received the Women in Industry Excellence in Engineering award for her leadership in engineering, technological excellence and innovation at Aurecon.

17. Kadambot Siddique
Professor Kadambot Siddique AM FTSE received the Life time Achievement in PGPR Research & Development Award at the 7th Asian PGPR International Conference for Sustainable Agriculture.

Professor Siddique has been named as a Premier's Science Awards finalist for Scientist of the Year.

18. Yi Min 'Mike' Xie
Distinguished Professor Yi Min 'Mike' Xie AM FTSE received the Sir John Holland Civil Engineer of the Year Award at the annual Engineers Australia Excellence Awards ceremony.

19. Marlene Kanga
Dr Marlene Kanga AO FTSE has been appointed as an inaugural Fellow of the International Science Council for her remarkable contributions to furthering understanding of and engagement with science.

20. Sue Barrell
Dr Sue Barrell AO FTSE has been named as the laureate of the IMO prize for her leadership of the international weather, water and climate community and for a career of commitment to the World Meteorological Organization.

21. Michelle Simmons
Professor Michelle Simmons AO FRS FAA FRSN FTSE has lead a team to engineer a quantum processor at the atomic scale to simulate the behaviour of a small organic molecule, a major milestone in the race to build the world's first quantum computer.

22. John Anderson
23. Anne Green
24. Tanya Monro
19. Marlene Kanga
25. Suresh Bhargava
26. Timothy Reeves
Six ATSE Fellows have been named in the 2022 Queen's Birthday Honours list:
John Anderson AC FTSE
Anne Green AC FTSE
Tanya Monro AC FTSE
Marlene Kanga AO FTSE
Suresh Bhargava AM FTSE
Timothy Reeves AM FTSE


26. Timothy Reeves


27. Sally McArthur


28. Emma Johnston


29. Peter Langridge


30. Peter Høj


31. Craig Simmons


32. Romilly Madew


33. Paul Wood

27. Sally McArthur
Biomedical engineering researcher Professor Sally McArthur FTSE has been named the new Director of Deakin University's Institute for Frontier Materials.

28. Emma Johnston
29. Peter Langridge
30. Peter Høj
31. Craig Simmons
Professor Emma Johnston FTSE FAA, Professor Peter Langridge FTSE FAA, Professor Peter Høj FTSE FAA and Professor Craig Simmons FTSE FAA have been elected as Fellows of the Australian Academy of Science.

32. Romilly Madew
Romilly Madew AO FTSE named as the new CEO of Engineers Australia.

33. Paul Wood
Professor Paul Wood AO FTSE was awarded the 2022 Eureka Prize for Outstanding Mentor of Young Researchers.

Paul is a co-founder of ATSE's industry engagement and mentoring program IMNIS and is on the IMNIS Expert Advisory Panel.

VALE

Dr Mick Poole FTSE

Mick Poole passed away peacefully on Sunday 4 September 2022 aged 79 after a 5-month battle with painful cancer. Mick's career in CSIRO followed a successful career with the Department of Agriculture in Western Australia. After retirement from CSIRO he held positions at the University of Western Australia, the WA Biodiversity Science Institute and Swan River Trust.

Mick graduated in Agricultural Science from the University of Western Australia in 1964, sponsored by the cadetship programme of the West Australian Department of Agriculture (WADA, now Department of Primary Industries and Regional Development).

He held positions as leader of various research teams, as Ministerial adviser, Director of Enterprise Development, and then Executive Director of Plant Industries, until leaving in 1994 to take up a new position in CSIRO.

Mick was appointed to CSIRO as Executive Chair of the Centre for Environment and Life Sciences (formerly Laboratory for Rural Research) that included staff from the Divisions of Animal Production, Entomology, Forestry, Plant Industry and Soils. He also served as Merger Chair of CSIRO Land and Water and a Program Leader for the Division of Plant Industry. As in WADA, Mick brought scientists and industry to work together to focus on issues of regional and national importance. For example, he brought together scientists and farmers to improve the production of crops, particularly wheat, for the high-rainfall zone of WA in a project funded by the Grains Research and Development Corporation (GRDC).

Mick's contributions to agriculture have been recognised with the awards of Urrbrae Medal, Farrer Medal, Centenary Medal and Member (AM) of the Order of Australia. Mick was a Fellow of the Agricultural Institute of Australia (FAIAS) and became a Fellow of ATSE in 1999. During his time he was an active member of the ATSE WA Division and Agriculture Forum. Mick was an active member of our Academy and we are sincerely grateful for his involvement.

Professor Robert Buchanan (Alex) FTSE

Alex was elected as a Fellow of our Academy in 1985, and during his time he was an active member of our ATSE Council from 1996 to 1999. He was Executive Director of the Crawford Fund from 1995 to 1999. He was also a member of the ATSE Membership Committee and Agriculture Forum. Alex was an active member of our Academy, and we are sincerely grateful for his involvement.

Alex had a distinguished career in the dairy industry and CSIRO, and achieved spectacular success in promoting cooperation between applied scientists in SE Asia under the umbrella of the ASEAN-Australia Economic Cooperation Program. In 2003, Alex received the Australian Government's Centenary Medal 'for service to Australian society in food science and technology'. He then received the Member of the Order of Australia (AM) in 2009 for service to food science and technology, particularly through research supporting aid programs in the South-East Asia region, and to the community.

From a report on his honour, it was noted that his research led to improvements in food production to support developing nations and emergency relief activities

Among Alex's accomplishments were the development of the Australian milk biscuit, a high-protein biscuit used by the Australian government and many Rotary clubs for emergency food aid, and the creation of affordable, nutritionally balanced infant food for health centres in Thailand. Alex also helped implement the first successful cooperative food research projects between Australia and the Association of South-East Asian Nations.

A devoted Rotarian, Alex helped to manage Rotary's Royce and Jean Abbey Endowment Fund and had been awarded the 2008–09 Rotary Foundation Global Alumni Service to Humanity Award. The award was created to honour outstanding former foundation program participants whose extraordinary service to humanity and professional achievements exemplify the Rotary ideal of 'service above self'.

Emeritus Professor Chris Fell AO FTSE

Chris was elected as a Fellow of our Academy in 1988, and during his time he was an active member of ATSE. He was Honorary Secretary for a year and also a member of the NSW division. Chris was also a member of our Education, Energy and Water Forums. Chris collaborated on many of ATSE papers and submissions and attended numerous events. Chris was a very active member of our Academy, and we are sincerely grateful for his involvement.

In addition to being Chair of the NCRIS Australian National Fabrication Facility (ANFF), and a member of the NSW Government Independent Planning Authority, Professor Fell was also active in technology and engineering in many professional networks. He was a former Dean of Engineering and Deputy Vice Chancellor (Research and International) at UNSW Sydney and is widely known for his pioneering research into the development of low-pressure membrane processes for water treatment and chemical handling.

Chris Fell was elected as a Fellow of the Royal Society of New South Wales in 2015. He was recognised for his services to science and engineering through various Australian Honours, being made a Member of the Order of Australia (AM) in 2003, awarded the Centenary Medal in 2001, and most recently made an Officer of the Order of Australia (AO) in 2021 for distinguished service to science and engineering, particularly to nanotechnology research and fabrication, and to professional networks. He was a strong supporter of young researchers through his sponsorship of student research prizes.

Emeritus Professor Robin King FTSE

Emeritus Professor Robin King was a leader in Australia's engineering education sector, having held senior national positions with Engineers Australia, the Australian Council of Engineering Deans, as well as in several universities. Prior to his retirement, he was the Pro Vice-Chancellor and Dean of the Division of Information Technology, Engineering and the Environment at the University of South Australia, a position he held from 1997–2007. Before joining UniSA, he was an Associate Professor in Electrical Engineering at the University of Sydney (1989–1996), a Senior Lecturer at UNSW (1985–1989), and a Lecturer at the University of Southampton (1976–1985) and the University of Technology in Lae, Papua New Guinea (1972–1976).

In recognition of his contributions, Professor King was elected as a Fellow of the Australian Academy of Technological Sciences and Engineering in 2011. He quickly became a central figure in the New South Wales Division and nationally through ATSE's governance. He recently served as Secretary of the NSW Division and contributed significant time and expertise to ATSE's policy Forums including the Digital Futures, Education, Energy and Health Forums, which are working to address Australia's most urgent challenges.

He was also a Fellow of the Royal Society and a member of numerous professional organisations.

Professor King was admired by his colleagues for his intelligence, wit, and kind nature.

He will be deeply missed by those who knew him and his contributions as an ATSE Fellow, his passion and expertise across the engineering sector will not be forgotten.

Professor King, and his wife Penny passed away in a tragic accident on Monday 25 July 2022. Both Robin and Penny joined numerous ATSE activities and were held dear by so many of the Academy's Fellows.

Dr William (Bill) Roderick Blevin AM FTSE FAA

Dr Bill Blevin was elected to the Academy in 1983 for his contributions to precision metrology in the fields of optical radiometry and photometry. His research greatly increased the accuracy attainable in measurements of radiant power.

Dr Blevin studied physics at New England University College. He joined CSIRO's Division of Physics in 1953, where he worked for 42 years, including as Chief Standards Scientist and Chief of Division. Dr Blevin received his DSc from the University of New England (UNE) in 1972 and in 1993 he was awarded the UNE Distinguished Alumni Award.

Dr Blevin was elected a Fellow of the Academy of Science in 1985 and was also a Fellow of the Australian Institute of Physics and the UK's Institute of Physics. He received the Academy's Lloyd Rees Lecture and the Matthew Flinders Medal and Lecture in 1996. He was made a Member of the Order of Australia in 1989 and received the Centenary Medal in 2001.

Professor Anthony (Tony) Vernon Bradshaw FTSE

Anthony (Tony) Vernon Bradshaw was the Chief of the Commonwealth Scientific and Industrial Research Centre (CSIRO)'s division of Process Technology from 1975 - 1980 and its predecessor division, the division of Fossil Fuels from 1980 - 1983. Prior to his role in Australia, Anthony Vernon Bradshaw was based in England and assisted in the formation of the John Percy Research Group in Process Metallurgy in 1965.

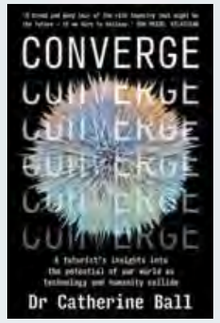
Tony joined the ATSE Fellowship in 1977 and was a valued member of the ATSE family. Tony was a member of the ATSE Council from 1980 to 1983, an Honorary Secretary of the NSW division for 1982 and 1983 and was a member for many years. In 2014 he was a member of the Membership committee.

Tony passed away peacefully in Sydney after a brief illness. Much loved husband of Pat, stepfather to Val and John, step grandfather to Dean, Belinda and Carmen, and cousin of Peter.

Tony was a special man - intelligent, humorous, generous and compassionate - and he will be greatly missed.

What we're reading

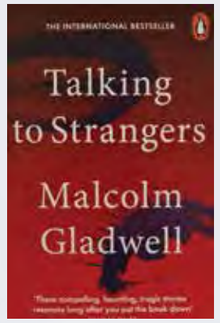
On the hunt for an intriguing read? We asked some of Australia's leading scientists, technologists and engineers for book recommendations.



Dr Dimity Dornan
AO FTSE
Founder, Chair and Board Director, Bionics Queensland

Converge
Dr Catherine Ball

Dr Catherine Ball has envisioned the future for our 'Children of Tomorrow'. A leading scientific futurist and tech influencer, she has combined her considerable understanding of current technologies with predictions of where they are heading, and how these will shape our future. Dr Ball is global visioneer to the XPRIZE, an advisor to the Schmidt Ocean Institute and an Associate Professor at Australian National University. Adept at interesting young people in STEM, Dr Ball is a staunch advocate for women in science and technology. She is the founder of the highly popular World of Drones conference. I would recommend this book to everyone who cares about inspiring a generation of technologists and creating a wonderful future for all mankind.



Professor Cordelia Selomulya
FTSE
Professor, School of Chemical Engineering and Associate Dean of Research, Faculty of Engineering, UNSW

Talking to Strangers
Malcolm Gladwell

I highly recommend getting the audiobook version as an immersive exercise on the message, which is partly about active listening and leaving preconceptions behind when interacting with strangers! Gladwell employs his extensive experience in running a successful podcast series (Revisionist History) to craft an engaging story-telling, touching on contemporary topics (the death of Sandra Bland, the trial of Amanda Knox, the Stanford rape case, etc) and historical case studies. Original audio clips, interspersed with re-enactments, are used to present his argument on why things unfolded the way they were. You may not be in complete agreement with all his takes, but it does offer interesting insights into how one may misconstrue another's intent by ignoring context – social, cultural, or others, which can lead to devastating outcomes.

Professor Saeid Nahavandi
FTSE
Haptic systems pioneer, Deakin University

The Last Train To London
Meg Waite Clayton

Each person has a story of their 'Last Train'. I was drawn by this book, taking me back in time to when I lived in the UK. In early December 1979, I needed to be in London for an early morning appointment. I lived in Nottingham and, being young, adventurous, more often listening to your heart than brain and, above all, believing fear has little room in one's life, I decided to take the last train to London, spend time around London walking and exploring the city as it looks during the night with less traffic, to kill time until dawn, have my favourite English breakfast tea and a roll and then be on my way for my appointment. Then again, it was not as simple as I thought it would be!! I have read this book and viewed it from various lenses and very much admire bravery in people who go out of their way to help others. After all, nothing in life can be more satisfying than that.

Dr Katherine Woodthorpe
AO FTSE FAICD
ATSE President

Girt
David Hunt

A hilarious yet informative synopsis of Australian history which doesn't paper over just how appalling the first British colonists were, but it will still have you laughing out loud.

The Pilbara

The Pilbara as imaged by Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER)

The Pilbara in northwestern Australia exposes some of the oldest rocks on Earth, over 3.6 billion years old. The iron-rich rocks formed before the presence of atmospheric oxygen, and life itself. Found upon these rocks are 3.45 billion-year-old fossil stromatolites, colonies of microbial cyanobacteria.

This image is a composite of ASTER bands 4-2-1 and was acquired on 12 October 2004. It covers an area of roughly 50km square and is located at 22.8 degrees south, 117.6 degrees east. ASTER is one of five Earth-observing instruments launched in 1999 and was built by Japan's Ministry of Economy, Trade and Industry. ASTER provides scientists in numerous disciplines with critical information for surface mapping and monitoring of dynamic conditions and temporal change. Example applications are monitoring glaciers, volcanoes, wetlands and coral reefs; identifying crop stress; determining cloud morphology; thermal pollution; surface temperature mapping of soils and geology; and measuring surface heat balance.

http://asterweb.jpl.nasa.gov/

CREDIT: NASA/METI/AIST/Japan Space Systems, and U.S./Japan ASTER Science Team

SOURCE: NASA's Jet Propulsion Laboratory at the California Institute of Technology.
https://www.jpl.nasa.gov/images/pia25122-pilbara-nw-australia

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