

The logo consists of a white triangle pointing downwards, containing the letters 'ATSE' in orange. This triangle is positioned on an orange background that tapers to a point on the left side of the top edge of the cover.

ATSE

The background of the cover is a photograph of a large, circular, ribbed dome structure, likely the interior of a large stadium or arena. The dome's ribs are dark and create a complex, repeating geometric pattern. In the foreground, a brick wall with several windows is visible, extending from the right side towards the center. The overall lighting is bright, suggesting a high-ceilinged interior space.

Australian Academy of
Technology & Engineering

Annual Review
2018—2019

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Professor Hugh Bradlow FTSE
President

Our 2017-2020 Strategy Plan covers eight important areas. Since strategy is ultimately about directional change, here I want to focus on three of our top priorities that are different from “business as usual”:

1. amplifying impact
2. diversity and inclusion
3. preparing Australia for a future of disruptive technological change.

The most contentious of these, amplifying impact, is still a work in progress. The brand refresh generated a lot of debate, and has since been finessed to encompass a range of Fellows views. ATSE’s brand now balances our rich, ongoing history with a bold visual identity and a 21st century web presence.

This ongoing process has generated the most engagement across the Fellowship I’ve seen in my 28 years as a Fellow. We have also made massive strides in our communications over 2018-2019. In particular, we significantly improved our media presence.

We can also be proud of our achievements in Diversity and Inclusion. Forty-four per cent of our 2018 new Fellows were women, a huge stride towards our goal of an equal gender balance among new Fellows by 2025. That said, our missed goal

of electing 40 per cent of new Fellows from industry and government will need more focus in future years.

Membership isn’t the only area where we’re achieving results in diversity. The Science in Australia Gender Equity (SAGE) program, a partnership between ATSE and the Academy of Science, awarded the first Athena Swan Bronze Awards to a cohort of institutions. And the Women in STEM Decadal Plan, another collaboration with the Academy of Science, is encouraging diversity and inclusion across STEM sectors.

We’re also proud of our Industry Mentoring Network in STEM (IMNIS) initiative, which breaks down barriers between industry and academia by equipping post graduate students with the knowledge, skills and connections for industry careers. The number of mentees participating in IMNIS increased from 407 in June 2018 to 642 in June 2019.

In terms of the third challenge, technology readiness, we’re developing a roadmap to help industries integrate emerging tech to Australia’s advantage. This Learned Academies Special Project (LASP) is funded by the Australian Research Council.

The first of our three reports for this project is on the transport sector.

We launched *Shifting gears – Preparing for a Transport Revolution* in April 2019 at a Melbourne event hosted by the Committee for the Economic Development of Australia.

The report generated substantial media and social media coverage and subsequent opportunities to present its recommendations to government and to transport-related conferences. Work has begun on the second report which will examine the readiness of the health services to adopt new technologies.

I would like to thank the many Fellows who have made invaluable contributions this year – whether as Board members, members of Assembly or Division committees, Forum leaders or contributors, or as members of Expert Working Groups like the technology readiness group.

Finally, I must thank our CEO and her team. It is particularly important that we recognise the role played by our CEO, Dr Margaret Hartley FTSE, who is leaving us at the end of 2019.

In leading the Academy over the past 11 years, Margaret has shaped the organisation into a professional enterprise and has put us in good shape both financially and in terms of our contribution to society.

We wish her all the best for her future.



Dr Margaret Hartley FTSE
Chief Executive Officer

The Academy had a fruitful year, exploring the big issues to provide practical advice for policy and decision-makers.

Focusing on topics in line with our Strategy Plan 2017–2020, the Academy published two major reports on technology readiness in the transport sector, and on digital futures along with four position statements and one action statement.

During the reporting year, the Academy made 10 formal submissions to government inquiries, drawing on the expertise of Forum leaders and the broader Fellowship.

Fellows continued to be involved across the Academy’s work, directly contributing to policy and international projects, committees, working groups or Forums, and Division activities. I thank them for their generous gift of time and expertise to the Academy.

I’m enormously proud that we are making progress in delivering on

our Diversity and Inclusion Policy. In 2018, 44 per cent of new Fellows were women – above the short-term 40 per cent target and approaching our target of 50 per cent by 2025.

We once again delivered unconscious bias training to all members of the Board and Assembly, as well as to staff. This year, we achieved another milestone, electing our first female Foreign Fellow, Kiran Mazumdar-Shaw FTSE, Chairperson and Managing Director of Biocon Limited (India).

Our commitment to international engagement is as strong as ever, including our stewardship of the Global Connections Fund, our membership of CAETS (now with a Board position), the exchange program we ran with China, and our ongoing engagement with our sister academies in Germany, China, Japan, South Korea, UK and NZ.

In November 2018 we launched a new public-facing website, with a fresh look and enhanced content. Our public newsletter, #TechKnow, and our growing podcast library are also contributing to taking Fellows’ expertise and insights to a wider public audience.

This reporting year has seen the Academy strengthen its position on a number of fronts, including another solid financial performance that enables us to undertake the policy development work which drives our mission.

I take this opportunity to thank the Board and its committees, the Fellows and staff, without whom none of this would have been possible.

It has been an honour to serve as CEO of the Academy for the past 11 years.

Transforming transport

Evidence-based policy research is at the heart of the Academy's mission. That's why we produced the report *Shifting Gears — Preparing for Australia's Transport Revolution*.

Technology change, globalisation and demographics will create a set of major opportunities and challenges for Australian business and society. Australia will require an inspirational policy vision to remain a leading society and economy by the end of the next decade.

That is why understanding Australia's readiness to adopt and adapt new technologies, and making recommendations about how to do so, is central to the Academy's strategy.

As a consequence, the Academy published a major report identifying sustainability and climate change, productivity and health as the three key challenges that will need to be addressed within the transport sector over the next decade.

Specifically, the transport sector will need to lower emissions, improve the efficient movement of people and freight and reduce transport-related deaths and serious injuries.

The deployment of connected and autonomous vehicles, low and zero-emission vehicles, high-frequency mass transport and intelligent transport systems are potential solutions to these challenges.

The report is a result of the Academy undertaking a major three-year (2018–2020) Australian Research Council Learned Academies Special Projects-funded research project to examine the readiness of different Australian industry sectors to develop, adapt and adopt new and emerging technologies, with a horizon out to 2030.

The transport sector is the first industry sector to be examined by the project. Work has begun on the second sector, health.

IMPACT

The report was launched at an event hosted by the Melbourne branch of the Committee for Economic Development of Australia (CEDA), in front of dozens of industry, research and government leaders.



Media coverage of the report included a front-page story in *The Advertiser* (Adelaide) and online coverage throughout News Corp's metropolitan network.

The *Sydney Morning Herald* published an opinion piece by the Academy President, which was reprinted in other Nine (formerly Fairfax) papers and carried online throughout Nine's metropolitan network.

The Executive Director, Policy, was interviewed on Sky TV news.

A 45-second video was published by the Academy on Twitter and LinkedIn, where it reached 35,000 people. Tens of thousands more viewed it on News Corp sites.



Read the report online
atse.org.au/transport



Our transport video reached more than 35,000 people on Twitter & LinkedIn. It also featured on the NewsCorp site which increased the reach exponentially. Other media coverage included articles in *The Advertiser* and the *Sydney Morning Herald*.



Informing decision makers

The Academy delivers trusted, evidence-based advice to Government to encourage policy that supports the implementation of technology for all Australians.

Connecting to the Minister

The Hon Karen Andrews MP, Minister for Science, Industry and Technology, spoke at the Academy's Innovation and Excellence Awards event. The Academy President; CEO; and Executive Director, Policy, have had a subsequent meeting with the Minister, who also launched the newly funded regional Queensland IMNIS program.

Victorian Parliament Seminars

The Academy organised a series of seminars to MPs at the Victorian Parliamentary Library. Fellows presented on subjects including autonomous vehicles, biomedical innovations and energy storage.

Election Priorities

In the lead up to the 2019 election the Academy released an agenda covering six science and technology priority themes to guide the next Federal Government. The priorities were:

Climate change and sustainability

- Energy: Urgently accelerate Australia's transition to low-emission energy generation.
- Water: Work with the states and territories to develop a new decadal strategy for national water management.
- Agriculture: Drive change in agricultural practices to reduce greenhouse emissions intensity and increase net carbon sequestration in the land sector.

Health technology

- Redesign the healthcare compensation system to encourage preventative technology.
- Incentivise uptake of in-home technology and services for the aged.
- Incentivise the use of My Health Record.

Privacy and data security

- Enact data protection legislation that ensures consumer privacy.
- Ensure that data access laws balance the needs of law enforcement agencies, technology investment and citizens.

Science, technology, engineering and mathematics (STEM) education

- Ensure high-quality, discipline-specific teacher training in STEM subjects.
- Phase out out-of-field teaching of STEM subjects in years 7 to 10.
- Invest \$20 million to give all schools access to STELR.
- Ensure that school education encompasses both STEM and humanities disciplines.

Transport infrastructure

- Support a transition to low-emission vehicles.
- Support the adoption of cooperative intelligent vehicles.

Diversity and inclusion

- Implement policy to overcome factors that discourage girls from studying STEM.
- Develop a national gender equity framework for SMEs.
- Incentivise gender equity in STEM businesses.

We continue to identify and advocate best-practice technology adoption, utilisation and invention for economic and social benefit.



SYMPOSLIA

ENERGY
Energy Markets
– The Consumer Perspective
Sydney October 2018

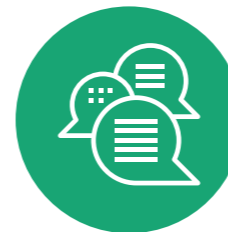
HEALTH
Big Data and Genomics
– The Future of Health
Sydney September 2018

CYBERSECURITY
Cyberwarfare
Brisbane March 2019



ASSEMBLIES

Assembly 21
Assembly 22
Addressing STEM Education Issues



ELECTION STATEMENT

Input from the Board
and all Forum chairs
April 2019



POLICY & ACTION STATEMENTS

Released by the following Forums:
Agriculture, Digital Futures, Education,
Energy, Industry & Innovation, Mineral
Resources and Water.



SUBMISSIONS & BRIEFINGS

Key topics:
GM moratorium
AI Ethics Commission
National Hydrogen Strategy
Automated Mass Transit
National Energy Guarantee
NSW Curriculum Review
Medical Research



PROJECTS & ACTIONS

The Policy team and Fellows have
contributed to discussions on:
Carbon Neutral Farms
STEM Schools Heatmap
Industry Engagement Scorecard
LASP Nexus Projects
Water Management National
Decadal Plan

RESEARCH-INDUSTRY COLLABORATION

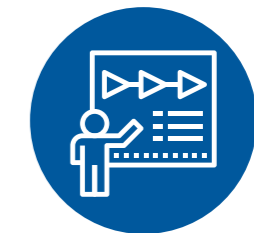
INNOVATION METRICS REVIEW

The Academy was commissioned by the Federal Government to create a Conceptual Framework and literature review of measuring innovation



Academy Expert Working Group

Two workshops
December 2018
January 2019



Conceptual Framework designed

December 2018



International workshop

Canberra March 2019



Literature review

June 2019

Policy & submissions

We apply our expertise to solve the big issues facing our nation in a fast-changing world, contributing robust and practical thinking to Australia's debates.

Australian and New Zealand Standard Research Classification (ANZSRC) Review 2019

The Academy recommended several specific changes to the classification system that measures and analyses research and development in Australia and New Zealand.

Artificial Intelligence: Australia's Ethics Framework Discussion Paper

The Academy urged the Federal Government to create an AI advisory panel with a broad range of stakeholders to ensure AI technologies are ethically implemented.

Implementation of the National Science and Research Priorities under the National Competitive Grants Program

The Academy supported setting national priorities for our research and developing efforts to better translate research into real-world outcomes.

Input into the Australian Renewable Energy Agency's Investment Priorities

The Academy agreed with ARENA's proposals to shift its areas of focus, but cautioned that these needed to be more specific if they were to make a practical difference.

Response to the COAG Energy Council National Hydrogen Strategy Discussion Paper

The Academy proposed that if hydrogen was to play a significant role in reducing emissions it should be produced with electrolysis powered by renewable energy resources.

Submission to the Review of Tasmania's Genetically Modified Organisms (GMO) Moratorium

The Academy suggested Tasmania lift its GMO Moratorium for the benefit of the economy and environment.

Digital Technologies: Australian Developments

The Academy presented a series of expert statements on the current status of digital technology research and application in this country.

Connect Globally for the Benefit of Australia

The Academy argued that international research and innovation partnerships open Australia's access to world-leading expertise, infrastructure, markets, investment and funding programs.

Submission to the NSW Education Standards Authority (NESA) NSW Curriculum Review

The Academy warned that Australia was failing to encourage enough school students to take senior STEM subjects, even though these skills will underpin our future health and prosperity.

Submission to the Inquiry into Funding Australia's Research

The Academy advocated for more, more targeted, and less fragmented funding for basic, strategic and applied research in Australia.

Department of Foreign Affairs and Trade Soft Power Review

The Academy proposed that Australia needs to embrace technology change and the disruption it will bring to secure our economic future, societal fabric and influence in the region.

Australia's response to climate change

The Academy urged Australia to use government policy to encourage investment in available renewable technologies, and adopt and advance new innovations, in order to mitigate and adapt to climate change.

Embracing Australia's Digital Futures

The Academy counselled that priority must be given to preparing Australian industry and society to be leaders and fast followers in the emergence and development of digital futures.

Research & Development Tax Incentive Amendments

The Academy believed the R&D Tax Incentive should offer a premium rate for research and development undertaken with Australian publicly funded research organisations to drive greater collaboration and wider benefits.

Positioning Australia as a Leading Digital Nation

The Academy encouraged Australia to ensure its digital future by leading the development of digital technology and its application in business, industry, government and society.

Submission to the Independent Review of the South Australian Moratorium on the Cultivation of Genetically Modified Food Crops

The Academy advised that advanced precision gene editing technologies could improve drought and disease resistance, reduce the use of fertilisers, herbicides and pesticides, and improve nutrition.

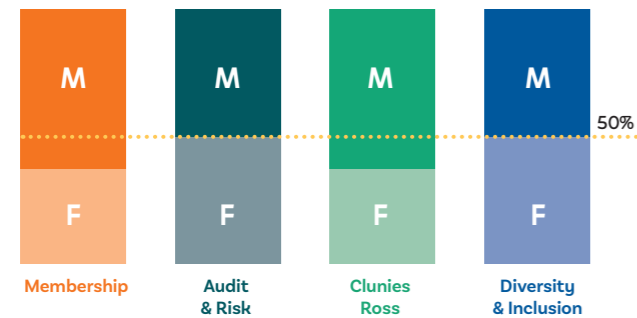
All submissions can be read online. atse.org.au

Diversity & Inclusion

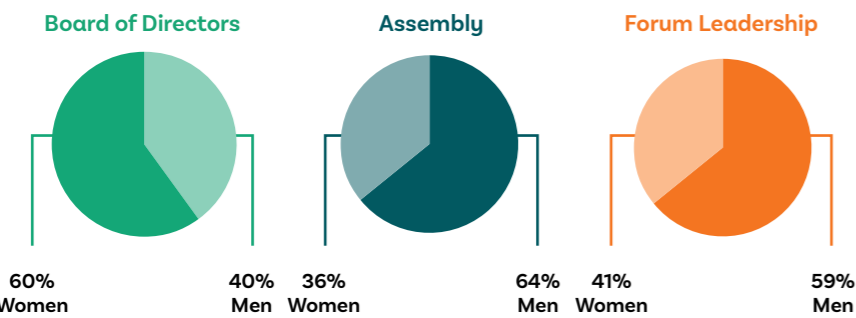
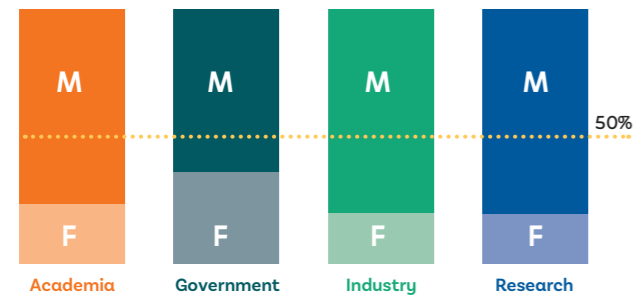
The Academy is committed to greater action around diversity and inclusion.

We have set gender targets for the Board, committees and the Fellowship. Our future diversity priorities include age, Indigenous Australians and ethnicity in STEM.

Board Committees % of women



Fellows by sector % of women



44% of Fellows elected were women

This is our highest proportion ever and in excess of the Academy's 40% target for this year.



First foreign female Fellow elected

COMMITMENT
The Academy will not support nor participate in any national or international activities where the organising body has no gender equity policy or where women are not reasonably and meaningfully represented among speakers and panellists.

OTHER DIVERSITY & INCLUSION ACTION BY THE ACADEMY

FELLOWSHIP TARGETS SET
A target of 50% of new Fellows to be women has been set for 2025.

MITIGATING UNCONSCIOUS BIAS
Training was given to the Board, new Assembly members and staff.

ACKNOWLEDGEMENT OF TRADITIONAL OWNERS
Instigated at all formal Academy meetings and events.

Externally the Academy partnered with the Academy of Science to develop the *Women in STEM Decadal Plan* and co-administered the *SAGE Athena Bronze Awards*, and on behalf of the Australian Government we organised an *Asia-Pacific Economic Cooperation (APEC) Workshop on Women in Entrepreneurship* in Santiago, Chile.



First SAGE Bronze awards

Fifteen Australian institutions have been recognised for efforts to improve gender equity and diversity, receiving inaugural Athena SWAN Bronze Awards from Science in Australia Gender Equity (SAGE). Nicolle Flint, MP for Boothby, representing Prime Minister Scott Morrison, presented the awards at Parliament House in Canberra. SAGE is a partnership between the Australian Academy of Technology and Engineering and the Australian Academy of Science.

Evidence is already emerging that the program is having a positive impact, including:

- increased career satisfaction and opportunities
- improved working practices to support career progression
- increased visibility of women in science
- an increased proportion of women in STEM – science, technology, engineering, maths and medicine – departments nationally.



Pictured at the Athena Swan Bronze Awards in December 2018: Margaret Hartley, CEO; Alison Johns, Chief Executive, Advance HE (UK Athena SWAN Charter); Wafa El-Adhami, SAGE Executive Director; Anna-Maria Arabia, Chief Executive, Academy of Science.

Launch of the Decadal Plan



The *Women in STEM Decadal Plan* was launched at Parliament House in Canberra by the Minister for Industry, Science and Technology, The Hon Karen Andrews MP.

The plan was developed by the Academy of Technology and Engineering in partnership with the Academy of Science.

It outlines six opportunities to strengthen gender equity in STEM in Australia over the next 10 years, including establishing a national evaluation framework to guide decision-making and drive investment and effort into STEM measures that work.

The Academy is contributing to the development of a framework to help SMEs improve gender equity.

The Decadal Plan is available on our website.

Women and Entrepreneurship Workshop in Chile

The Academy organised an Asia-Pacific Economic Cooperation (APEC) Workshop on *Women in Entrepreneurship* in Santiago, Chile, on behalf of the Australian Government.

The workshop brought together leaders from incubator and accelerator ecosystems across the APEC economies to share best practice in programs aimed at women entrepreneurs and to develop recommendations for future policy across the region regarding women in entrepreneurship.

Other diversity and inclusion activity and participation by the Academy's policy team included:

- > UN Equals – *The Global Partnership for Gender Equality in the Digital Age*
- > *Gender Equity in Engineering* with the World Federation of Engineering Organisations (WFEO)



MEETING with Federal Education Minister to discuss STEM teaching August 2018



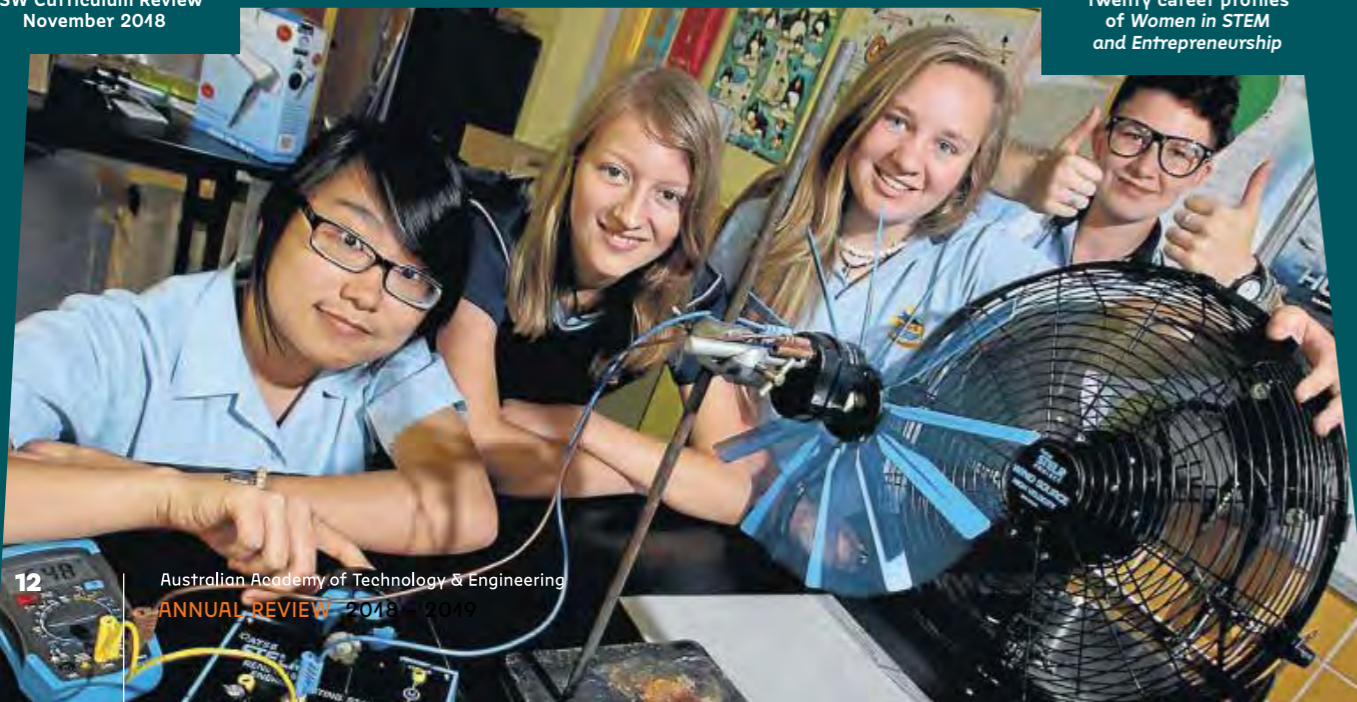
CAREER PROFILE VIDEOS available on Australia's Science Channel, ABC iView and through STELR.



SUBMISSION NSW Curriculum Review November 2018



WOMEN IN STEM Twenty career profiles of Women in STEM and Entrepreneurship



STEM education

Technological transformation is coming, whether we're ready or not. Our research has shown that Australia is headed towards a STEM skills shortage that risks undermining our future.

That's why the Academy runs STELR (Science and Technology Education Leveraging Relevance) program. It uses hand-on, relevant learning to address the problem of low participation rates in STEM subjects at the upper secondary school level.

In every Australian state and territory and in countries across the world, STELR is inspiring the next generation of scientists, technologists and engineers. The program now operates in schools in Indonesia, Singapore, the Philippines, Peru, the US, Canada and India.

All schools that have chosen the Academy's STELR STEM education kits from 2009-2019 have remained with the program.



STELR

stelr.org.au



87%

of teachers said they were more confident and skilled in inquiry based learning STEM using STELR



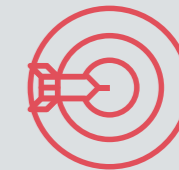
86%

of students are more engaged with STEM through STELR



75%

of students say they are more enthusiastic for learning science after STELR



56

new schools were added in 2018-2019 to make a total of 713 Australian schools using the STELR program



This year saw STELR celebrate 40 years of partnership with its foundation sponsor Orica, which has made this life-changing work possible.

IMNIS

An important part of the Academy's work is developing options to enable academics and researchers to form stronger links with industry.

Encouraging those links when researchers are still PhD candidates and early in their career is an important way to build such relationships.

The Industry Mentoring Network in STEM (IMNIS) project is an Academy initiative which pairs PhD students with industry mentors.

In its third year, this high-impact initiative has grown to 324 mentoring partnerships, up from 204 in 2017-2018, and operates in all mainland states.

It is having impact. Some 95 per cent of mentees and 92 per cent of mentors report the overall mentoring experience to be "positive and successful".

And 86 per cent of mentees say they have attained knowledge or skills to assist in engaging and collaborating with industry.

IMNIS events are held in each major capital city. Some of the 2018-2019 events included:

- IMNIS Visionary Leadership
- IMNIS Engaging with Industry
- IMNIS STEM Careers in Industry
- IMNIS Leaders Forum
- IMNIS Mentee Videocon



95%

MENTEES AGREE

92%

MENTORS AGREE

The overall experience was "positive and successful".



86%

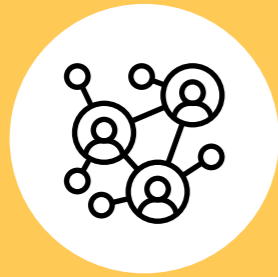
of Mentees say they attained knowledge or skills to assist in engaging & collaborating with industry

IMNIS
INDUSTRY MENTORING
NETWORK IN STEM



The IMNIS program gains increased participation from industry mentors and PhD students year on year.





Joint Workshops & Meetings

Japan: Sustainable Development. Melbourne December 2018
 Korea: Transport. Seoul July 2018
 China: Optics. Changchun August 2018
 Kenya: Engineering. Melbourne February 2019
 Chile: APEC Women in Entrepreneurship. Santiago May 19



International strategy

Published December 2018



APEC Policy Partnership on Science, Technology and Innovation

Standing invitee representing Australian Government
 Papua New Guinea: August 2018
 Chile: May 2019



CAETS

Academy President elected to Board of International Council of Academies of Engineering and Technological Sciences
 June 2019



Australia-China Young Scientists Exchange Programme (YSEP)

China to Australia: July 2018
 Australia to China: Nov 2018
 Contract renewed: Mar 2019
 Next Step Initiative: May 2019



GLOBAL CONNECTIONS FUND

21 Bridging Grants to promote early stage commercialisation for Australian researchers and SMEs were awarded at a cost of

\$961,536

Collaboration occurred across 12 countries.

Global Connections

Ideas know no borders. That's why we organise exchanges, workshops and conferences that bring together Australian researchers and experts with counterparts from across Asia and beyond.

CAETS

In September 2018 the International Council of Academies of Engineering and Technological Science (CAETS) held its annual Convocation in Montevideo, Uruguay; the first time it has been in South America.

Academy President Professor Hugh Bradlow and Executive Director, Policy, Dr Matt Wenham attended the conference, which had the theme *Engineering a Better World – Sustainable Development of Agricultural and Forestry Systems*.

They also attended the 2019 Convocation in June in Stockholm. The theme was *Engineering a Better World – The Next 100 Years* and included deep discussions on the future of engineering education.

Asia-Pacific Women in Entrepreneurship Initiative

The Academy organised an Asia-Pacific Economic Cooperation (APEC) Workshop on *Women in Entrepreneurship* on 6-8 May 2019, in Santiago, Chile, on behalf of the Australian Government.

The workshop brought together accelerator leaders from across the APEC economies. They discussed best practice in programs for women entrepreneurs and how to develop recommendations for future women's entrepreneurship policy across the region.

Key themes included skills development, access to capital, access to markets and the identification of barriers that prevent women's full participation in entrepreneurship programs.

Connecting with Japan

The Academy's engagement and collaboration with our peers in Japan included the Australia Japan Symposium: *Innovative Approaches to the UN Sustainable Development Goals*, which was held in Melbourne in December 2018.

In October 2018, Professor Bradlow represented the Academy at the 15th Science and Technology in Society (STS) Forum in Kyoto and the *Innovation for Cool Earth Forum (ICEF)* in Tokyo.

Australia-China Young Scientists Exchange Programme (YSEP)

YSEP funds an annual two-way exchange of Australian and Chinese early to mid-career researchers in the fields of science, engineering, technology and medicine. Sixteen Chinese researchers visited Australia in July 2018, and sixteen Australian researchers visited China in November 2018.

IMPACT

The Academy's Communications team ran a campaign on Twitter and LinkedIn to promote YSEP during April and May 2019.

The campaign aimed to:

- generate nominations (measured by unique visits to the YSEP page on the Academy website)
- raise awareness of the YSEP (measured primarily by impressions and video views)

The campaign focused on seven videos – six former YSEP participants, and a highlights reel – which proved to be particularly engaging.

The overall results of the campaign were a success: 1246 unique visits to the YSEP page; 456,070 impressions across Twitter and LinkedIn and 160,836 total video views.

Chinese Academy of Science-AAS-ATSE Symposium 2018

The 2018 Symposium, entitled *The Miracle of Light* was held in August 2018 Changchun, China. Professor Hugh Bradlow and Dr Carolyn O'Brien represented the Academy, and Professor Bradlow gave a speech on whether fibre networks are really necessary.

Delegation from the Engineers Board of Kenya

The Academy hosted a senior delegation from the Engineers Board of Kenya, 18-20 February, who were visiting to discuss the establishment of an Academy of Technology and Engineering in Kenya.

Celebrating excellence

Australia needs to celebrate its innovation success stories. That's why we champion leaders who have shared their visions and applied technology for the benefit of Australia.

We held our 2019 Innovation and Excellence Awards in Sydney in June.

Distinguished Professor Genevieve Bell FTSE gave a phenomenal keynote address on how innovation changes lives. Minister for Industry, Science and Technology, Karen Andrews spoke about her experience as a woman engineer and presented the Clunies Ross Awards.

The Batterham Medal, ICM Agrifoods Awards and inaugural Ezio Rizzardo Polymer Scholarship were also awarded.

CLUNIES ROSS AWARDS

INNOVATION

Professor Thorsten Trupke and Adjunct Associate Professor Robert Bardos have transformed the research, development and manufacturing of solar cells worldwide. Products based on their technology have been sold to almost all leading manufacturers in the global solar panel supply chain.

ENTREPRENEUR OF THE YEAR

Dr Jane Oppenheim's scientific and business leadership has created many jobs and improved the lives of people with skin conditions. She is the Scientific and Operations Director of Ego Pharmaceuticals, which makes science-based products to help address conditions like skin tear and eczema.

KNOWLEDGE COMMERCIALISATION

Professor Anthony Weiss AM from the University of Sydney has developed synthetic skin to treat wounds and scars, leading to a multi-million-dollar commercial deal. Innovative work with tropoelastin and elastin – the unique biological ingredients that give human tissue its elasticity – led to this breakthrough.

EZIO RIZZARDO POLYMER SCHOLARSHIP

Naomi Paxton from QUT is researching better ways to 3D print body parts. The biocompatible polymer surgical implants can be specifically designed for individual patients and replicate a range of tissues, including bone. Ms Paxton is the inaugural winner of this award.

ICM AGRIFOODS AWARDS

Dr Lee Hickey from QAAFI at the University of Queensland has played a key role in applying crop "speed breeding" technology to slash the time required to develop improved varieties of wheat, barley and chickpea for farmers.

Dr Lydia Ong from the University of Melbourne has developed a suite of microscopy capabilities to study the behaviour of food components such as protein and fat on a molecular scale.

BATTERHAM MEDAL

Professor Michael Milford's (QUT) pioneering transdisciplinary research integrates biology, neuroscience, robotics, machine learning and computer vision to create new technologies for autonomous vehicles and robotics.

Innovation and Excellence Awards

June 2019, Sydney



The Hon Karen Andrews MP, Minister for Science, Industry and Technology (left) and Distinguished Professor Genevieve Bell FTSE speaking at the Academy's Innovation and Excellence Awards event in Sydney in June 2019.



Award winners and selectors.



Left to right: Professor Thorsten Trupke FTSE, Adjunct Associate Professor Robert Bardos and Dr Jane Oppenheim.



Professor Anthony Weiss AM FTSE.

THANK YOU

Thank you to our Platinum Sponsors: Macquarie and UNSW (Sydney).



UNSW SYDNEY

Annual Oration & New Fellows Induction

November 2018, Melbourne

ACADEMY ORATION
Delivered by Catherine Tanna FTSE
Energy Australia

NEW FELLOWS INDUCTION
The Academy's official welcome
to the 2018 new Fellows



Vital to our sustained expertise, quality of advice, effectiveness and ultimate impact is ensuring we elect the best minds to the Academy.
The new Fellows for 2018 were:

- 1 **Ms Leeanne Bond FTSE**
Non-Executive Director
Liquified Natural Gas Limited
- 2 **Professor Michael Brear FTSE**
Professor, University of Melbourne
- 3 **Professor Attila Brungs FTSE**
Vice-Chancellor and President,
University of Technology
- 4 **Professor Mark Burry AO FTSE**
Professor of Urban Futures and Director
of the Smart Cities Research Institute,
Swinburne University of Technology
- 5 **Dr Alan Bye FTSE**
Vice-President Technology Strategy
& Innovation, BHP
- 6 **Professor Colin Andrew Campbell
FTSE**
Chief Executive Officer, Australian Centre
for International Agricultural Research
- 7 **Professor Wallace Cowling FTSE**
Professor, University of Western Australia
- 8 **Dr John Dixon FTSE**
Principal Advisor, Australian Centre for
International Agricultural Research
- 9 **Professor Annabelle Duncan
FPSM FTSE**
Vice-Chancellor, University of
New England
- 10 **Dr Gordon Frazer FTSE FIEEE**
Research Leader High Frequency Radar,
Defence Science and Technology
- 11 **Professor Justin Gooding FAA FTSE**
ARC Australian Laureate Fellow,
University of New South Wales
- 12 **Professor Keith Hampson FTSE**
Chief Executive Officer, Australian
Sustainable Built Environment National
Research Centre (SBEnrc) Curtin
University
- 13 **Professor Emily Hilder FTSE**
Director, Future Industries Institute,
University of South Australia
- 14 **Dr Anna Koltunow FAA FTSE**
Team Leader, CSIRO
- 15 **Ms Sue MacLeman FTSE**
Chair and Non-Executive Director,
MTP Connect Limited
- 16 **Professor Eric May FTSE**
Professor, University of
Western Australia
- 17 **Professor Christopher Moran
FTSE**
Deputy Vice-Chancellor and Vice-
President (Research), Curtin University
- 18 **Dr Sarah Pearson FTSE**
Chief Innovation Officer, Department
of Foreign Affairs and Trade
- 19 **Professor Andrew Peele FTSE**
Director, Australian Synchrotron,
ANSTO
- 20 **Professor Fiona Stapleton FTSE**
Head, School of Optometry and Vision
Science, University of New South Wales
- 21 **Professor Chun Wang FTSE**
Professor, University of New South Wales
- 22 **Professor Phillip Watson FTSE**
Shell Chair in Offshore Engineering,
University of Western Australia
- 23 **Professor Johanna Westbrook
FTSE**
Director, Australian Institute of Health
Innovation, Macquarie University
- 24 **Dr Dong Yang Wu FTSE**
Chief Aerospace Division, Defence
Science and Technology
- 25 2018 HONORARY FELLOW
Ms Elizabeth Broderick AO FTSE
Principal, Elizabeth Broderick and Co
- 26 Absent from this photo
Professor Genevieve Bell FTSE
Distinguished Professor, Australian
National University
- 27 2018 FOREIGN FELLOW
Ms Kiran Mazumdar-Shaw FTSE
Chairperson and Managing Director,
Biocon Limited (India)
- 28 **David Cook AO FTSE FRSN**
Board member and Membership
Committee Chair



Ms Catherine Tanna FTSE,
Managing Director of
EnergyAustralia delivered
the Academy's 2018
Annual Oration.

Achievements

The work of our Fellows make the Academy stronger. We recognise and celebrate the many ways our Fellows contribute to Australia and the world. Here are some of the year's highlights.

Hugh Bradlow

The National Academy of Engineering of Korea announced the appointment of our President Professor Hugh Bradlow as a Foreign Member.

John Church

Professor John Church became the first Australian to be awarded the BBVA Foundation Frontiers Knowledge Award in Climate Change.

Bogdan Dlugogorski

Professor Bogdan Dlugogorski was elected a Fellow of the Combustion Institute, based in Pittsburgh, USA.

Alan Finkel

Former Academy President Dr Alan Finkel AO had his term as Chief Scientist extended until the end of 2020.

Bronwyn Fox

Professor Bronwyn Fox was awarded the 2018 GCMM Research Leadership Award at the 14th Global Congress on Manufacturing and Management.

Min Gu

Distinguished Professor Min Gu was appointed Executive Chancellor of the University Council at University of Shanghai for Science and Technology (USST). USST also named him Distinguished Professor for Future Optics in the School of Optical-Electrical and Computer Engineering.

The International Society for Optics and Photonics (SPIE) also announced Distinguished Professor Gu as the 2019 recipient of the Dennis Gabor Award in Diffractive Optics.

David Hurley

Honorary Fellow General David Hurley AC DSC was appointed Governor-General of Australia.

Chennupati Jagadish

Professor Chennupati Jagadish AC won a UNESCO Medal for contributions to the development of nanoscience and nanotechnologies.

Anna Lavelle

Dr Anna Lavelle received the BioMelbourne Network 2019 Women in Leadership Award – Impact for Industry. The award recognises her many years of contributions to biotechnology, medical technology and the pharmaceuticals sector.

Ramesh Mashelkar

For his seminal research on smart polymer gels, Indian polymer scientist Dr Mashelkar won the 2018 Lenovo Science Prize from The World Academy of Science.

Tanya Monro

Professor Tanya Monro was appointed Australia's Chief Defence Scientist, becoming the first woman to hold the role.

Simon Poole and Steven Frisken

Dr Simon Poole and Dr Steven Frisken, along with two other scientists, were awarded the \$250,000 Prime Minister's Prize for Innovation for creating and commercialising optical switch technology that underpins the global internet.

Judy Raper

Professor Judy Raper AM was named Australia's top female engineer, winning the prestigious Ada Lovelace Medal for Outstanding Woman Engineer.

Margaret Sheil

The University of Melbourne named a new bio-medical institute, the Margaret Sheil Mass Spectrometry laboratories, in honour of our Fellow and Australia's first female chemistry professor, Margaret Sheil AO.

Murray Scott

Professor Murray Scott is the 2019 winner of the prestigious biennial Lawrence Hargrave Award, honouring an Australian who has made a significant contribution to Australian aviation.

Kadambot Siddique

Professor Kadambot Siddique AM received an Excellence Award for Community Service from the World Malayalee Council. It honoured his agricultural work in the southern Indian state of Kerala after recent flooding. Professor Siddique also became the first Australian ever elected to the African Academy of Sciences.

Michelle Simmons

Quantum physicist Professor Michelle Simmons AO was appointed Honorary Patron of Mateship by the Australian Embassy in the United States.

Greg Tegart

Professor Greg Tegart AM was awarded the Professor Robert Boucher Distinguished Alumni Award by the University of Sheffield in the UK for more than six decades of scientific leadership.

Doreen Thomas

Professor Emeritus Doreen Thomas, a Board Director and chair of the Academy's Education Forum, was inducted into the Victorian Honour Roll of Women on 8 March – International Women's Day.

Brian Walker

Dr Brian Walker received Japan's Blue Planet Prize in recognition of his lifelong career pioneering "resilience science". It is awarded to outstanding individuals or organisations whose work contributes to the global environment.

ORDER OF AUSTRALIA HONOURS

Twenty-four of our Fellows and one Academy staff member were awarded Queen's Birthday and Australia Day honours this year.

AUSTRALIA DAY 2019

Companion of the Order of Australia (AC)

Dr Elizabeth Dennis AC FAA FTSE
Professor Peter Hoj AC FAA FTSE
Emeritus Professor Richard Larkins AC FTSE

Officer of the Order of Australia (AO)

Professor Barney Glover AO FTSE
Professor Ross Large AO FTSE

Member of the Order of Australia (AM)

Dr James Harvey AM FTSE
Dr Carrie Hillyard AM FTSE
Dr Chris Pigram AM FTSE
Professor Judy Raper AM FTSE
Professor Zhiguo Yuan AM FTSE

QUEEN'S BIRTHDAY 2019

Companion of the Order of Australia (AC)

Professor David Burke AC FAA FTSE
Emeritus Professor Maree Smith AC FTSE

Officer of the Order of Australia (AO)

Professor Calum Drummond AO FTSE
Mr Dale Elphinstone AO FTSE
Ms Kathryn Fagg AO FTSE
Ms Susan Murphy AO FTSE
Professor Michelle Simmons AO FAA FTSE

Member of the Order of Australia (AM)

Distinguished Professor Shi Xue Dou AM FTSE
Ms Katherine Hirschfeld AM FTSE
Dr Ian MacLeod AM FTSE
Dr Mark Toner AM FTSE
Dr Peter Tyree AM FTSE
Professor Yi-Min Xie AM FTSE
Dr Marguerite Evans-Galea AM (IMNIS Executive Director)

Medal of the Order of Australia (OAM)

Mr Ernest Frederick Dawes OBE OAM

Vale

REMEMBERING OUR FELLOWS

Professor Michael Desmond Rickard died on 25 June 2019, aged 77.

Dr Robert Melville Hobbs died on 10 May 2019, aged 78.

Sir Arvi Parbo AC Kt died on 1 May 2019, aged 93.

Laureate Professor Scott William Sloan AO died on 23 April 2019, aged 64.

Dr Bernard Kenneth Bowen AM died on 19 March 2019, aged 88.

Mr Peter John North AM died on 19 March 2019, aged 85.

Mr Courtney John Denton Williams AM died on 7 March 2019, aged 95.

Dr Eric Raymond Vance died on 7 March 2019, aged 76.

Professor Andrew Potts died on 6 March 2019, aged 59.

Sir Rupert Myers KBE AO FAA died on 21 February 2019, aged 98.

Mr John Hooke CBE died on 28 October 2018, aged 85.

Mr Murray Jackson died on 9 September 2018, aged 75.

Dr Angus McEwan died on 5 September 2018, aged 81.

Emeritus Professor Leonard Kelman Stevens AM died on 17 August 2018, aged 93

Dr Owen Denmead AO died on 3 July 2018, aged 85.

Division activity

The Academy's state and territory Divisions play a valuable role – bringing together Fellows to exchange ideas and promoting policy positions to governments.

Divisions also act as a space where ideas emerging from the Academy's policy forums can be debated and assessed. Activities included the following:

ACT

A guest lecture on the potential of hydrogen usage and a further lecture on the efficacy and regulation of "alternative medicines".

NEW SOUTH WALES

A luncheon series of talks that included topics such as "How are health information technologies changing the nature and outcomes of health care?", "Opal Towers: The tip of the iceberg? What should be done now?" and "Doing business in Australia – battling political and technical disruptors. (Is it worth the effort?)".

The Division held the annual Malcolm Chaikin Oration, on "Innovation", delivered by Catherine Livingstone AO FAA FTSE.

The Division organised two symposia: one on health – "Genomics & Big Data", and the other on energy – "Energy Markets: The Consumer Perspective".

In addition, the Division participated alongside other Learned Academies and the Royal Society of NSW in a forum at Government House, entitled "Towards a Prosperous yet Sustainable Australia – What now for the Lucky Country?".

QUEENSLAND

More than 200 people attended a presentation on the future of cyberwarfare, organised by the Division in collaboration with the University of Queensland. The public lecture, held at the university's Customs House, was delivered by the Australian Defence Force's Head of Information Warfare Major General Marcus Thompson AM.

The Division also organised a forum on "From 'Corporate' to 'Chaos': My Journey in Start-ups", as well as a lunchtime seminar on innovation.

SOUTH AUSTRALIA

The Division put a major focus on engaging with state politicians. Fellows participated in the *Science Meets Parliament* event, which was attended by nine MPs, including the Minister for Primary Industries and Regional Development, Tim Whetstone, and the Deputy Leader of the Opposition, Dr Susan Close.

The Division also held meetings with three Ministers in the new state government, the Chief of Staff of the Leader of the Opposition, Leaders of the Greens and Advance SA parties, some local back-benchers as well as the science adviser of a SA representative of the Federally-based Centre Alliance.

South Australian Minister for State Development and Skills, David Pisoni, addressed Fellows and friends at the Division's Annual Meeting and dinner.

VICTORIA

The Division held regular forums, including one with the Victorian Chief Engineer and another with Victoria's Lead Scientist.

Topics included "The Engaged University of the Future: Where Technology Meets Humanity", "Bioinspired Hydrodynamic Solutions/Sustaining Mining" and "Warracknabeal to Svalbard: The Future of Broad Acre Agriculture".

WESTERN AUSTRALIA

The Division announced Professor Jessica Meeuwig, Director of the Centre for Marine Futures at the University of Western Australia, as its Eminent Speaker for 2019.

The role recognises a Western Australian scientist whose research is having significant economic or environmental impact and who is an outstanding communicator – able to share the excitement and impact of research and development based in WA.

The announcement and Professor Meeuwig's public lectures generated media coverage.



DIVISION EVENTS

26 events held across all Divisions in 2018-2019

Impact

To fully harness the expertise of our Fellows, the Academy needs to be recognised as a trusted source of advice. That's why we communicate with policy-makers, industry and the STEM-connected public to build our profile and strengthen our relationships.

MEDIA MENTIONS

Academy policy initiatives, reports and statements garnered **542 media mentions over the course of the year.**

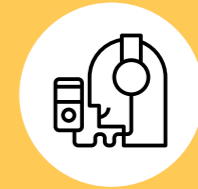
Topics included the Academy's Transport report, the risks and benefits of the My Health system, the first cohort of SAGE Athena SWAN Bronze Award winners, the 2018 new Fellows and the 2019 Clunies Ross Award winners.

The transport report was cited by Mark Butler, the Shadow Minister for Climate Change, whose comments were reported in *The Australian* (print and digital) and *The Guardian* (online). National coverage ranged from ABC and Macquarie Radio to Sky TV, from *The Sydney Morning Herald* and the *Financial Review* to a front page story in Adelaide's *The Advertiser*.

On Twitter, the Academy more than doubled its following from 1242 to 2653, reaching 2.1 million users with its content.

On LinkedIn, the Academy saw similar growth, with the number of followers climbing from 734 to 1461.

In 2018-2019 we doubled our social media followers and reached more than 2.1 million users with our content.



PODCASTS & VIDEOS

In 2018-2019 the Academy's podcast library grew rapidly, featuring conversations with Fellows and Clunies Ross Award winners. In total, **18 podcasts** were produced during the year, and were listened to **1811 times**. Topics included:

War on waste: here comes microrecycling
Shooting for the stars: introducing the Australian Space Agency
From folklore remedy to skin cancer treatment
Nano-engineering and entrepreneurship: a winning combo

The Academy also produced short videos as entry points to our website for more in-depth reading and background information. Uploads in 2018-2019 included:

Synthetic skin changing lives around the world
Australia-China Young Scientists Exchange Programme highlights
Skin care based on science creates jobs
Shifting gears – Preparing for a Transport Revolution
Better Crops – it's all in the breeding

All our podcasts are available on our website and on SoundCloud.

Our videos are also available on our website and on YouTube.

CONNECT WITH US

ATSE

Website	atse.org.au
Twitter	@ATSE_Au
LinkedIn	Academy of Technology and Engineering
SoundCloud	Academy of Technology and Engineering
YouTube	Australian Academy of Technology and Engineering

IMNIS

Website	imnis.org.au
Twitter	@_IMNIS
Facebook	@1MNIS

STELR

Website	stelr.org.au
Facebook	@STELRproject
Twitter	@STELRproject
YouTube	STELRproject

STELR videos can also be found on Australia's Science Channel.

The Academy at work

2018-2019



The President, Professor Hugh Bradlow FTSE, and Executive Director, Policy, Matt Wenham attended the 2019 CAETS Convocation in Stockholm, Sweden



Organised by the NSW Division, the Energy Symposium Energy Markets – The Consumer Perspective was chaired by George Maltabarow FTSE.



Dr Margaret Hartley FTSE, CEO, speaking at the Innovation and Excellence Awards in Sydney in June 2019.



Dr Margaret Hartley FTSE, CEO; Professor Hugh Bradlow FTSE, President; The Hon Paul Fletcher MP, Minister for Urban Infrastructure; and Dr Matt Wenham, Executive Director, Policy, during the Minister's visit to the Academy.



Drew Clarke, co-chair of the Industry Technology Readiness Project Steering Committee, speaking at the launch of the *Shifting Gears* report at a CEDA event.



Cybersecurity Forum held by the Queensland Division at the University of Queensland.



Chief Scientist of South Australia, Professor Caroline McMillen speaking at an IMNIS event *STEM careers in Industry (SA)*.



Margaret Hartley FTSE, CEO (right) with Dr Megan Clarke FTSE, Head of the Australian Space Agency who visited the Academy to record a podcast.



The ballroom of the Sydney Sofitel Wentworth on the night of the Innovation and Excellence Awards in June 2019. The room was full of Fellows, academics,

industry leaders, researchers, entrepreneurs and government representatives celebrating excellence in science, technology and engineering.



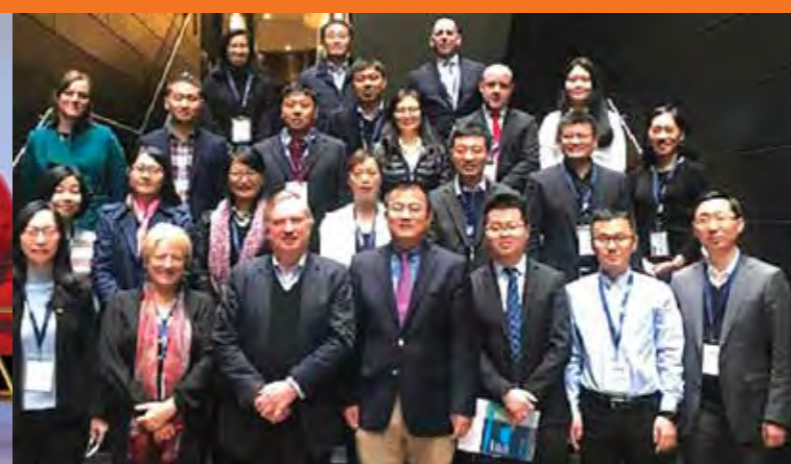
Teacher Sarah Edwards was taught using STELR equipment and was inspired to become a science teacher to pass on her love of STEM onto others.



The Academy hosted a delegation from the Engineers Board of Kenya to discuss the establishment of a Kenyan Academy of Technology and Engineering.



The NSW Division hosted the Health Symposium *Big Data and Genomics: The Future of Healthcare*.



YSEP orientation session Melbourne with Dr Carolyn O'Brien, Senior International Relations Associate, and Professor Murray Scott FTSE.



Executive Director, Policy, Matt Wenham moderating an APEC Workshop: *Women in Entrepreneurship* in Santiago, Chile.

Financial Summary

FOR THE YEAR ENDED 30 JUNE 2019

Principal Objectives

The long term objective of the Academy is to promote in Australia the application of scientific and engineering knowledge to practical purposes. The activities of the Academy during the financial year were directed towards our key strategy of enhancing Australia's prosperity through technical innovation.

In particular, the Academy:

- provided evidence-based advice on a range of technology and innovation policy issues to governments, industry and the community
- provided a forum for debate and policy formulation on important national issues
- undertook projects on matters of major national significance
- fostered and recognised excellence in technological sciences and engineering
- used its international linkages to provide access to expertise from around the world
- conducted a program in 713 Australian secondary schools to promote the relevance of science and technology and a more scientifically literate society.

Operating Result

The operating result for the Academy showed a total revenue of \$6,581,968.

The major source of income was government grants and contracts accounting for 51.1 per cent of revenue and sponsorship at 7.9 per cent up from 6.6 per cent in the previous year.

There was an operational surplus for the year of \$328,608 (compared to a deficit position of -\$135,937 in the previous year). The realised net fair value gain on available-for-sale financial assets was \$504,160 (compared with \$87,148 in 2017-18).

The total comprehensive income for the year was \$832,768 (compared with a deficit of -\$48,787 for the previous year).

The financial position remains strong with total current assets of \$6,008,356 and total liabilities of \$3,588,850.

The asset to current liability ratio was 1.67 (a healthy financial position is reflected in a ratio greater than 1.0).

PROFIT & LOSS STATEMENT

Statement of profit or loss and other comprehensive income for the year ended 30 June 2019

	2019 \$	2018 \$
REVENUE	6,581,968	6,743,777
EXPENSES		
Learned Fund	(2,207,998)	(2,186,063)
Corpus (Endowment) Fund	(575,394)	(587,362)
Technical Projects	(993,678)	(632,997)
International Science and Technology	(1,664,680)	(2,275,755)
STELR	(720,948)	(1,111,704)
Awards	(90,662)	(85,833)
	(6,253,360)	(6,879,714)
GAIN / (LOSS) FOR THE YEAR	328,608	(135,937)
OTHER COMPREHENSIVE INCOME		
Fair value gains on financial assets at fair value through other comprehensive income	504,160	87,148
Other comprehensive income for the year	504,160	87,148
TOTAL COMPREHENSIVE INCOME / (LOSS) FOR THE YEAR	832,768	(48,787)

FINANCIAL POSITION

Statement of financial position as at 30 June 2019

	2019 \$	2018 \$
ASSETS		
Current assets		
Cash and cash equivalents	3,569,614	4,405,538
Trade and other receivables	519,655	297,972
Financial assets	1,823,265	1,354,027
Other assets	95,822	122,802
Total current assets	6,008,356	6,180,339
Non-current assets		
Financial assets	6,234,941	5,622,662
Plant and equipment	358,551	447,245
Intangible assets	30,747	61,651
Total non-current assets	6,624,239	6,131,558
TOTAL ASSETS	12,632,595	12,311,897
LIABILITIES		
Current liabilities		
Trade and other payables	351,738	241,586
Income in advance	2,965,890	3,612,650
Provisions	257,300	236,460
Total current liabilities	3,574,928	4,090,696
Non-current liabilities		
Provisions	13,922	10,223
Total non-current liabilities	13,922	10,223
TOTAL LIABILITIES	3,588,850	4,100,919
NET ASSETS	9,043,745	8,210,978
EQUITY		
Reserves	1,381,247	384,301
Retained surplus	7,662,498	7,826,677
TOTAL EQUITY	9,043,745	8,210,978

Donations

The Academy acknowledges donations from the following Fellows, individuals and philanthropic organisations:

Dr Oliver Mayo FAA FTSE
Mr Richard Carter AM FTSE
Mr John Gunn FTSE
Mr John Ralph AC FAA FTSE
Ms Stephanie Ashworth
Mr Warwick H Bisley FTSE
Dr Doreen Clark AM FTSE
The James N Kirby Foundation Ltd

Professor Chennupati Jagadish FAA FTSE
ASCA Donation
Dr Sydney Richards FTSE
Dr Geoffrey Knights AM FTSE
Percy Baxter Charitable Trust
Mr John Laurie AC FTSE
Dr Carrie Hillyard FTSE

The Australian Academy of Technology and Engineering operates as a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems.

Bringing together Australia's leading thinkers in applied science, technology and engineering the Academy provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.



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Technology & Engineering

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