

# FOCUS

## WOMEN ARE MAKING THEIR MARK – NOW

BUT THERE IS STILL A MOUNTAIN  
OF CHALLENGES TO OVERCOME

THE ARGUMENT ABOUT 'WHY' IS OVER – IT'S NOW ABOUT  
'HOW' AND 'WHEN' – AND AUSTRALIA IS MAKING PROGRESS





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AUSTRALIAN ACADEMY OF  
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BY KATHRYN FAGG  
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# Australian business turns increasingly to women

**WOMEN – NOW** The key to achieving gender balance is leadership. Men must play a critical role – women cannot do it by themselves.

A

At the end of 2015, Catherine Livingstone, an ATSE Fellow, was recognised as Australia's Business Person of the Year by the *Australian*

*Financial Review*. This recognition came as a result of the central role Ms Livingstone, as President of the Business Council of Australia, has played in advocating for strategies to encourage national competitiveness and growth, including through greater innovation and collaboration, during a period of unprecedented technological change.

Ms Livingstone has brought particular authority to the debate on how Australia can best position itself for the future given the technological shifts underway as a result of her position as Chairman of Telstra and her earlier experiences as the Chairman of CSIRO and CEO of Cochlear.

Through her outstanding contribution, Ms Livingstone is helping shift perceptions of what being a leader means in Australia. She clearly does not fit the traditional stereotype of what a business leader looks like. She is not alone.

One of the other leading businesswomen who made headlines this last year is Christine Holgate who is the CEO of Blackmores. It was the stellar performance of the company on the Australian stock market during 2015 – with its share price going through the \$200 mark at one point (the first company listed on the ASX to do so) – and its successful push into China that saw Ms Holgate as one of the other five contenders for Australia's Business Person of the Year.

The increasing prominence of women featured in the business media reflects a shift that has gathered pace during the past



PHOTO: ISTOCKPHOTO

*Women and men need to work together.*

decade, as women do have the opportunity to play a more significant role in the financial and economic life of the community.

And there needed to be a shift over the decade, because it did not start well. The Australian Census of Women in Leadership in 2008 by the Australian Government's Equal Opportunity Workplace Agency showed that, relative to 2006, the proportion of women to men on corporate boards and in executive leadership roles had declined across all indicators.

This was a surprising result given the number of female university graduates had outnumbered male graduates for quite a while. It had been assumed for many years that it was just a question of time before there were more women in leadership, even if the rate of progress seemed glacial.

However, seeing the census numbers going backwards was a turning point.

Senior business leaders, many of them men, went on the public record to say it was no longer acceptable that women weren't getting more opportunity – it was wasteful and unfair. There was a realisation that greater intervention was needed – because time alone was not going to rectify the situation. It turns out we had to go backwards so that we could go forwards.

Where progress has been most obvious in recent years is on our largest corporate boards. Back in 2006, women made up only 8.7 per cent of board members of the ASX200. At the end of 2015, women made up 21.5 per cent. More importantly, women now comprise more than 30 per cent of new appointments to ASX boards. This means we are heading towards a

critical mass of women on these boards in line with the target set by the Australian Institute of Company Directors for all ASX200 boards to have 30 per cent of board members being women by the end of 2018.

This is progress to be celebrated.

However, increasing the number of women on boards does not address the key challenge for stronger gender balance in business. It is increasing the number of women in the executive ranks that has proven to be much more difficult. This is a particularly important challenge since it is a company's executive members, rather than board members, who play the key role in influencing the direction, style and performance of a company – and are rewarded accordingly.

The numbers paint the picture for the size of the challenge. The most recent Census for Women in Leadership in 2012 showed that women held just under 10 per cent of the key management positions for the ASX200 companies – and only six per cent of the line roles, where responsibility for businesses and operations performance sit.

This starting point indicates the magnitude of change required to achieve the goal that the Business Council of Australia (BCA) set in 2013 of increasing the number of women in senior roles in BCA organisations to 50 per cent in the next decade.

The good news is that we now know much more what needs to be done to meet this challenge. There is no magic bullet. But the key to achieving gender balance is leadership.

Therefore, the reality for Australian businesses is that men must play a critical role – women cannot do it by themselves.

Fortunately, more men are stepping up to this responsibility.

At a national level, this is occurring most visibly through the Male Champions of Change, a group convened by the former Sex Discrimination Commissioner, Elizabeth Broderick. Through her inspired leadership, the Champions are playing a key role in tackling the challenge in their own organisations but also in advocating for change in the broader community. And they are sharing what they are learning as they work to try things – whether it is a policy such as 'all roles are flexible', pioneered by Mr David Thodey FTSE when he was CEO of Telstra, or introducing 'targets with teeth' by Mr Elmer Funke Kupper at the ASX.

### BETTER UNDERSTAND

To better understand what 'leadership' means when it comes to improving gender balance, the Male Champions of Change partnered with Chief Executive Women (CEW), Australia's pre-eminent organisation representing Australia's most senior women leaders, to create a model, called the 'Leadership Shadow', to identify what a leader must do – in terms of what to say, how to act, what to prioritise and how to measure.

Some of the key ways a leader can make a difference include:

- articulating a compelling case for gender balance;
- being a role model for an inclusive culture;
- building a top team with a critical mass of women;
- playing a strong role in key recruitment and promotion decisions;

■ championing flexibility for men and women; and

■ understanding the numbers and setting targets.

For our business leaders, it is increasingly important to address the gender balance in their organisations – to have the very best talent available but also to meet expectations of their employees, customers, investors and the broader community.

It can perhaps be taken as a sign of the times that a respected survey of 70 Australian CEOs at the end of 2015 by *The Australian* asked as one of its five questions: "How many females are there among the CEO's direct reports?" Such a question – which is a good measure of gender balance in an organisation – would not have been asked a decade ago.

The Australian community has clearly shifted in its expectations of the leadership role that women should play. The public response to the new Federal Cabinet in late 2015 – with the number of women increasing from two to five and with our first female Defence Minister and our first female Cabinet minister within the Treasury portfolio – was testament to this.

The reason for this shift is perhaps best captured by the response that Justin Trudeau, the new Prime Minister of Canada, gave last year to the question of why he had appointed the same number of women as men to his cabinet – "because it's 2015".

As we head into 2016, with a great deal of volatility in the global economy, it is more important than ever that Australian business fully utilises all the talent available.

Over the past decade, we have made good progress but there is still much work to do to achieve gender balance in Australian business. Nonetheless, the lessons that have been learned by our leading businesses seeking to improve gender balance are relevant to us all seeking to bring about change. ☺

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*[A] respected survey of 70 Australian CEOs at the end of 2015 ... asked as one of its five questions: "How many females are there among the CEO's direct reports?" Such a question – which is a good measure of gender balance in an organisation – would not have been asked a decade ago.*





BY MARK TONER  
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# We need to come to terms with unconscious bias

**WOMEN – NOW** There is a general but superficial view that unconscious bias training removes or reduces our unconscious biases simply because we have become aware of them.

Let's take a common situation: one female candidate and three to four male candidates being interviewed for recruitment by an organisation. Let's assume there are three interviewers, with one female amongst them, although in male-dominated businesses the interviewers will often all be male.

The interviewers will try to be fair and treat all applicants equally, but they will probably be unaware of the following biases which can affect their interviewing behaviour and subsequent decision-making about the suitability of each applicant:

- in-group bias, which causes us to be more comfortable with and favour people like us, that is, of the same gender, background, experience, interests or personality type;
- the halo effect, which causes us to allow the physical characteristics of others to affect our judgement of their other qualities, for example, physically attractive people are more trustworthy;
- anchoring bias, which causes us to rely too much on an irrelevant piece of data or belief, for instance, one of the interviewers had previously hired a woman and it turned out badly;
- minority pool bias, which causes interviewers to evaluate more negatively applicants who comprise a minority of the applicant pool;
- confirmation bias, which causes us to notice data and information that conforms with our beliefs and to disregard any that doesn't; and
- availability bias, which causes us to grab readily available data to make decisions

rather than use all available and relevant data, which will take longer to analyse.

So the single female applicant starts out with an initial disadvantage of having the minority gender amongst the applicants. When interviewed, the male interviewers may see the male applicants as members of their in-group and favour them consciously or unconsciously, and they may see the female applicant as a member of their out-group with characteristics similar to the other women in business they know, which could be negative.

The other biases listed above can further confuse their judgement of the most appropriate applicant and, of course, there are many other types of cognitive bias which could also affect the interviewers' decisions.

These factors can also be present in performance appraisals, promotions and other decisions about people. So organisations need to examine at a detailed level not just their written policies and procedures but their current practices in the hiring, performance review and promotion of staff, and provide appropriate training.

Some definitions may help:

- cognitive bias is a systematic deviation from rational thinking when we make judgements and decisions, and has different causes. There are more than 150 known types of such bias;
- unconscious (or implicit) bias is a bias that happens automatically, is not under our control and is triggered by our unconscious mind making quick judgments and assessments of people and situations, influenced by our genetic make-up, background, past and present cultural environments and personal experiences; and

- gender bias is the general name given to any type of bias that occurs in a situation involving gender.

Almost every week in the national or business media there are articles about women in business, covering issues such as a lack of women in senior positions, pay gaps between men and women, the business case for gender diversity, and discussions about bullying, harassment and career discrimination.

There are fewer articles about how these issues affect women in academia and research institutes but these issues are just as relevant to them.

Given their importance, it is critical that these issues continue to be aired publicly. However, in many of these articles the cause of all these problems is generally attributed by both women and men to unconscious gender bias.

Perhaps this occurs for two reasons. First, it is an easy way out to attribute the cause of these problems to other people's unconscious beliefs because they are not aware of such beliefs and therefore can't be held accountable for them – so nobody is to blame. Second, the men and women who believe unconscious bias is the main or sole cause of poor treatment of women do not perhaps observe the degree of conscious sexism that does occur in business.

Men who are sexist have learned to be careful about what they say in front of women (and perhaps vice versa), which means that women do not observe the amounts of sexist behaviour that does occur in business and academia. Hence many of the authors of such articles, who are mostly women, underestimate the degree of



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conscious sexism prevailing in our workplace and attribute sexist behaviour solely to unconscious bias.

Unconscious bias is reflected in our prejudices and stereotypes that are deeply seated within us as a result of our genetics and socialisation. In increasingly popular 'unconscious bias training', employees take tests which indicate where their biases are, the rationale being that, once we are aware of our previously unknown biases, we can train ourselves to think differently and make less biased judgements and decisions.

So the general but superficial view is that unconscious bias training removes or reduces our unconscious biases simply because we have become aware of them.

Some large publicly listed organisations have stated in recent annual reports that they have put their staff through unconscious bias training – and that is a good start – but the real question is: what are they then doing to assist their staff to deal with their unconscious biases and how are they addressing the conscious biases that we are all subject to?

## TRAINING

Certainly, training which increases our awareness of our unconscious biases is useful but is insufficient on its own to bring about greatly improved employment practices.

Most organisations which have written policies and procedures for recruitment, performance appraisal and promotion of staff believe that they manage these key processes well and that their decisions are based on 'merit', which they regard as an objective concept but is actually very subjective.

Unfortunately, current data on the number of women in middle and senior positions in industry and academia in Australia indicate that these beliefs are ill-founded and that gender bias is prevalent in many such organisations. The problem is not only due to unconscious bias, as many commentators continue to claim, but to both conscious and unconscious bias and a lack of understanding of how bias can affect our decisions about people.

*Modelling of an organisation ... which initially had an equal number of men and women at the bottom level, shows that a mere one per cent bias against women in all promotion decisions produced almost twice as many men than women in the second-top level reporting to the CEO.*

Unfortunately, there is little evidence that consciously realising an unconscious belief or association is sufficient to mitigate it. It may do so in some cases. Some unconscious biases can be extremely deep-seated because they are genetically inherited – for example, in-group bias. In contrast, there is some evidence that unconscious bias training can reinforce cognitive biases and prejudice.

Bringing an unconscious belief or association to the conscious level does not necessarily remove it from the unconscious mind or change it. In fact, if the unconscious belief is aligned with a conscious belief, it will reinforce the unconscious belief, so that if someone who is consciously sexist discovers he/she is unconsciously sexist as well, his/her beliefs at each level are unlikely to change and could be strengthened.

It's also possible to have conscious and unconscious beliefs remaining unaligned with each other, which will cause confusion in the mind of the person when a relevant situation arises.

So it is a complex scene and different biases need different treatments to mitigate their different causes.

Modelling of an organisation with eight levels of management from the very bottom to the very top, which initially had an equal number of men and women at the bottom level, shows that a mere one per cent bias against women in all promotion decisions

produced almost twice as many men than women in the second-top level reporting to the CEO. A one per cent bias in decision-making is undetectable in practice, but this modelling showed the significant effect that a tiny amount of bias can have when management makes decisions about its staff.

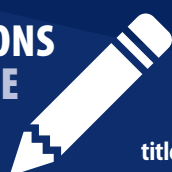
Further refinement of the algorithm should allow organisations to model their own staff numbers and calculate the average level of bias in their promotion decisions. It will be interesting to see if Australian management is interested in such an analysis of their organisations' practices.

Best practice would be for the recruitment panel to discuss their own biases before interviewing candidates, to have at hand a description of biases relevant to recruitment, their causes and their mitigation, and after the interviews, to discuss how the panel mitigated their own biases in a very transparent process.

How long will it take for business and academia to adopt such practices? ☺

*Dr Mark Toner FTSE is Chair of ATSE's Gender Equity Working Group. He is a consultant with Gender Matters, which advises organisations on gender equity issues. A former CEO of the engineering and construction company Kvaerner (now Jacobs) Australia, he is a board member (and a past Chair) of Australian Science Innovations (a non-profit organisation promoting science education to secondary school students) and Chair of Calsmelt Pty Ltd (an aluminium technology start-up). He has been a company director for more than 25 years in the STEM and IT sectors.*

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BY SUSAN POND  
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# From Black Swan to Athena SWAN

**WOMEN – NOW** Original ideas come from environments that brim with people from diverse backgrounds and original circumstances.

**T**he observation of a single black swan in Australia in the 1600s was enough to overturn long-held ideas and theories in the Old World and create new ones. Today, the metaphor of the black swan has been extended to explain outlier events or observations that disrupt conventional thinking in a range of fields, from philosophy to finance.

Why hasn't equally compelling evidence in report after report showing that women are equally as capable and ambitious as men but do not have an equal chance to flourish had the same disruptive impact?

Why is it important that they do and that conventional thinking begins to change?

In announcing its 'Welcome to the Ideas Boom' National Science and Innovation Agenda (NISA) a few weeks ago, the Australian Government made this crystal clear: "innovation and science are critical for Australia to deliver new sources of growth, maintain high-wage jobs and seize the next wave of economic prosperity".

Three tenets of this go-forward plan are crucial to its success:

- 1** Boosting the capabilities of Australia's science, technology, engineering and mathematics (STEM) disciplines.
- 2** Creating a culture in our teaching and research institutions that nurtures radical new ideas and the entrepreneurial spirit.
- 3** Overturning organisational structures, cultures and attitudes in these organisations that disadvantage women.

In support of the third tenet and to "realise our full potential as a nation through greater contribution from women", the NISA

announcement included investment of more than \$13 million to:

- support the greater participation of girls and women in the research sector, STEM industries, startups and entrepreneurial firms;
- celebrate female STEM role models; and
- build programs and networks that support workplace gender equality, such as the Science in Australia Gender Equity (SAGE) pilot.

## SCIENCE IN AUSTRALIA GENDER EQUITY (SAGE)

The Australian Academy of Science (AAS) and the Academy of Technology and Engineering (ATSE) lead SAGE in partnership. SAGE aims to improve gender equity in the Australian science, technology, engineering, mathematics and medicine (STEMM) sectors, with a focus on higher education institutions, medical research institutions and publicly funded research agencies in Australia.

Professor Brian Schmidt and Professor Nalini Joshi founded SAGE and its Steering Committee in early 2014 under the auspices of the AAS. They were motivated by continuing concerns about the entrenched under-representation of women at higher levels of appointment in Australian universities and research organisations.

ATSE, similarly motivated, has been implementing practical policies to address the stark inequalities in its own ranks and in STEM organisations more broadly since 2010.

As a first step, the Steering Committee conducted a SAGE Forum Development Meeting in July 2014. The aim of the meeting, attended by the Steering Committee and

13 other participants, was to facilitate discussion on the Athena SWAN Charter, the UK's response to similar chronic under-representation.

The background briefing for the meeting noted: *"Within the sciences, women in universities comprise only 17 per cent of level D and above positions. The evidence appears to show that women are not being promoted to more senior positions within science at the same rate as men, and that many leave the science workforce altogether. This represents a significant waste of talent and investment, which must be arrested."*

Taking advantage of the momentum generated by the July meeting, SAGE invited representatives from the UK's Equality Challenge Unit (ECU), which administers Athena SWAN, to its second Forum in November 2014.

At the Forum, senior representatives from Australian universities, medical research institutes, funding bodies, government science agencies, ATSE and many other relevant organisations gave clear endorsement to SAGE and the idea of conducting a pilot of the UK's Athena SWAN Charter in Australia.

## ATHENA SWAN CHARTER

The Athena SWAN Charter evolved from two initiatives that were working separately in the UK to advance the representation of women in STEM: the Athena Project and the Scientific Women's Academic Network (SWAN).

In 2005, 10 institutions from the university and publicly funded research sector joined forces with the ECU to form the Charter. Members signed up to the then six principles of the Charter and to the long-term



*Women front and centre at the SAGE launch.*

goal of changing embedded cultures, systems and behaviours that disadvantage women.

In May 2015, the Charter was expanded to 10 principles and to recognise the arts, humanities, social sciences, business and law, to administrative and support roles and to transgender staff and students.

Within three years of committing to the Charter's principles, organisations are expected to apply for at least a Bronze award, the lowest of the three levels available. The awards are designed to promote and reward continuous progression and sustainable change.

Applicants for awards must collect and analyse longitudinal data on women's progression within the organisation. Using this data, they are to identify reasons for female exclusion and under-representation and develop action plans to address these reasons and demonstrate progress over time.

Once an institution as a whole has received at least a Bronze award, individual departments and faculties can also apply. The awards are only valid for three years,

## ATHENA SWAN CHARTER PRINCIPLES

- 1** To address gender inequalities requires commitment and action from everyone, at all levels of the organisation.
- 2** To tackle the unequal representation of women in science requires changing cultures and attitudes across the organisation.
- 3** The absence of diversity at management and policy-making levels has broad implications which the organisation will examine.
- 4** The high loss rate of women in science is an urgent concern which the organisation will address.
- 5** The system of short-term contracts has particularly negative consequences for the retention and progression of women in science, which the organisation recognises.
- 6** There are both personal and structural obstacles to women making the transition from PhD into a sustainable academic career in science, which require the active consideration of the organisation. health, social, business, agricultural, environmental, landholder and economic impacts of the industry; and harmonisation of federal and state/territory government legislation, regulations and policies.

after which holders must reapply. Renewal requires evidence of progress and successful completion of milestones during the previous three years.

Since its inception in 2005, Charter membership has grown rapidly from the

original group of 10 to the current 136.

The impact of the Charter on changing the culture and attitudes with the member organisations is assessed independently on a regular basis. The most recent Athena SWAN Evaluation Report, in 2014, found





*Our vision is to create sustainability and excellence in Australia's power engineering.*

## What is the API?

The Australian Power Institute (API) is a not for profit national organisation established by the Australian power industry to boost the quality and numbers of power engineering graduates with the skills and motivation for a career in the energy industry which encompasses:

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- End users of electricity in their operations.

## Value Proposition

To deliver a sustainable supply of highly skilled power engineering professionals working effectively to meet the challenges of creating Australia's new energy future, and underpin the technical and commercial success of member companies in the energy sector.

The key objectives of API are to achieve the following:

- Provide a sustainable supply of quality power engineering graduates to industry
- University power engineering teaching and learning provides relevant industry skills
- Value added continuing professional development programs
- A respected organisation leading the national development of power engineering skills.

## Further Information

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considerable evidence of effectiveness in advancing women's careers in STEMM and sustainable change in culture, systems and attitude in participating institutions.

Interestingly, however, the Report noted that even after nearly 10 years of the Charter's operation, institutional champions were generally females working in equality and diversity roles. It recommended that the ECU consider how to address this imbalance and the associated widely held misconception that gender-equality work is only pursuing improvements for women.

In a controversial move, Dame Sally Davies, the UK Government's Chief Medical Officer, announced in 2011 that, from 2015, medical schools would require a Silver Athena SWAN award to be eligible for the Medical Research Council's National Institute for Health Research Funding. This move led to an increase in applications for the award and increased scrutiny of decisions and processes within the ECU and the institutions seeking and obtaining awards.

### SAGE PILOT

The SAGE Pilot of Athena SWAN was launched in Parliament House in Canberra last September.

The launch involved, moderated by political journalist Ms Lyndal Curtis, attracted a host of parliamentary leaders and equality advocates, including:

- Ms Karen Andrews, Parliamentary Secretary to the Minister for Industry and Science and Co-convenor Parliamentary Friends of Science;
- Ms Kelly O'Dwyer, Parliamentary Secretary to the Treasurer and Co-convenor Parliamentary Friends of Women in Science, Mathematics & Engineering;
- Mr Richard Marles, Shadow Minister for Immigration and Border Protection and Co-convenor Parliamentary Friends of Science;
- Professor Nalini Joshi FAA and Dr Susan Pond AM FTSE, SAGE Steering Committee Co-Chairs and Committee members Dr Jennifer Martin, Professor Sharon Bell and



Launching SAGE (from left) Ms Lyndal Curtis, Mr Richard Marles, Dr Jennifer Martin, Professor Nalini Joshi, Ms Kelly O'Dwyer, Ms Karen Andrews, Dr Alan Finkel, Professor Sharon Bell, Dr Maggie Evans-Galea, Professor Andrew Holmes and Dr Susan Pond.

Dr Maggie Evans-Galea;

- ATSE President Dr Alan Finkel AO FTSE; and
- AAS President Professor Andrew Holmes FRS FAA FTSE.

By the time of the launch, the two Academies had forged a strong partnership and the Steering Committee had made a call for applications and selected 32 institutions willing to participate.

The objectives of the pilot are two-fold: demonstrate the efficacy and feasibility of operating Athena SWAN in Australia and work with SAGE to adapt the UK processes and materials to suit the Australian context.

Funding to date has been provided by donations from Academy Fellows, sponsorship from each Academy and the Office of the Chief Scientist, and contributions from the participating organisations.

The pilot will run for 3.5 years and involve two cohorts. The first 20 participants commenced in September 2015. The second cohort will start in September 2016.

In addition to providing the licence for Athena SWAN, the ECU will provide oversight of the assessment process and training workshops for participants. These will commence in early 2016.

### ENSURING SUCCESS

The need for female and male champions to ensure the success of SAGE was very much in the minds of ATSE and AAS when they reached a formal agreement to work in partnership on the SAGE Pilot. Each Academy being male-dominated has a lot of champions to choose from. Even so, the audience at the launch of the SAGE Pilot was predominantly female. Females do represent a powerful force for change. But self-segregated monocultures – of men or women – will not overturn the entrenched gender inequality in Australia's academic and research institutions. Remaining silent on the gender gap is not an option for anyone. ☺

*Dr Susan Pond AM FTSE is a senior leader in business and academia, recognised for major national and international contributions in biotechnology, renewable energy and sustainability. She is Co-Chair of SAGE, consultant to the United States Studies Centre and Adjunct Professor in Engineering and Information Technologies at the University of Sydney. As Vice-President (2011–15) Dr Pond led the development of ATSE's gender equity policies and strategies. She is Director of Biotron Ltd and Engineering Sydney, and Chairman of the Australian Institute of Bioengineering and Nanotechnology. In 2013, the Australian Financial Review and Westpac named her in the Top 100 Women of Influence.*





ATSE – stepping out on gender equity.

PHOTO: ISTOCKPHOTO

## ATSE IS TAKING THE LEAD ON GENDER EQUITY

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A key recommendation from the 2005 Review of the Australian Learned Academies was that “all of the Academies focus

on addressing gender imbalances in their Fellowships”.

In 2007, as part of a program of governance reform of ATSE, the ATSE Board commissioned a review of membership processes and sought advice on a number of issues including gender balance. The Board noted the need to enhance the recognition of leading women in technological sciences and engineering and instructed Division Committees to actively increase the nomination of women for consideration for ATSE membership.

Women bring to the science, technology, engineering and mathematics (STEM) sector a wealth of talent and creativity but continue to be under-represented in STEM organisations, particularly at senior levels.

Research institutes, academia, business and government need to adopt mechanisms which recruit and retain women in technological sciences and engineering and enable them to thrive, excel and be recognised.

Additionally, much research has been carried out by reputable organisations such as McKinsey, Goldman Sachs and Credit Suisse on the financial benefits of having more women at senior management and board level in organisations, and all the research points to superior outcomes when women are well represented at these levels. This is the so-called ‘business case’ for more women in management and on boards.

So maximising participation and retention of women at all levels in technological sciences and engineering should be a priority in terms of maximising productivity and innovation in Australia, as well as seeking social equity.

ATSE has committed to actively promote gender diversity and equity (equal rights and opportunities for all regardless of gender) through various initiatives over the past five years. Implementation of a new Gender Equity Policy in late 2010 included setting a gender target of 33 per cent for new Fellows elected each year.

ATSE recognised then that more direct action was needed to address the gender imbalance both within its membership and its structures and activities as well as more broadly in promoting women at senior levels in technological sciences and engineering in Australia. To this end, in 2015 it established a Gender Equity Working Group, with its own Terms of Reference, to advise the Board on gender equity issues and to work with the ATSE CEO in providing advice and direction on implementation of gender policies.

A revised Gender Equity Policy was issued in late 2015.

In mid-2015 ATSE partnered with the Australian Academy of Science to implement the Science in Australia Gender Equity (SAGE) program, which addresses gender equity in the science, technology, engineering, mathematics and medical (STEMM) sector. The program has been adapted from the Athena SWAN Charter, established in the UK in 2005, an accreditation and improvement program for higher education and research organisations focusing on gender and other

forms of inequality. In the UK the Athena Swan Charter has proved highly successful in transforming gender equity action to improve the promotion and retention of women and gender minorities within STEMM.

ATSE’s initiatives have made it a leader in gender equity amongst Australia’s Learned Academies and other professional institutions. The impact of these initiatives over the past five years is very evident in its own activities:

- over the past three years, its target of one-third of new Fellows being women has been achieved;
- as a result, the proportion of women across its Fellowship has been increasing steadily and is now more than 10 per cent;
- the proportion of women on its Board over the past three years has exceeded 40 per cent;
- the proportion of women in its Division Committees has been steadily increasing and currently averages about 20 per cent; and
- it actively encourages gender equity in all STEM areas by adopting a policy that it “will not support or participate in external activities where the organising body has no gender equity policy or where women are not reasonably represented amongst speakers/panellists, unless there are extenuating circumstances”.

Through its initiatives in gender equity in recent years, both within its own organisation and across its Fellowship, ATSE has demonstrated strong leadership in the STEM sector and has set the example for other organisations to follow. ☉

– DR MARK TONER FTSE





BY MARLENE KANGA  
marlenekanga@bigpond.com

# Altering the mindset: women essential for engineering

**WOMEN – NOW** Our neighbours in Asia and Africa are powering along, attracting girls to science and engineering as careers of choice, providing high levels of respect and satisfaction.

**I**t's time to bust the prevailing myth that engineering is a male-dominated profession. While the proportion of women in engineering remains small in many countries where engineering first established as a profession – the UK, Western Europe, the US, Canada, Australia, New Zealand and South Africa – the proportion of women in engineering is significantly higher in Latin America, Asia and Africa and, increasingly, women are taking leadership roles in these countries.

Innovation and new technologies are increasingly seen as the route to becoming a developed economy. Consequently, countries around the world are recognising the importance of science and mathematics as skills in these areas will be essential for careers in science, technology and

engineering. Many have a strategic national approach that provides opportunities for boys and girls, as this is a numbers game and it's recognised that it is important to attract and retain the best and the brightest.

However, Australia continues to lag in this important area. In the post-mining-boom era, where Australia is looking to innovation to develop new industries and create jobs, there is a serious deficit in the participation of women in science, engineering and technology.

These are the worst performing sectors by any measure. For example, listed companies in this sector have the lowest proportion of women on their boards, and most of the women that are appointed to these boards do not have a science or engineering background. Only five Australian-owned companies in this sector were listed

as Employers of Choice by the Workplace Gender Equality Agency in 2015, indicating that the majority had not implemented systematic processes to ensure gender equity.

We do have a small number of very competent, high profile women engineers in Australia who are in significant leadership positions and gaining recognition for their leadership in science and engineering, especially in innovation. However, Australia is falling behind in the proportion of girls studying science and mathematics, the enabling subjects for tertiary studies in engineering.

## BELOW 20 PER CENT

The proportion of young women studying engineering remains below 20 per cent – 14.4 per cent for all levels of qualifications in 2012, although pockets of higher percentages



Women from all continents at the World Federation of Engineering Organizations meeting in Kyoto in December 2015.

exist in some faculties. On graduation a high proportion leave engineering within the first 10 years, especially as they start a family. Women in engineering surveys have repeatedly shown that balancing work and family is a top priority for women and a key reason for their movement into other fields.

The 2011 census shows that about 50 per cent of qualified women engineers do not work in engineering and that the overall proportion of women working in engineering is just 9.7 per cent, of which two-thirds are overseas born, showing the large losses that occur in Australia after graduation. The losses continue throughout the career cycle, especially after family formation, so that, according to the 2011 census, the average age of women engineers is 35 years and there were only approximately 500 Australian-born women working in engineering and aged more than 50 years. Consequently, the pipeline of career progression of women engineers to leadership positions is full of very large holes.

By comparison, our neighbours in Asia

and Africa are powering along, attracting girls to science and engineering as careers of choice, providing high levels of respect and satisfaction. In Malaysia, for example, nearly 30 per cent of registered engineers are women and the proportions studying engineering are around 50 per cent, supported by government policies that recognise the importance of women's contribution to innovation and economic development.

In Kuwait, the proportion of women studying engineering is greater than 50 per cent and increasing numbers are working in engineering. Malaysia and many other countries in Asia and Africa have recognised the importance of diverse leadership teams and have set targets of 30 per cent of women on boards and in leadership positions.

It is clear that women around the world are studying engineering and are active in the profession in increasing numbers. It's a myth that engineering is a male-dominated profession or that women cannot be great engineers. Women excel at engineering and I

know many who derive enormous enjoyment from the intellectual challenges and opportunities that engineering provides.

What is needed is a change in the mindset of engineering organisations, especially our leaders. Increasing the diversity in the engineering profession, with equitable access for everyone, is a business decision.

It has been repeatedly shown that diverse teams significantly outperform homogenous ones, even if the latter are made up of star performers. According to McKinsey, the global consulting firm, increasing diversity is the most effective way for companies to improve their performance at every level.

So what is the best way to build diverse teams? Organisations have spent large amounts of effort and money on a plethora of programs to increase diversity without much success. A cultural transformation is needed, similar to that achieved in changing Australia's approach to safety in the workplace. Companies have shifted from a 'she'll be right' attitude to one where safety is a paramount, non-negotiable value, recognised as an

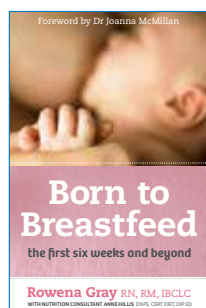
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important goal by everyone. Australia's safety performance is now world-class.

Similarly, there is a need for the leaders of the engineering profession to step up to change the workplace to be more diverse and inclusive. As with safety, the transformation requires a strategic approach that is led from the top.

I have developed such a strategic approach with innovative reporting using leading and lagging indicators, similar to those used in safety. The approach re-positions existing programs within a strategic framework, achieving significant change without incurring additional cost. Importantly, organisations that have used this approach are also on the path to becoming Employers of Choice. This strategy is freely available from the link below.

In addition to enhancing business and innovation performance, it's an ethical responsibility to ensure our workplaces provide genuine equity of opportunity and value the differences in perspective that people of different backgrounds, ages, gender and ability bring to the team.

Inclusive cultures respect all individuals and recognise that differences are essential to drive innovation, reduce risks and create more relevant products. Ultimately these result in improved financial performance, better governance, more opportunities and ultimately better economic outcomes for Australia. ☺

## FURTHER READING

1. Dr Marlene Kanga, *A strategy for inclusiveness, wellbeing and diversity in engineering workplaces* [https://www.wgea.gov.au/sites/default/files/Inclusiveness\\_Wellbeing\\_Diversity\\_Strategy.pdf](https://www.wgea.gov.au/sites/default/files/Inclusiveness_Wellbeing_Diversity_Strategy.pdf)
2. *The engineering profession, a statistical overview*, 11th edition, 2014 [www.engineersaustralia.org.au](http://www.engineersaustralia.org.au)

*Dr Marlene Kanga AM FTSE is a member of the ATSE Gender Equality Working Group. She is a Director of Sydney Water Corporation and Director of iOmniscient Pty Ltd, which has developed patented software technology for intelligent video analytics systems. She is a Board member of Innovation Australia and chair of its R&D Incentives Committee. She was National President of Engineers Australia in 2013 and is President Elect of the World Federation of Engineering Organisations (WFEO). She has been listed among the Top 100 Engineers in Australia in 2013, 2014 and 2015 and the Top 100 Westpac Women of Influence in 2013.*

## WORKING HARD TO RECRUIT WOMEN ENGINEERS

Australia is frantically short of engineers – the country annually imports more than double the number who graduate from Australian universities, and has done so for more than a decade.

Every year, some 18,000 engineering positions need to be filled. Almost 6000 come from engineering students who graduate from universities in Australia, of whom almost 20 per cent come from the University of New South Wales (UNSW), which has the country's biggest engineering faculty.

The other 12,000 engineers arrive in Australia to take up jobs – 25 per cent on temporary work visas.

"Demand from industry completely outstrips supply, and that demand is not slowing – in fact, it has doubled in the past decade," says Professor Mark Hoffman FTSE, Dean of Engineering at UNSW.

Only about 13 per cent of engineers in Australia are women, a ratio that has been growing slowly for decades.

UNSW's Faculty of Engineering is investing in a number of initiatives to support this.

The Faculty has recently tripled the number of its Women in Engineering scholarships to 15, with a value of more than \$150,000 annually, partly funded by UNSW and industry partners such as the Commonwealth Bank, Arup and WSP Parsons Brinckerhoff, as well as private benefactors.

It also hosts the annual Women in Engineering Camp. In January, 90 young women with their hearts set on a future of maths and science came to UNSW from around Australia, more than tripling the size of previous camps. The Years 11 and 12 students spent five days exploring engineering as a career and visiting major companies such as Google, Resmed, Transurban and Sydney Water to see the engineering profession in action.

In the past, 75 per cent of girls who attended the camp in Year 12 have gone on to enrol in engineering at UNSW.

"There may be young women in high school right now who could become some of the best engineers ever born – but if they don't know about the profession and what it offers, they'll never realise that potential," says Alexandra Bannigan, Manager of the Women in Engineering Initiative at UNSW. "If we succeed, it's a win for them as individuals, it's a win for us as a society and it's a win for the engineering profession."

Professor Hoffman's goal is to raise female Faculty representation among students, staff and researchers to 30 per cent by 2020. Currently, 21 per cent of UNSW engineering students are female, compared to the Australian average of 16 per cent.

"Engineering has one of the highest starting salaries, and the average starting salary for engineering graduates has been actually higher for women than for men," he says.

"In a knowledge-driven economy, the best innovation comes from diverse teams who bring together different perspectives," he adds. "This isn't just about plugging the chronic skills gap – it's also a social good to bring diversity to our technical workforce, which will help stimulate more innovation."

"We can't win at the innovation game if half of our potential engineers are not taking part in the race."



*UNSW Women in Engineering Camp participants visit the Qantas Engineering and Maintenance facility in Sydney.*





BY MARGARET HARTLEY  
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# Academy women hold big industry and research roles

**WOMEN – NOW** Chief Scientists, business leaders, CSIRO stalwarts and leaders in engineering, minerals, food and fibre, and medicine and biotechnology.



Women Fellows of the Academy hold leading roles in government, industry and research across Australia – and are influential in advice

to governments around the country. As CEO of ATSE, I am very proud of the significant impact they are having on Australia's future through their work in technological fields.

**Emeritus Professor Mary O'Kane** AC FTSE is NSW Chief Scientist and Engineer and was recognised for her work in the 2016 Australia

Day Honours. She has chaired major reviews of the Bureau of Meteorology and the Cooperative Research Centres Program. She was Vice-Chancellor of the University of Adelaide (1996 to 2001), Chair of

the Australian Centre for Renewable Energy (2010–12) and is a former member of the Australian Research Council, the Cooperative Research Centres Committee, the board of FH Faulding & Co Ltd and the CSIRO Board.

She is one of three Women Fellows holding chief scientist roles – **Dr Leanna Read** FTSE, a former ATSE director, is SA Chief Scientist and **Ms Leonie Walsh** FTSE is Victoria's Lead Scientist. Prior to her appointment to the Lead Scientist position, Ms Walsh worked for Visy Industries and South East Melbourne Water in Victoria, and internationally for Henkel and Dow Chemical. Dr Read is a renowned biotechnology expert, chair of the CRC for Cell Therapy

Manufacturing, a member of the SA Economic Development Board, the Council for the University of South Australia and a member of BioAngels, which supports early-stage life sciences businesses.

**Professor Lyn Beazley** AO FTSE is a neuroscientist, educator and science ambassador based in Perth and was Chief Scientist of Western Australia (2006–13).

## BUSINESS LEADERS

**Ms Catherine Livingstone** AO FAA FTSE is one of Australia's most-recognised business leaders – President of the Business Council of Australia, Chair of Telstra, former CSIRO Chair and a director of Macquarie Bank and WorleyParsons.

**Dr Megan Clark** AC FTSE, former CEO of CSIRO, is a Director of Rio Tinto; **Ms Kathryn Fagg** FTSE is a board member of the Reserve Bank of Australia, Boral, Incitec Pivot and Djerriwarh Investments; **Dr Patricia Kailis** OBE AM FTSE is a prominent business woman, geneticist and neurologist who has combined her training in medicine with involvement in family shipbuilding, prawning and pearling industries in WA; and **Ms Else Shepherd** AM FTSE is Chair of Powerlink (Queensland) and a pioneer and role model in breaking through the barriers to women's professional acceptance particularly in 'non-traditional' fields such as engineering.

**Dr Rosalind Dubs** FTSE is a company director, serving on the boards of Aristocrat Leisure Ltd and ASC Pty Ltd. She managed international engineering businesses in Europe for Thales SA, and chaired the Space Industry Innovation Council (2010–12).

**Dr Carrie Hillyard** FTSE was a Co-Founder

and is Managing Partner at CM Capital Investments Pty Ltd, focused on life sciences investments at the firm, and is Deputy Chair of Mater Research in Brisbane.

**Ms Katherine Hirschfeld** FTSE is a chemical engineer who, prior to her retirement in 2010, was Executive Director, BP Australasia and is now a Director of Transfield Services Ltd (now Broadspectrum), Toxfree Solutions Ltd and UN Women Australia.

**Dr Erica Smyth** FTSE is Chairman, Toro Energy Ltd, Scitech, the Diabetes Research Foundation (WA), and ScreenWest, and Director of ANSTO, EMECO Holdings Ltd and the Royal Flying Doctor Service (WA).

## CSIRO

ATSE women have also been prominent in leadership roles within CSIRO.

**Dr Mary Ann Augustin** FTSE is Research Program Leader (Food Science) at CSIRO, leading research and working to apply the outcomes to creation of an impressive array of commercially successful food ingredients, products and processes.

**Dr Nan Bray** FTSE, was formerly Chief of Division, CSIRO Marine Research, based in Tasmania, and earlier headed the Physical Oceanography Division at the Scripps Institution of Oceanography in San Diego.

**Dr Joanne Daly** PSM FTSE is Strategic Advisor at the Australian Centre for International Agricultural Research with responsibility for advising the CSIRO Executive



Mary O'Kane



Erica Smyth

on its collections and facilities. Her immediate past role was as Group Executive, Agribusiness (2007–11) on the CSIRO Executive.

**Dr Liz Dennis** FAA FTSE is currently a chief scientist at the plant division of CSIRO Canberra. She jointly received the inaugural Prime Minister's Prize in 2000 for her outstanding achievements in science and technology and won the Farrer Memorial Trust Medal in 2014.

**Dr Cathy Foley** PSM FTSE heads CSIRO's Materials Science and Engineering Division and is known for her work on SQUID systems underpinning the discovery of mineral ores worth many billions of dollars. She won a Clunies Ross Award in 2015 and is past President of both the Australian Institute of Physics and Science and Technology Australia.

**Dr Elizabeth Heij** FTSE is a former Chief of the Division of Horticulture at CSIRO and later was Chief of its Division of Tropical Agriculture.

**Dr Anita Hill** FTSE is a member of the CSIRO Executive, and as Executive Director, Future Industries, oversees its Manufacturing, Health and Biosecurity, and Food and Nutrition Business Units, as well as CSIRO's

Services line of business.

**Dr Jennifer Stauber** FTSE is Chief Research Scientist, CSIRO, and Australia's foremost ecotoxicologist who has pioneered the development and application of

environmental assessment techniques for contaminants for regulators and industry.



Jennifer Stauber

## DEFENCE

**Ms Janis Cocking** FTSE heads the DSTO Maritime Platforms Division, where she oversees the S&T support program for the Royal Australian Navy's fleet. She led the scientific and technological support program for the Collins class submarines.

**Air Vice Marshall**



Janis Cocking

**(Retd) Julie Hammer** AM FTSE, was formerly Australia's most senior woman in the Australian Defence Force and President of Engineers Australia. She was the first woman to command an RAAF operational unit, the Electronic Warfare Squadron.

## ENERGY & MINERALS

**Ms Denise Goldsworthy** FTSE was a General Manager at Rio Tinto and is now a management consultant, Chairman of ChemCentre WA, and a Director of Arrium Ltd, Export Finance and Insurance Commission and the Minerals Research Institute of Western Australia.

**Dr Vanessa Guthrie** FTSE is Managing Director of Toro Energy Ltd and a leader in uranium mining and extraction and nuclear power options and previously held senior appointments in the minerals and gas industries with Woodside, Alcoa, WMC and Pasminco.



Vanessa Guthrie

**Ms Chloe Munro** FTSE is Chair and Chief Executive Officer of the Clean Energy Regulator. She has been Secretary of two Victorian Government departments, held senior positions in Telstra and was Commissioner and Chair of the National Water Commission.

**Dr Lorraine Stephenson** FTSE is a leading industry expert working across energy, climate change and sustainability. She has held senior executive roles and current Board positions and advises governments on the development and financing of low-emission technologies.

**Dr Susan Pond** AM FTSE is a senior leader in business and academia, Co-Chair of SAGE, consultant to the United States Studies Centre, Adjunct Professor in Engineering and Information Technologies at the University of Sydney as well as a former ATSE Vice-President.

**Professor Beverley Ronalds** FTSE is an engineer with experience in major firms in Australia and UK, who was appointed Woodside Chair in Oil and Gas Exploration at the University of Western Australia in 1995 and served as Group Executive, CSIRO Energy.

## ENGINEERING

**Dr Marlene Kanga** AM FTSE is a Director of Sydney Water Corporation and iOmniscient Pty Ltd. She is a Board member of Innovation Australia, was National President of Engineers Australia in 2013 and is President Elect of the World Federation of Engineering Organizations.

**Professor Elizabeth Taylor** FTSE is a consultant who chairs Engineers Australia's Accreditation Board, RedR Australia and International RedR. She is a former Pro Vice Chancellor of Central Queensland University and former President of the Australian Council of Engineering Deans.



Elizabeth Taylor

## FOOD & FIBRE

**Dr Diane Davidson** AM FTSE is an agricultural scientist and horticulturalist, viticultural consultant, a Member of the Murray–Darling Basin Authority, Deputy Chancellor of the University of Adelaide and a former member of the SA Premier's Climate Change Council.

**Dr Kate Fairley-Grenot** FTSE chairs the nation's Rural Research and Development Council and has wide-ranging agricultural interests. She is an adjunct Professor in the Faculty of Agriculture and the Environment at the University of Sydney.

**Dr Meryl Williams** FTSE is a former Chair of the Australian Centre for International Agricultural Research (ACIAR) and Director General of the WorldFish Center who won the 2015 Crawford Fund Medal for 30 years' work in aquaculture, conservation and agricultural F&D.

**Dr Elizabeth Woods** OAM FTSE is Director-General, Agriculture in Queensland and recognised nationally and internationally for her leadership in innovative agricultural research, farmer profitability and hunger and poverty in the developing world.

**Dr Doreen Clark** AM FTSE founded Organic Crop



Elizabeth Woods

Protectants Pty Ltd, was MD of Analchem Bioassay Pty Ltd for 30 years, the first woman to be elected National President of The Royal Australian Chemical Institute, Chair of the National Standards Commission and an ATSE Vice President.

**Dr Mary Rose** FTSE is a former Principal Husbandry Officer with the Queensland Department of Primary Industries' Sheep and Wool Institute.

**Dr Jennifer Wythes** FTSE is an agricultural scientist who was Chair and CEO of the Queensland Livestock Meat Authority and a director of the Meat Research Corporation.

## MEDICINE & BIOTECHNOLOGY

**Professor Marilyn Anderson** AO FAA

FTSE is Chief Scientist, Hexima Ltd, and is recognised internationally as an outstanding



Marilyn Anderson

plant molecular biologist whose discoveries has been applied globally and as a leader and contributor to community debates on technology

**Dame Marie Bashir** AD CVO

FTSE is the former

Governor of NSW, Chancellor of the University of Sydney and Clinical Director of Mental Health Services for the Central Sydney Area Health Service, with a long history of service to medicine and psychiatry.

**Dr Bronwyn Evans** FTSE is CEO of Standards Australia and chairs the Medical Technologies and Pharmaceuticals Growth Centre. An electrical engineer by training, she led the quality, clinical and regulation process for Cochlear Ltd and was also chair of the Medical Technology Association of Australia.

**Ms Barbara Gibson** FTSE is a former GM of Orica's Chemicals Group in Australia and Chair of Orica NZ and Director of Incitec Ltd and Biota Holding Inc. She was also Vice President of the Australian Pharmaceuticals Manufacturing Association.

**Dr Cherrell Hirst** AO FTSE, Deputy Chair/Acting CEO, Queensland Biocapital Funds Pty Ltd, is known for her pioneering work in establishing and promoting breast cancer screening, which has had a profound influence on women's health.

**Dr Anna Lavelle** FTSE, CEO of Ausbiotech,

has played a pivotal role in biotechnology and healthcare innovation and increased investment into the industry. She championed the R&D Tax Incentive to fund product development and increase foreign direct investment.

**Dr Tracie Ramsdale** FTSE is a Director and co-founder of Alchemia Ltd, which licensed its technology to major international pharmaceutical and manufacturing partners, and has served on the Advisory Council on Intellectual Property, the Queensland Biotechnology Advisory Council.

**Dr Deborah Rathjen** FTSE is CEO and MD of Bionomics Ltd, and known for her significant contribution to Australia's biotechnology sector as an inventor, commercial developer and entrepreneur and her impact on the biotechnology industry.

**Dr Merilyn Sleigh** FTSE is a former CEO and MD of Evogenix Pty Ltd, R&D Director of Peptech Ltd and Chief Research Scientist and Assistant Chief of Division with CSIRO who has served on a wide range of government committees, boards and councils.

**Dr Meera Verma** FTSE is Acting Chief Executive of BioSA, which aims to bring innovative South Australian products and technologies to global markets, with a strong background in biotechnology company management and manufacturing.

## TECHNOLOGY POLICY

**Dr Margaret Hartley** FTSE has been CEO of ATSE since 2009 and was previously the Principal Scientific Advisor to the Australian Department of Health and Ageing, Director of the Office of Chemical Safety and Australia's Industrial Chemical Regulator (1997 to 2006).

**Dr Sue Meek** AO FTSE has been the Chief Executive of the Australian Academy of Science since May 2008. She has more than 30 years' experience working in a variety of capacities at the interface of industry, academe and government.



Katherine Woodthorpe

**Dr Katherine Woodthorpe** FTSE is Chair of the Antarctic Climate and Ecosystems CRC and a director of Sirtex Medical Ltd. She has made substantial contributions to the Australian

technology and science translation landscape over the past 25 years, with significant influence on government policies.



Sue Barrell

## WATER, CLIMATE & SUSTAINABILITY

**Dr Susan Barrell** FTSE is Deputy Director, Observations and Infrastructure in the Bureau of Meteorology. She is a world leader in weather and climate observation technologies and a widely respected authority on international climate change monitoring and research.

**Dr Wendy Craik** AM FTSE, former Productivity Commissioner and Murray-Darling Basin Commission CEO, earlier head of the National Farmers Federation and now Chair of the Climate Change Authority, is also Deputy Chancellor of the University of South Australia.

**The Hon Karlene Maywald** FTSE was Chair and Commissioner, National Water Commission, a former SA Government Minister and Strategic Adviser – Water Opportunities to the SA Government, assisting its water expertise global sales pitch.

**Ms Susan Murphy** FTSE is CEO, Water Corporation Western Australia, and Chair of the Water Services Association of Australia. She has been listed repeatedly among the top 100 most influential engineers in Australia by Engineers Australia. ☺

*Dr Margaret Hartley FTSE has been CEO of ATSE since 2009 and was previously the Principal Scientific Advisor to the Australian Department of Health and Ageing, and Director of the Office of Chemical Safety. She was Australia's Industrial Chemical Regulator (1997 to 2006), responsible for leading and managing the regulation of chemicals and cosmetics and promoting safe and sustainable use of industrial chemicals. Dr Hartley formerly held positions in pharmacology and epidemiology at Monash University and the ANU.*





BY ROSALIND DUBS  
rosalind.dubs@gmail.com

# Women Fellows influential leaders in Australian universities

**WOMEN – NOW** Chancellors, Vice Chancellors, Provosts and Deputy Vice Chancellors – and research leaders across diverse disciplines.

**A** ATSE Women Fellows play an impressive role in Australian universities at management, research leadership and researcher levels, and I am delighted to present this extensive list of female leadership and achievement. All of them play a significant part in advancing Australia's innovation agenda. At the peak level of governance, they have been serving in key roles as Chancellors and Vice Chancellors.

**Ms Catherine Livingstone** AO FAA FTSE, Chair of Telstra and President of the Business Council of Australia – and a former Chair of CSIRO, will shortly become Chancellor of the University of Technology Sydney, following an 11-year stint by eminent life scientist and former CEO of the Australian Research Council, **Professor Vicki Sara** AO FTSE.

**Professor Adrienne Clarke** AC FAA FTSE, former Victorian Lieutenant Governor and also a former CSIRO Chair, has been Chancellor of La Trobe University since 2011.

**Dame Marie Bashir** AD CVO FTSE, former Governor of NSW, was Chancellor of the University of Sydney (2007–12).

**Dr Wendy Craik** AM FTSE, former Productivity Commissioner and Murray–Darling Basin Commission CEO and now Chair of the Climate Change Authority, is Deputy Chancellor of the University of South Australia.

**Dr Diane Davidson** AM FTSE, an agricultural scientist and horticulturalist and a Member of the Murray–Darling Basin Authority, is Deputy Chancellor of the University of Adelaide.

**Emeritus Professor Helen Garnett** PSM FTSE, a former Executive Director of ANSTO, was inaugural Vice Chancellor of Charles Darwin University



Adrienne Clarke

At the senior executive level of Australian universities, ATSE's women Fellows contribute a wealth of talent to the management and conduct of research.

**Professor Margaret Sheil** FTSE, former CEO of the Australian Research Council, is Provost of the University of Melbourne – and an ATSE Director – and Professor Edwina Cornish AO FTSE, a member of the CSIRO Board, is Provost of Monash University.

**Professor Tanya Monro** FAA FTSE is Deputy Vice Chancellor Research and Innovation at the University of South Australia – and an ATSE Vice President.

**Professor Robyn Owens** FTSE is Deputy Vice Chancellor (Research), University of WA.

**Professor Judy Raper** FTSE holds the same position at the University of Wollongong and is an ANSTO Director.

**Emeritus Professor Lesley Parker** AM FTSE was Deputy Vice Chancellor of Curtin University for eight years.

Then there is the sizeable group of highly regarded researchers and research leaders across the country in a wide range of fields.

## CHEMISTRY & CHEMICAL ENGINEERING

**Professor Rose Amal** FTSE is an ARC Laureate



Robyn Owens



Rose Amal

Fellow and was Director, ARC Centre of Excellence for Functional Nanomaterials (2010–13). She leads the Particles and Catalysis Research Group at the University of NSW.

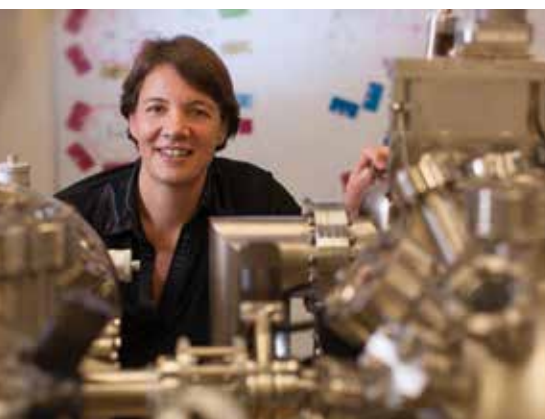
**Professor Hua Kun Liu** FTSE is a Distinguished Professor and a coordinator of the energy materials research program of the Institute for Superconducting and Electronic Materials (ISEM) at Australian Institute of Innovative Materials, University of Wollongong.

## CLIMATE, ENVIRONMENT & INFRASTRUCTURE

**Professor Ann Henderson-Sellers** FTSE is an Emeritus Professor at Macquarie University, Sydney, a former Director of the World Climate Research Program in 2006 and 2007 and earlier Director of the Environment Division at ANSTO and Deputy Vice-Chancellor (R&D) at RMIT.

**Professor Amanda Lynch** FTSE is Professor of Geography at Monash University, the author of many publications and is one of the eight scientists sharing in the 2007 Nobel Peace Prize awarded jointly to the IPCC and former US Vice-President Al Gore.

**Professor Helene Marsh** FTSE is Professor of Environmental Science and the Dean of



Michelle Simmons



Doreen Thomas



Helene Marsh

Graduate Research Studies at James Cook University and a program leader in the Marine and Tropical Science Research Facility, focusing on dugong population ecology.

**Professor Cynthia Mitchell** FTSE, Deputy Director, Institute for Sustainable Futures, University of Technology Sydney, has a national and international reputation for her transdisciplinary work for economic, environmental, and social sustainability in the water and wastewater sector.

## COMMUNICATIONS & COMPUTING

**Professor Bronwyn Harch** FTSE is an environmental statistician who is Assistant Dean of Research in the Science and Engineering Faculty and Deputy Director of Research in the Institute for Future Environments at Queensland University of Technology.

**Professor Michelle Simmons** FAA FTSE is an ARC Laureate Fellow and Director of the ARC Centre of Excellence for Quantum

Computation and Communication Technology at the University of NSW. An international expert in atomic electronics and quantum computing, she leads a large team of researchers developing a radical, uniquely powerful, ultra-secure computing technology.

**Professor Svetha Venkatesh** FTSE is Professor of Computer Science and Director of the Centre for Pattern Recognition and Data Analytics at Deakin University. She is known widely for her contributions to formulation and extraction of semantics in multimedia data.

**Professor Branka Vucetic** FTSE, from the University of Sydney, is recognised as a world leader in channel coding theory and its applications in wireless communication systems. Her innovations have had a world-changing impact on technology.

## ENGINEERING & ASTRONOMY

**Professor Ana Deletic** FTSE is Associate Dean of Research (Engineering) and a Director

of Monash Water for Liveability at Monash University. She won the Victoria Prize in 2012 and has more than 20 years' experience in urban water research.

**Professor Anne Green** FTSE is Professor of Astrophysics at the University of Sydney and the first female Head of the School of Physics. She has outstanding achievements in astronomy and telescope technology, and made a significant impact on planning for the Square Kilometre Array.

**Professor Veena Sahajwalla** FTSE is the founding Director of UNSW's Centre for Sustainable Materials Research and Technology (SMaRT) and is recognised internationally for her environmentally friendly process for recycling plastics and rubber tyres in steelmaking.

**Professor Doreen Thomas** FTSE is the Head of Mechanical Engineering at the University of Melbourne and Associate Dean (Research) for the Melbourne School of Engineering who has an international

## ICT PROFESSION CHASES GENDER EQUITY

The ACS – the professional association for Australia's ICT Sector – has launched a new report, *The Promise of Diversity: Gender Equality in the ICT Profession*, outlining a series of recommendations to increase the participation of women in the ICT profession.

The Report says that, at a time when Australia is facing a serious shortage of skilled ICT professionals, women represent only 28 per cent of the ICT workforce compared to 43 per cent of the wider professional workforce. This underutilisation of human capital in ICT looms as a major constraint on Australia's national growth, it notes.

The Report examines the entire life cycle of female participation in ICT and focuses on three key areas:

- female participation in the workforce;
- females and the school education sector; and

- females and the vocational and higher education sectors.

The ACS argues a fundamental and urgent change to the cultural mindset and attitudes to women in the workforce is needed. This requires genuine, committed, outcome-focused leadership.

The Report also notes that changes are required in our education system. The ACS recommends initiatives aimed at improving the self-confidence of girls in their own abilities in maths and science, creating a school environment that actively encourages girls to pursue a digital career, introducing a mandatory Digital Technologies Curriculum, and developing a marketing program aimed at changing perceptions of what a digital career can offer.

The ACS launched the Report with the Assistant Science Minister, Karen Andrews, at the National Press Club, Canberra.



Jocelyn McPhie



Kaye Basford



Anne Simmons

reputation for mathematical research in network optimisation.

**Professor Mary-Anne Williams** FTSE, from the University of Technology Sydney, is an international authority in artificial intelligence (AI) and human-robot interaction whose research has changed design paradigms in intelligent systems.

**Professor Xinhua Wu** FTSE is a world-renowned metallurgical engineer who is Director of the ARC Centre of Excellence for Design in Light Metals at Monash University and is making a major impact on advanced manufacturing technologies for the aerospace industry.

## ENERGY & MINERALS

**Professor Jocelyn McPhie** FTSE is Professor of Earth Sciences in the School of Physical Sciences, University of Tasmania. She is a world leader in the application of volcanology to minerals exploration.

**Professor Alison Ord** FTSE is a Senior

Principal Research Fellow at the Centre for Exploration Targeting at the University of WA and formerly Chief Research Scientist, CSIRO Exploration and Mining. She is an acclaimed structural geologist.

University of NSW **Emeritus Professor Maria Skyllas-Kazacos** AM FTSE is an internationally acclaimed researcher in the area of energy storage, whose technology is internationally regarded as the foremost battery technology for large-scale energy-storage applications.

## FOOD & AGRICULTURE

**Professor Kaye Basford** FTSE is a Professor in Biometry at the University of Queensland and was formerly President of the Academic Board, Head of the School of Land, Crop and Food Sciences and President of the International Biometric society and the Statistical Society of Australia. She is a current Vice-President of the ATSE Board.

**Emeritus Professor Jen McComb** AM

FTSE won wide acclaim as Associate Professor of Plant Sciences at Murdoch University, applying plant tissue culture to plant breeding and improvement.

**Professor June Olley** AM FTSE is an honorary research professor at the University of Tasmania. Prior to retirement she was a Senior Principal Research Scientist with CSIRO, where she pioneered what became predictive food microbiology.

## MEDICAL RESEARCH & HEALTH SCIENCES


**Emeritus Professor Margaret Bullock**

AM FTSE was one of the first two people in Australia to graduate with a degree in physiotherapy and the first to be awarded a physiotherapy PhD.

Flinders University biomedical engineer **Professor Karen Reynolds** FTSE, who heads South Australia's Medical Device Partnering Program (MDPP), was named as SA's Professional Engineer of the Year in 2010, and SA Scientist of the Year in 2012.

**Professor Anne Simmons** AM FTSE, from the University of NSW, has helped shape biomedical engineering in Australia. She was formerly headed the Graduate School of Biomedical Engineering at UNSW and spent nearly 20 years with the Nucleus Group.

**Professor Maree Smith** FTSE is a specialist in pain management and pain pharmacology and heads the University of Queensland's pain research group in the School of Pharmacy. She has been involved in translational research for more than 20 years.

**Professor Judith Whitworth** AC FTSE is Director of the John Curtin School of Medical Research and Howard Florey Professor of Medical Research at the Australian National University, and Head of the High Blood Pressure Research Unit at ANU. 

*Dr Ros Dubs is a company director, serving on the boards of ASX100 company Aristocrat Leisure Ltd, government shipbuilder ASC Pty Ltd, ANU Enterprise Pty Ltd and Astronomy Australia Ltd. She chaired the Space Industry Innovation Council (2010–12). Her career has spanned a range of industries in publicly listed, private and government companies. With extensive operational experience in the aviation, transport and engineering sectors, she managed large engineering businesses in Germany, France and Australia for Thales SA. Having also worked in CSIRO and held leadership positions within universities, most recently as Deputy Vice-Chancellor (External Relations) at UTS, Dr Dubs devotes considerable effort to encouraging research–industry collaboration.*

## MCA AWARDS FOUR AICD SCHOLARSHIPS

The Minerals Council of Australia, in conjunction with BHP Billiton and Downer Mining, has awarded four scholarships to women to help them progress towards company board positions. The scholarships, valued at \$9500 each, have been awarded to women working in the mining industry to enable them to complete the Australian Institute of Company Directors (AICD) Company Directors' Course during 2016.

The scholarship winners are: Laura Tyler, BHP Billiton; Meryl Jones, St Barbara Ltd; Frances Burgess, Mt Isa Mines Ltd; and Janette Hewson, Peabody Energy.

The 2015–16 scholarships continue the program which has seen 11 women complete the Company Directors' Course in 2013, 2014 and 2015.

MCA will award a further seven highly commended applicants with access to an AICD e-learning module: Linda Dawson, Rio Tinto; Melanie Gordon, BHP Billiton; Lara Bruhns, Newmont; Melinda Macleod, BHP Billiton Iron Ore; Linda O'Farrell, Fortescue Metals Group; Michelle Keegan, Dyno Nobel; and Bobbie Foot, BHP Billiton Iron Ore.



# WOMEN FELLOWS STRONG IN THE INNOVATION CONSTELLATION

## WOMEN – NOW



Women Fellows of ATSE comprised more than 10 per cent of the names among the Knowledge Nation 100 – a group of Australians named in *The Australian* newspaper's *The Deal Magazine* in December as the “stars of the Australian innovation constellation”.

The ATSE women were prominent in the ‘Next frontier medicine’ and ‘Science whisperers’ categories and were strongly represented among ‘The brokers’.

The list was compiled by the Knowledge Society and the Office of the Chief Scientist and launched by Prime Minister Malcolm Turnbull following the release of the National Innovation and Science Agenda (NISA).

It recognised 100 Australians – 20 from this Academy, including 11 women Fellows – who are at the cutting edge of innovation and science in Australia and who are contributing to Australia's future economy.

The list was divided into categories: Big-data pioneers, The upstarts, Change agents, STEM

heroes, The brokers, Next-frontier medicine, Venture capitalists, The shapers, Diaspora stars, Digital enablers and Science whisperers.

Four women Fellows dominated the ‘Next-frontier medicine’ category of seven – Dr Bronwyn Evans FTSE, Dr Deborah Rathjen FTSE, Professor Karen Reynolds FTSE and Professor Maree Smith FTSE.

ATSE women were prominent in the ‘Science whisperers’ category – the chief scientists – providing three of the six names – Professor Mary O’Kane AC FTSE, Dr Leanna Read FTSE and Dr Leonie Walsh FTSE.

Professor Tanya Monro FAA FTSE and



Leanna Read



Leonie Walsh

Professor Robyn Owens FTSE – both Deputy Vice Chancellors – were named among seven in ‘The brokers’ category.

Professor Svetha Venkatesh FTSE was named among the 19 ‘STEM heroes’ and Ms Catherine Livingstone AO FAA FTSE was among the five named as ‘The evangelists’.

The group is scheduled to meet at a summit about innovation in the economy in March 2016.

The Knowledge Nation 100 achievement followed the earlier success of four Fellows named in the *Australian Financial Review*/Westpac listing of Australia's 100 Women of Influence. Professor Veena Sahajwalla FTSE won the Innovation category, while Ms Kathy Hirschfeld FTSE, Professor Cynthia Mitchell FTSE and Dr Erica Smyth FTSE were finalists in other categories.

In earlier years winners and finalists have included Professor Margaret Shiel FTSE, Professor Judy Raper FTSE, Dr Megan Clark FTSE, Professor Ann Henderson-Sellers FTSE and Dr Marlene Kanga AM FTSE. ☺

## MISSING OPPORTUNITIES IN INNOVATION

Innovation in Australia is suffering from a lack of direction, short-termism and a haphazard approach, according to recent report by ACOLA, released before the Government's National Innovation and Science Agenda was announced.

Titled *Translating research for economic and social benefit*, the report examined innovation initiatives in 14 nations and found a clear link between national policy and performance.

The 14 were: Finland, Denmark, Sweden, Germany, the UK, Israel, the US, Canada, South Korea, Japan, Singapore, China, Brazil and Chile.

Among its 15 key findings, the report highlighted the need for a coherent national innovation strategy with an agency to manage it and less reliance on indirect support for business such as through the R&D Tax Incentive.

“The contrast with Australia is stark, and our review shows how our policies and supportive programs are piecemeal, opportunistic and almost invariably short-lived,” the report said.

Dr John Bell FTSE, the Chair of the report's Expert Working

Group, said there were measures in other countries that could be adopted to lift Australia's performance.

“What we found is that is that other nations have ongoing, stable support measures, with multiple incentives enabling parties to capitalise on potential wherever it lies.”

Dr Bell noted, for example, that the Small Business Innovation Research Program has now operated continuously in the US for 33 years, was recognised as a lynchpin of the American start-up economy and had been replicated successfully in many nations.

Launching the report at Parliament House in Canberra, Australia's retiring Chief Scientist Professor Ian Chubb AC FTSE said it was a timely reminder that success owes more to choice than chance.

“Fiddling at the margins of policy will not secure the economic transformation we need to keep pace, let alone compete in an ambitious world,” Professor Chubb said. “Nations which do better than us are characterised by intelligent policies settings and programs which encourage a culture of innovation and collaboration.”

## “Don’t flinch” says Chubb

Retiring Chief Scientist Professor Ian Chubb AC FTSE has urged Australians to adhere to ethical science methods and not flinch in the face of denigration and disparagement.

In a retirement statement, he wished Australian and international scientists, technologists, engineers and mathematicians every success as they “strive to understand our planet and to make it better” for all its inhabitants.

“We know it isn’t easy. We know there are those who want only to be told what they want to hear. When they aren’t, they simply denigrate and disparage and dream up conspiracies.

“I can only say to scientists: don’t flinch. Do your work; do it according to the trusted methods of ethical science and talk regularly to the public. Encourage the public to walk with you and learn with you. Their support, and the weight and quality of evidence, must always trump make-believe.

“There is no other path to the future that I believe Australians want than to put science at the core of everything we do – a future of rising living standards, good jobs for those who seek them, healthy communities to enjoy and wondrous places to explore.

“Nor is there any prospect of growing the pie, or sharing it fairly, without an education system that prepares all children to be part of a world that relies substantially on science, technology, engineering and



Ian Chubb

mathematics (STEM),” Professor Chubb said

“It wasn’t, and isn’t, a question of just doing the same things differently. It means doing different things too. The future demands more of us than fiddling at the edges with the policy prescriptions we’ve tried before.

“It means a focus on STEM – learning, researching and applying. It means seeking national solutions, implemented across government, reaching across industries all pursued with the understanding and support of all Australians. It means working hard for what we want, rather than presuming that ‘she’ll be right’ because it has been.

“The Australian Government’s National Innovation and Science Agenda is, as I have said, an important step in the right direction. If it is implemented in the spirit the Prime Minister has called for – as a living document to be evaluated, adapted and extended – it can make an important difference.

There’s a different and better Australia to make; and we can do it if we have the passion, patience and persistence,” he added.

Professor Chubb was Australia’s Chief Scientist for almost five years. He commenced in the role on 23 May 2011 and completed his appointment on 22 January 2016, succeeded by Dr Alan Finkel AO FTSE.

■ Assistant Minister for Science Ms Karen Andrews thanked Professor Chubb for his remarkable dedication and acknowledged his ongoing pursuit to place science, technology and innovation at the forefront of national importance.

## ORATION DINNER FAREWELL TO ALAN FINKEL

ATSE Fellows at the Oration Dinner in Melbourne in November gave a rousing send-off to retiring President Dr Alan Finkel AO FTSE, who resigned the role to take up his new position as Australia’s Chief Scientist. He was farewell officially by Vice President Dr Susan Pond, who made a presentation of a selection of premium chocolates and a business satchel.



Susan Pond makes the presentation to Alan Finkel.

## TIME TO BACK OUR POTENTIAL – FINKEL

Australia needs to be resilient, to back its potential today and build new potential through education for tomorrow, Australia’s new Chief Scientist, Dr Alan Finkel AO FTSE, said at the start of his tenure.

“Professor Ian Chubb was a trailblazer and leaves behind a great legacy. In taking the baton, I recognise that we have to be resilient, to keep going when we stumble,” Dr Finkel said.

“As Australia’s eighth Chief Scientist, I want to tell Australia’s great success stories. I have witnessed many firsthand, as a researcher, entrepreneur and advocate. I hope to uncover and help inspire many more.

“I want to put important topics on the table, such as sustainable energy use, to help Australians understand and weigh up the options. We will count the benefits of innovation in prosperity shared, jobs created, lives saved and opportunities uncovered; but only if we pursue a new conversation.

“I also look forward to the new responsibilities that the National Innovation and Science Agenda brings to the role of Chief Scientist, including chairing the expert group to map long-term research infrastructure needs; contributing to the review of the Research and Development Tax Incentive program; and serving as Deputy Chair of Science and Innovation Australia as it develops its critical 10 to 15 year plan.”

# ATSE IN ACTION

## New challenge for water managers

Population growth, increasing demand for natural resources, rising costs and community expectations are impacting management of Australian water resources.

These pressures require the water industry to develop innovative and more efficient processes to optimise resource recovery from wastewater, according to a new ATSE report.

The Report, *Wastewater – An Untapped Resource?*, was launched in Melbourne in December by Professor John Thwaites, Chair of Melbourne Water and former Deputy Premier of Victoria.

The report notes that Australian wastewater contains nutrients, carbon, energy and other inorganic and organic resources worthy of recovery and examines the potential industry opportunities for resource recovery in Australia. It reviews international case studies, considers the Australian regulatory framework and evaluates the key technologies and products, as well as analysing several investment options.

The Report shows that there are several significant value-creating opportunities to pursue for investors in Australia in the medium term.



John Thwaites launches the Report.

*Wastewater – An Untapped Resource?* was prepared by ATSE with funding from the Australian Water Recycling Centre of Excellence. The Report was developed by a working group led by Dr John Burgess FTSE, a chemical engineer who has more than 20 years' experience as a senior executive and research leader.

The working group included Professor Damien Batstone (Deputy Director of the Advanced Water Management Centre at the University of Queensland), Dr Tim Muster

(a Senior Research Scientist from CSIRO Land and Water) and Mr Francis Pamminer (Manager of Research and Innovation, Yarra Valley Water).

The launch, at Melbourne Water's Docklands office, was chaired by Dr Paul Greenfield AO FTSE, a Director of ATSE and Chair of the International Water Centre in Brisbane.

**THE REPORT IS AVAILABLE  
ON THE ATSE WEBSITE AT  
[SUBJECTS>NATURAL RESOURCES](#)**

## STELR RECOGNISED AS A LEADING STEM PROGRAM

PricewaterhouseCoopers' 21st Century Minds Accelerator Program, designed to discover and support Australia's best new STEM initiatives, has judged ATSE's STELR program to be one of the best STEM initiatives in Australia. PwC is supporting 20 organisations through an intense and bespoke acceleration process to help them achieve rapid and effective scale.

STELR was one of 120 STEM initiatives that applied to be part of the program and was one of only two programs selected for the Impact Accelerator program. This is a 20-week program supporting start-up and early-stage entrepreneurs to achieve sustainable and scalable impact.

This intense program comprises the following components:

- Assessment Stage – one-week focused Enterprise Needs Assessment and Action Plan Development;
- Acceleration Stage – a 10-week Accelerator Program for rapid enterprise growth; and
- Impact Stage – a 10-week coaching and guidance towards market delivery.

### STELR WILL ALSO RECEIVE:

- a travel allowance to attend interstate events;

- a place on the 21st Century Minds Networks Program;
- potential to share in \$500,000 of PwC services through the 21st Century Minds Accelerator Fund; and
- a mentor team for the 2016 journey.

The 21st Century Minds (21CM) Accelerator Program is designed to unearth, grow and scale Australia's best education initiatives focused on building Australia's pipeline of innovators and problem-solvers.

"The quantity and quality of applications received proves overwhelming that, not only is there a need for support to get STEM education initiatives off the ground, but that there is depth of innovative talent out there – the business community just needs to nurture and support that talent," PwC Managing Partner Tony Peake said.

"That's why PwC is collaborating with businesses and investing over \$2.5 million in cash and in-kind services in our 21st Century Minds Accelerator program over the next 18 months. I'm tremendously excited by our winners. Any one of them can help to lift STEM education nationally and internationally."

Australia's Chief Scientist Dr Alan Finkel AO FTSE welcomed investment in the workforce of the future.

"Thousands of Australian students can be entrepreneurs if we open their minds and nurture their talent," Dr Finkel said.



# ATSE IN ACTION

## ATSE applauds the NISA initiative

ATSE strongly supports the Government's announcement of the National Innovation and Science Agenda – a key piece of national policy which is crucial to Australia's ability to ensure continued economic, social and environmental well-being. The Agenda contains 24 measures in four key themes – Culture and capital, Collaboration, Talent and skills, and Government as an exemplar – which are projected to cost \$1.1 billion over the forward estimates.

### MEASURES OF PARTICULAR NOTE FOR ATSE INCLUDE:

- The introduction of impact and engagement measures for university research, built on the existing work by ATSE on Research Engagement for Australia (REA).
- Modification of the research block grants to equally value external research income, in line with the principles behind REA.
- A Global Innovation Strategy, along the lines called for by ATSE in its International Engagement Action Statement, with specific funding to expand programs such as the ATSE-developed CAESIE Priming Grant program to foster collaboration between SMEs and researchers in Australia and overseas.
- Confirmed funding over 10 years for the National Collaborative Research Infrastructure Strategy (NCRIS), following on from the Research Alliance campaign around NCRIS, in which ATSE was heavily involved, and the Research Infrastructure Review.
- Funding for a pilot program Business Research and Innovation Initiative (BRII), modelled on the US SBIR and UK SBRI programs, as consistently recommended by ATSE over several years.
- Funding to expand the pilot of the Science in Australia Gender Equity (SAGE) program, a joint partnership by ATSE and the Academy of Science – plus other initiatives to promote gender equity in STEM, as consistently promoted by ATSE.
- Continuous application and fast-track approval of ARC Linkage Grants, as outlined in the ACOLA SAF09 research translation report.
- Expanded funding for the re-badged

Innovation Connections program (formerly Research Connections), in line with the ACOLA SAF09 findings around intermediaries and brokerage.

- Initiatives to foster innovation in agriculture, including support for programs to support digital agriculture as highlighted in ATSE's Green Growth Agriculture Report and the ATSE Agriculture Position Statement.

A key factor to the success of the Agenda, and Australia's long-term prosperity, will be the scale and stability of the measures outlined.

ATSE welcomes the Opposition's commitment to innovation, and hopes that all political parties will work together constructively to ensure support for the concept of Australia as an "innovation nation".

ATSE is pleased to see that the Government has adopted a long-term strategy for science, technology and innovation. Work by ATSE and many others has consistently shown that providing Australian researchers and businesses with certainty about the policy settings to promote research translation is critical to success.

"We congratulate the Government for all of the initiatives in this package," said retiring ATSE President Dr Alan Finkel AO FTSE.

"This long-term and thoughtful set of policies that substantially improves the research and innovation ecosystem will be well received. ATSE is pleased that its initiatives to promote better research engagement with industry – based on a comprehensive set of performance data and a final qualitative contribution by a panel of experts – have borne fruit.

"We congratulate the Government for taking a balanced approach in which both research excellence and end-user engagement contribute to the block grant funding formula, providing a balanced pair of metrics in which the new ATSE engagement metric will sit alongside the ERA (Excellence in Research Australia) measure," Dr Finkel said.

## NEW RESEARCH METRIC READY FOR USE

ATSE's new measure of research engagement and collaboration – Research Engagement for Australia (REA) – has now been tested in a pilot study, as a result of which the metric has been refined and is considered ready for adoption.

ATSE anticipates that this metric will stimulate necessary collaboration between university researchers and industry and other potential end users of research, such as hospitals and community services.

ATSE says Australia currently determines in a very rigorous process the excellence of research in Australian universities through the established ERA (Excellence in Research for Australia). The proposed ATSE engagement metric is intended to visibly stand alongside the current ERA measurement of research excellence.

ATSE is keen to see both ratings used, as together they will provide a rounded overview of research quality and engagement.

Spurred by OECD data showing that Australia ranks poorly among 33 surveyed countries when it comes to collaboration between public-sector researchers and their counterparts in industry, ATSE last year proposed the new metric as a measure of research engagement and collaboration, and as a forward proxy of impact.

Its key principle is to assess, using data already collected, the revenue provided by industry and other end users to the nation's universities, within recognised fields of research. The collection and publication of such data in the ATSE engagement metric would provide visible recognition to those whose research is being taken up and applied by end users for national benefit.

*ATSE is pleased to see that the Government has adopted a long-term strategy for science, technology and innovation.*

# ATSE IN ACTION

## Twenty Fellows named innovation stars

Twenty ATSE Fellows were named among The Knowledge Nation 100 – a group of Australians named in *The Australian* newspaper's *The Deal Magazine* as the "stars of the Australian innovation constellation".

The list was compiled by the Knowledge Society and the Office of the Chief Scientist and launched by Prime Minister Malcolm Turnbull following the release of the National Innovation and Science Agenda (NISA).

It recognises 100 Australians – 20 per cent of them from this Academy – who are at the cutting edge of innovation and science in Australia and who are contributing to Australia's future economy.

The group is scheduled to meet at a summit about innovation in the economy in March 2016, by which time Dr Alan Finkel AO FTSE will have replaced Professor Ian Chubb AC FTSE as Chief Scientist.

The list profiles visionary scientists alongside entrepreneurs and embraces existing and nascent industries, as well as profiling the reinvention of established organisations.

*The Deal* says there are many opportunities for Australia in its areas of global comparative

advantage – mining, energy, advanced manufacturing, agriculture, medicine and health, soil and water, transport and logistics, alternative fuels and cybersecurity.

"All of the Australians in this list deserve celebration. As the trailblazers who show the rest of the economy where the future lies, they are a window on tomorrow.

"It is time to make science and mathematics sexy again. This is the only way for a country to respond to the challenges of automation, globalisation and the digitisation of our businesses and industries."

The list was divided into categories: Big-data pioneers, The upstarts, Change agents, STEM heroes, The brokers, Next-frontier medicine, Venture capitalists, The shapers, Diaspora stars, Digital enablers and Science whisperers.

ATSE Fellows dominated in several categories.

Eight of those named among the 19 'STEM heroes' are Academy Fellows: Professor Mark Cassidy FTSE, Professor Hugh Durrant-Whyte FRS FAA FTSE, Professor Ian Frazer AC FAA FTSE, Professor Martin Green AM FRS FAA FTSE, Professor Peter Quinn FTSE, Professor Kadambot Siddique AM FTSE, Professor Svetha Venkatesh FTSE and Professor Gordon Wallace FAA FTSE.

Professor Tanya Monro FAA FTSE and Professor Robyn Owens FTSE – both Deputy Vice Chancellors – were named among seven in 'The brokers' category.

Four women Fellows dominated the 'Next-frontier medicine' category of seven – Dr Bronwyn Evans FTSE, Dr Deborah Rathjen FTSE, Professor Karen Reynolds FTSE and Professor Maree Smith FTSE.

Dr Alex Zelinsky FTSE was ATSE's lone name among the seven names as 'The shapers' and Ms Catherine Livingstone AO FAA FTSE was the lone ATSE Fellow among the five named as 'The evangelists'.

But ATSE dominated the 'Science whisperers' category, with five of the six names – Australia's retiring Chief Scientist Professor Ian Chubb AC FTSE and four state Chief Scientists: Professor Mary O'Kane AC FTSE, Dr Geoff Garrett AO FTSE, Dr Leanna Read FTSE and Dr Leonie Walsh FTSE.

## WORKSHOPS FOCUS ON INVESTMENT

The Academy hosted two workshops in association with the 2015 AGM, both focused on the need for investment.

ATSE's Agriculture Forum hosted a seminar featuring presentations by leading economist Professor Kym Anderson AC FASSA, beef genetics expert Ms Lucinda Corrigan and Deputy Director of CSIRO's Agriculture Flagship Dr Michael Robertson, plus a panel discussion chaired by Agriculture Forum Chair Professor Timothy Reeves FTSE.

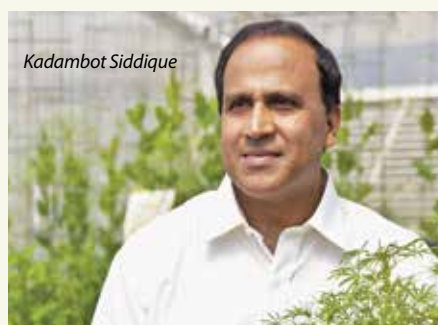
The speakers discussed the importance of investment in agricultural R&D to maintain our competitive edge internationally. Attendees saw the implementation of robotics in the red meat industry, with laser scanning technology and precision automation yielding higher value primary cuts and improving worker safety.

The importance of digital technology in agribusiness was also highlighted, with an emphasis on the need for appropriate data analytics services to help farmers make best use of their data to improve decision-making processes.

The Industry and Innovation workshop sought to draw on the experience of industry and research Fellows, to identify a small number of practical actions that could encourage and support companies to invest in links with research.

The expert panel and attendees agreed that the most fundamental component of collaboration was building relationships, which take time and patience. Further to this, it was important to identify priority areas of focus to develop co-invested research collaboration. They noted that return on investment, in terms of growth and productivity, would ensure the success of collaborative projects.

The key barriers for industry were time, money, resources, leadership and commitment. More proactive engagement and collaboration models need to be implemented, including developing a data-matching service for industry and researchers, speeding up engagement cycles, streamlining IP arrangements and setting out new metrics for measuring increased innovation and collaboration.



Kadambot Siddique



Peter Quinn



Svetha Venkatesh

# ATSE IN ACTION

## Canberra engineer wins first Batterham Medal

Dr Lachlan Blackhall was named the inaugural winner of the Batterham Medal, an award that recognises an early career engineer who has achieved substantial peer and industry recognition for their work in the past five years.

The medal was presented to Dr Blackhall by Professor Robin Batterham AO FREng FAA FTSE at the ATSE Oration Dinner in Melbourne in November.

In addition to recognising outstanding achievement in the application of engineering, the Award also aims to promote the profession of engineering by promoting the contribution engineering makes to Australia.

It recognises the contribution to engineering made by Professor Batterham, the Kernot Professor of Engineering at the University of Melbourne, and former Chief Scientist of Australia and Academy President.

The Award will be presented annually by ATSE on behalf of the Go8 & Associates Deans of Engineering (the Group of Eight plus the universities of Newcastle and Wollongong, as well as Auckland). It comprises the Batterham Medal and a cash prize of \$5000. The 2015 Selection committee was chaired by Mr Dick Kell AM FTSE.

Dr Blackhall (31) graduated with a BE (Aerospace)/BSc (Advanced Mathematics) with First Class Honours and the University



*Robin Batterham congratulates Lachlan Blackhall.*

Medal from The University of Sydney in 2007. He participated in the Advanced Engineering Program, was listed on the Dean's merit list and was awarded The Mechanical Engineering Minor Prize (2005) and The Mechanical Engineering Association Senior Prize for Outstanding Proficiency (2005).

He then graduated from The Australian National University with a PhD in Control Theory focused on the theory of controlling large networks of systems. During his PhD Dr Blackhall was awarded two major international prizes for his research: the IFAC World Congress Young Author Prize (2008) and the 2nd IFAC Workshop on Distributed Estimation and Control in Networked Systems

(Necsys) Best Student Paper Award (2010). He remains the only Australian to receive either award.

After completing his PhD he co-founded Reposit Power, a technology company designing advanced control systems for grid-deployed energy storage. As Chief Technology Officer, he has pioneered the use of distributed control schemes to manage, control and optimise the performance of distributed energy storage systems.

For his technical work, outreach and impact he has been the recipient of alumni awards from both The University of Sydney and ANU and was an ACT finalist for the Young Australian of the Year in 2015.

## PETER GRAY APPOINTED INTERIM PRESIDENT

Professor Peter Gray FTSE has been appointed Interim President of the Australian Academy of Technology and Engineering following the resignation of Dr Alan Finkel AO FTSE. Dr Finkel resigned as President on 18 December ahead of taking up the role of Australia's Chief Scientist in January 2016. Professor Gray, a Vice President of the Academy, became Interim President on 19 December until a permanent appointment is made. Professor Gray has recently retired from his position as Founding Director of the Australian Institute of Biotechnology and Nanotechnology at the University of Queensland.

ATSE has also elected two new Directors who took up their roles on 1 January 2016. They are Dr Bruce Godfrey FTSE, Chair of the Academy's Energy Forum and CEO of Australian Scientific Instruments, and Professor Margaret Sheil FTSE, Provost of the University of Melbourne. Their election was confirmed at the Academy's Annual General Meeting in Melbourne in November. Dr Susan Pond AM FTSE has retired from the Board at the end of December after having completed her maximum term.



*Peter Gray*

## 2015 AGM

The Academy's Annual General Meeting was held on Friday 27 November at the Hotel Windsor in Melbourne and was attended by 84 Fellows. The meeting heard reports from the President, Dr Alan Finkel AO FTSE, the Chair of the Audit and Risk Committee, Dr Susan Pond AM FTSE, the Chair of the Fellowship Committee, Dr David Cook FTSE and the CEO, Dr Margaret Hartley FTSE. The meeting confirmed the election of two new Directors, Mr Bruce Godfrey FTSE and Professor Margaret Sheil FTSE, and marked with appreciation the service of retiring Board Directors and Division and Forum leaders.



# ATSE IN ACTION

## David Thodey Oration sees a brilliant future

There is a brilliant future ahead for Australian scientists, engineers, researchers and innovators, according to Telstra CEO Mr David Thodey FTSE.

"Australia has always prided itself on its 'applied inventiveness' – and it is certainly true that there is a long list of unique Australian inventions to point to, from the stump-jump plough of the 19th century through to the wine cask, polymer banknotes and of course WiFi," he told ATSE Fellows when delivering the Academy's 2015 Oration in Melbourne.

"So we can assume that there is no shortage of invention in our country. However, I think it is fair question to ask, 'Has that long list of inventions translated into real innovation and a culture where innovation is really celebrated?'"

"Nobody innovates on their own. The best innovation successes are achieved by teams – multidisciplinary teams from across businesses, sectors, skill sets and interest groups. So research–business–academic collaboration is very important.

"Innovation is not just a policy, or a department, or an organisation, or a project – and is not a process that can be purely defined in a textbook. Innovation comes from our innate ability to create and invent – this is fundamental to every human being. It is about culture and values – and this explains why some nations and organisations are more innovative than others. It is about what you value ... what you talk about ... what you teach ... what you recognise ... what you celebrate ... and where you invest. Equally, what you don't do can undermine innovation.

"Innovative thinking can be taught – it is an approach to problem solving, it is an attitude that the seemingly impossible or difficult can be solved – and you can find innovation everywhere. Innovation can often be the simple product of hard work – disciplined work and application ... the desire to improve, explore and create.

"I do believe that we have a wonderful future ahead of us – if we are willing to take personal leadership in advocating the importance of creating an innovative culture in Australia and developing the personal characteristics that are essential to be successful.



David Thodey delivers the 2015 Oration.

The 2015 Oration Dinner at the Windsor Hotel in Melbourne on 27 November attracted 180 Fellows and guests to hear Mr Thodey's Oration. Professor Robin Batterham presented the inaugural Batterham Medal. Guests saw retiring President Dr Alan Finkel AO FTSE present Fellowship certificates to almost all of the 26 new Fellows admitted to the Academy at the Annual General Meeting and retiring Vice President Dr Susan Pond AM FTSE pay tribute to Dr Finkel's presidency and make a retirement presentation to him.

"We have never lived in a period of greater change ... in all parts of our lives ... personally and professionally ... and that this rate of change is accelerating. We have a unique opportunity to capitalise on this change.

"I think these changes are driven by three driving factors:

- the exponential growth in connectivity driven by the internet, with high speed fixed and wireless networks;
- improved affordability of computers; and
- advances in software.

"These three factors are allowing all parts of society to consider new business models, new forms of automation and new research approaches that we were unable to consider five to 10 years ago. We all refer to this as 'digital disruption'; – and it applies to

governments, society, scientists, engineers, businesses, charities, education – to all of us in every part of our lives.

"Who would have thought 10 years ago that we would see these new global businesses:

- Amazon – the online book company – making more profit from providing web services than from selling things, and they sell a lot;
- Airbnb – an accommodation company with no properties;
- Uber – a taxi company that owns no cars;
- eBay – a marketplace with no stock.

"These companies are all examples of the sort of digital disruption that is changing the way we think about the world ... and it is only the beginning."

# ATSE IN ACTION

Mr Thodey discussed each of the driving factors for change.

**“Connectivity** – in the past 10 years we have seen exponential growth in the number of people and devices connected electronically. There are 3.2 billion fixed internet users, and 4.6 billion active mobile users, a 12-fold increase since 2005. There are an estimated 15 billion connected things in the world, which is projected to grow to 30 billion by 2020, and 50 to 60 billion by 2025. We have never seen this type of growth of any technology and it is enabling the sharing of information on a global scale – instantaneously. Smartphones are just the beginning.

*Innovation must be at the heart of what we do as a nation – it is that innate human quality that drives us all.*

**“Computational affordability** has made greater computer power available to more people and will continue to improve. Advances in chip design and lower manufacturing costs have been keys to PC affordability. Additionally, the availability of generic silicon has changed the cost equation and led to the revolution in tablets and smart devices like Google Glasses and applications like nanotechnology. On-demand computational capability through cloud computing has revolutionised the industry. And with quantum computing there's more to come.

**“Software:** Marc Andreessen's 2011 observation about software eating the world is so true. Think about big data and the ability to handle large data sets or neural computing, artificial intelligence, robotics, and the march of advanced manufacturing and 3D printing. These drivers are impacting us all – and when combined with great minds we see new innovations, new research findings and new business models that are changing the structure of industries and competitiveness of nations.

“Additionally, this disruption and digital enablement means we are now all global citizens living in global industries. The change is at a pace and scale that few people predicted, but is creating a unique opportunity for those willing to see what disruption creates.

“This is even more applicable to those of us who work in science, engineering, research, biomedicine or are looking for innovation. We must capture the opportunities created by these drivers and the disruption – to advance our thinking and initiatives.

“I see many Australians who identify this future and are grasping it with both hands – to be the beneficiaries of change and not the victims of change!”

Mr Thodey said great Australian innovators – including Billy Hughes, Barry Marshall and Tan Le – all shared a deep belief in the power of innovation to improve society.

“But there is another insight that I think applies to us all ... the unique characteristics and values that great innovators, great scientists, great leaders, great engineers or technologists have:

- A driving vision or purpose – each of these people held a greater objective or purpose to achieve something for society or the world. It is what ultimately drove and sustained them.
- Strong self-belief and understanding of themselves – this is not something that can be taught – it is the self-confidence and self-belief to keep going.
- A deep commitment and willingness to work diligently – every great innovation or breakthrough is the product of hard work – success in any field of endeavour requires a deep commitment, self-sacrifice and just plain hard work to be successful.
- An incredible resilience and determination to succeed in the face of opposition – in nearly all the examples I have mentioned the determination and resilience of these individuals is evident – the ability to stay the course and not accept defeat.
- A willingness to collaborate and learn from others – a commitment to continual learning and inquisitiveness.
- Ability to overcome failure – this is often mentioned in an Australian context in relation to our general intolerance of failure,

especially in the venture capital world. I think it is true – when you look at most great innovators or leaders, they have often failed many times – privately or publicly – and we do need to learn to applaud those who give it a go but who may fail.

“One of the most important things that we can do to foster innovation in Australia is to build a more collaborative and aligned group of organisations united in our ability to work together for a higher objective and outcomes for Australia.

“When we see collaboration rates improve between tertiary institutions we will know we've started to change the culture. When we see industry start to invest seriously in R&D, we'll know we are maturing as a nation. It will take this level of change to create good solutions and responses to what is coming at us.

“Innovation must be at the heart of what we do as a nation – it is that innate human quality that drives us all. We are living in a unique time of change and opportunity – digital disruption. We must continue to align our efforts as a nation and celebrate each other's success across the academic community, research community, government and the private sector.

“I am most excited about the future because we can be the change agents in creating a truly innovative culture in Australia. And to do that requires us all – everyone in this room – to cultivate those values that drive innovation, namely:

- a strong sense of purpose;
- self-belief;
- hard work;
- resilience;
- collaboration; and
- ability to overcome failure.

“I am delighted with the leadership from the Government and the many great initiatives that I see happening in Australia at the moment. But we should not be dependent on government. Rather we need to be the leaders in creating a more innovative Australia. It starts with us!”

**THE FULL TEXT OF MR THODEY'S 2015 ATSE ORATION A BRILLIANT FUTURE ... FOR AUSTRALIAN SCIENTISTS, ENGINEERS, RESEARCHERS AND INNOVATORS IS ON THE ATSE WEBSITE AT PUBLICATIONS>ORATIONS.**

# WOMEN IN TSE

## Marlene Kanga to head global peak body

Dr Marlene Kanga AM FTSE was announced as President-Elect of the World Federation of Engineering Organizations (WFEO) at its World Engineering Convention in Kyoto, Japan.

WFEO, under the auspices of UNESCO, is the voice of the engineering profession at an international level, addressing global issues such as education standards, international mobility, sustainable engineering practices and solutions to mitigate the impacts of climate change and natural disasters. It represents 90 national and 10 international and regional institutions and some 20 million engineers.

Dr Kanga's election was a clear recognition of her leadership at an international level, said Mr Stephen Durkin, CEO of Engineers Australia.



Marlene Kanga hosting the Australian Engineering Excellence Awards in 2013.

"Dr Kanga has been an outstanding advocate for the engineering profession in this country," Mr Durkin said. "As a former National President of Engineers Australia, Dr Kanga has a strong history of service to the engineering profession and we are proud to have such an eminent engineer representing Australia on the international stage."

"Dr Kanga will formally take the role of President of this international organisation in December 2017, for a two-year term. During her term, Engineers Australia will be celebrating its centenary and hosting the World Engineers Convention in Melbourne in November 2019. Dr Kanga has been a strong campaigner for the critical role of innovation in our national economy and other issues that challenge our profession and our national economy."

"Dr Kanga's election comes at a time when Australian engineers and engineering firms are expanding their global influence. Having such an eminent engineer take the message of Australian engineering to the international community is an outstanding achievement."

Dr Kanga is a member of the Academy's Gender Equity Working Group.

## ANTARCTIC DIVISION'S FIRST FEMALE CHIEF SCIENTIST

Dr Gwen Fenton is the Australian Antarctic Division's new Chief Scientist, succeeding Dr Nick Gales after his recent appointment as Director of the Division. Dr Fenton has been with the Australian Antarctic Division since 2003, managing science planning and coordination for all projects within the Australian Antarctic Science Program.

Prior to this she spent seven years with the Tasmanian Government, managing the state's marine environmental policy issues within the Marine Resources Division of the Department of Primary Industries Water and the



Environment. In her early career Dr Fenton gained her PhD in marine zoology from the University of Tasmania and subsequently spent 11 years conducting postdoctoral marine research. Dr Gales said Dr Fenton brought to the role a depth of experience from marine research, environmental policy and managing Antarctic science.

## WOMEN ON THE "SLOWER TRACK"

Professionals Australia says the results of the 2015 Survey of Women in the STEM Professions – titled *The Slower Track* – are cause for serious concern.

The survey found a complex set of interrelated factors that contributed to respondents reporting that they were "on a slower track" than their male counterparts.

The report aims to detail some of the factors which contribute to women's under-representation in the STEM professions and to explore professional women's career experiences as part of the STEM workforce.

Professionals Australia says addressing the issues raised in the report is not only a matter of justice and equity, but that fully realising Australia's productivity potential and innovative capability into the future will depend on ensuring a sustainable STEM skills pipeline and effectively attracting, developing and retaining women in the STEM workforce.

The latest OECD data show that just over 30 per cent of tertiary qualifications were awarded to women in STEM fields in OECD countries, and in Australia 33 per cent of tertiary STEM qualifications were awarded to women, the report noted. The differential persisted in the workforce, with only 28 per cent of the employed STEM-qualified Australian workforce aged 15 years and over

being female, compared to 55 per cent for all fields in the tertiary qualified population. The workforce participation figure stood at 14 and 86 per cent for females and males respectively in engineering and related technologies, and 25 and 75 per cent respectively for females and males in ICT.

There was less disparity in the natural and physical sciences where females comprised 47 per cent of the workforce compared with 53 per cent males. In pharmacy, women comprised 56 per cent of the workforce.

The report noted that international research showed that 75 per cent of the fastest-growing occupations require STEM skills and that Australian employers reported difficulties recruiting STEM-qualified graduates and staff. The report is available on the Professionals Australia website.

■ Professionals Australia, formerly the Association of Professional Engineers, Scientists and Managers, Australia (APESMA), represents more than 23,000 Australian professionals across the STEM professions including engineers, scientists, managers, veterinarians, surveyors, IT professionals and pharmacists.





## NEWS

## Australian cancer drug licensed in \$730m deal

*A scientist working in CSIRO's Recombinant Protein Production Facility.*

A promising new cancer drug, developed in Australia by the Cancer Therapeutics CRC (CTx), has been licensed to US pharmaceutical company Merck in a deal worth \$730 million.

The drug, which was developed with support from the UK-based Wellcome Trust and Cancer Research Technology (CRT), has potential clinical applications in both cancer and haemoglobinopathies (non-cancer blood disorders).

According to Dr Tom Peat from CSIRO, one of the key research partners in the CRC, the drug is designed to inhibit the protein PRMT5,

develop a drug that binds to this protein, allowing it to target the cancerous cells.

Under the terms of the licence, Merck US will now further develop the drug, taking it to clinical trials, with a view to worldwide commercialisation.

The deal provides potentially significant financial returns, which will be shared between CRT, CTx and the Wellcome Trust, with the majority being returned to CTx and its Australian research partners including CSIRO, Monash University, Peter MacCallum Cancer Centre and the Walter and Eliza Hall Institute.

which is associated with a range of cancers, including mantle cell lymphoma, lung cancer, breast cancer and colorectal cancer.

"Patients who have these types of cancers often have high levels of this protein, which is unfortunately also linked to poor survival rates," Dr Peat said.

"Using our recombinant protein production facilities, we were able to produce samples of these proteins, crystallise them for structure-based drug design and support the consortium's pre-commercial investigations and trials.

"The CTx consortium was able to

## FLAXSEED OIL FIGHTS SUPERBUGS

Australian start-up company Kayban has developed a claimed world-first antimicrobial healthcare range made from organic flaxseed oil following collaboration with CSIRO.

The company hopes the range of topical lotions and washes, called Bio3 Guardian, will provide their main revenue stream and has plans to take the innovation to the global healthcare market.

Kayban says that, according to independent tests, the products are fast-acting and effective at killing golden staph, a prevalent superbug, which led to 1621 hospital-acquired infection cases in 2013-14.

Flaxseed oil contains alpha-linolenic acid, an omega-3 fatty acid with known antimicrobial properties.

With the support of a Victorian Government Innovation and Technology Voucher, Kayban and CSIRO developed the method for extracting the crucial alpha-linolenic acid from organic flaxseed.

"The challenge was to come up with a



*Kayban's Bio3 Guardian range.*

cost-effective manufacturing technology that consistently produced excellent quality, highly enriched alpha-linolenic acid," CSIRO organic chemist Dr Peter Duggan said.

"What we've achieved is a smarter, more efficient process that's been pivotal in Kayban's journey to commercialising a unique saleable product."

The technology has been transferred to Melbourne-based CSIRO spin-out Boron Molecular, which will extract the flaxseed component. Kayban will then work with another local manufacturer to formulate the end product.

## UNIVERSITIES GO ONLINE FOR BUSINESS MATCHES

A new website will allow companies to search all the intellectual property patents held by Australia's universities and public research organisations – important in expanding the uptake of Australian research breakthroughs.

The Source IP digital marketplace will be an online match-making service for industry–university collaboration. It will enable businesses to look through all the intellectual property patents held by universities that could help to improve their products, services or productivity.

Every Australian university has listed their patents on the new Source IP site, making it a comprehensive searchable source of Australia's university-held patents. It also notes those that can be licensed.



BY MARTIN THOMAS  
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# Nuclear energy: Australia has a proud legacy

Prudent foresight suggests that all low-emission generation sources should be considered and nuclear power should be a candidate technology.

ANSTO's OPAL research reactor.



A

Australia has a quarter of the world's uranium reserves and is the third-largest supplier, reliably delivering refined uranium oxide (yellowcake)

to the world's nuclear power reactors.

Its energy content in terms of electricity generated is of the same order as Australia's total energy coal exports. Coal is cheap but uranium is far cheaper! Emerging Generation IV reactors offer the prospect of increasing uranium energy recovery some 60 times, negating any prospect it will 'run out', while thorium, still over the commercial horizon, promises further eons of clean, reliable power.

No less important is Australia's role as a world-leading producer of medical radioisotopes, soon to meet some 15 to 20 per cent of global demand when the Australian Nuclear Medicine facilities at Lucas Heights come on-stream.

Yet Australia is the only top 20 OECD nation in which nuclear power remains illegal.

## PROUD NUCLEAR LEGACY

It is useful to review Australia's world-class nuclear achievements. They are many.

Although State and Territory governments, not the Commonwealth, are responsible for energy delivery – a colonial hangover – national agencies manage today's dramatically different energy architecture within singularly

complex ownership and operational structures for a relatively small economy.

By the 1950s it was clear a national approach to nuclear energy was needed. The Australian Atomic Energy Commission was established – strongly driven, among others, by Sir Philip Baxter, an eminent engineer and educator and Academy foundation Fellow.

The AAEC attracted significant international respect for its major scientific and technological developments. Synroc waste encapsulation and centrifugal enrichment and Silex laser enrichment, now US-owned, were developed in Australia.

The young nation, with a strong base in power systems engineering, then boldly committed to a 500MW nuclear station at Jervis Bay. Meantime a tertiary nuclear engineering course was established at the University of New South Wales, while the Australian National University established a Department of Nuclear Physics, undertaking advanced fusion and accelerator research. Australia's nuclear future was promising. We had a seat at the table.

Then unfavourable project economics, due in part to Australia's cheap, high-quality, black coal and abundant brown coal, together with negative politics, saw the 1972 cancellation of Jervis Bay, termination of the AAEC and eventually closure of the UNSW degree course in 1987.

Nuclear power has since been illegal in New South Wales, Victoria and Queensland, while Commonwealth prohibitions remain in place. Arguably Australia walked away from an opportunity.

## NUCLEAR TODAY

Notwithstanding Australia's ambivalent attitude to nuclear power, exacerbated by the Three Mile Island (1979), Chernobyl (1986) and Fukushima Daiichi (2011) accidents, its uranium mining industry flourishes in well-regulated international trade.

Nevertheless the industry has undergone considerable political activism, with several inquiries to ensure that safety, environmental protection and Aboriginal land ownership issues are properly managed. Its potential remains vast, with world-class underground, open-cut and in-situ leaching extraction technologies.

Australia's nuclear R&D activities are a magnificent success story. Established in 1987, the Australian Nuclear Science and Technology Organisation (ANSTO) at Lucas Heights on Sydney's outskirts manages two world-class research reactors, the High Flux Australian Reactor (HIFAR) built in 1958 and the advanced Argentinian 20MW Open Pool Australian Lightwater Reactor (OPAL) commissioned in 2006. HIFAR is now decommissioned – its contribution to medical

and other research was massive. OPAL currently produces medical radioisotopes worth some \$2 million each year and contributes to advanced neutron beam research, although not to nuclear power.

Prime Minister John Howard commissioned the Uranium Mining, Processing and Nuclear Energy Review (UMPNER) in 2006 to examine the potential for Australia to contribute to and derive benefit from the nuclear fuel cycle, including power generation and high-level waste disposal.

Politically UMPNER brought nuclear debate into the open and authoritative views were considered rationally. However, the 2007 change of government saw the report sidelined, although today debate is recovering momentum with concerns that fossil fuel emissions of carbon dioxide and other pollutants contribute to atmospheric and oceanic warming, unhealthy environments and potential climate change.

Some feel that renewable energy resources, principally hydro, wind and solar, can economically replace coal and gas combustion. Others see a technologically neutral mix of renewables and nuclear energy as a more promising approach. Public perception, yet to be tested, holds that nuclear power is unacceptable although a growing number of politicians of varying persuasions privately express support.

## ENERGY PROFILE

In 2012 and 2015, following wide-ranging consultation to which ATSE contributed, the Australian Government delivered Energy White Papers. In 2012, while clearly supportive of coal, carbon sequestration and renewables, nuclear energy was cautiously declared a reserve technology to be taken up only if preferred technologies failed to meet carbon reduction, environmental protection and energy security targets at acceptable cost.

In 2013 a major ATSE conference raised the nuclear issue nationally and by 2015 the White Paper took a neutral approach to all viable energy technologies, including nuclear, while acknowledging that the legislative and regulatory framework had yet to be put in place.

While the popular media impression is that renewables are fast replacing coal the reality is more modest – dependence on coal remains significant. Electricity demand has declined due to carbon pricing, reduced

economic activity and enhanced energy efficiency but coal remains by far Australia's dominant energy source. Gas is filling the gap but costs may increase with LNG parity pricing.

Meantime vigorous resistance to local exploitation constrains domestic supply. Renewables are certainly reducing in cost but it is inconceivable they can economically provide beyond a modest share of national electricity needs before today's coal stations end their commercial lives. Baseload nuclear remains an option that cannot be ignored.

Nuclear power is but one of many proven generation technologies available to Australia. Coal (black and brown), oil, gas, solar, wind, biomass, geothermal and nuclear all have an economic 'sweet spot' but each has roles it cannot economically fulfill. Primary energy supply and technology capital costs, deployment site load characteristics and the service role to which the technology is best suited must all be evaluated, along with associated 'externalities' – primarily carbon dioxide and other pollutants – in reaching investment decisions.

Modern coal and nuclear power stations can operate at capacity factors of 90 to 95 per cent to provide the baseload power that industrialised countries demand. Gas generation, like hydro, can vary to meet system peaks, while solar and wind, with capacity factors typically only 10 to 35 per cent, contribute a valuable component to Australia's energy needs.

## ENERGY COSTS

To help compare technology costs the Levelised Cost of Electricity (LCOE) is used, measured in dollars per megawatt-hour (\$/MWh) delivered to the grid. LCOE includes plant capital cost, financing and depreciation over plant life, primary energy supply, annual operation and maintenance, network connection, carbon costs and waste disposal.

A 2012 analysis of nuclear plant capital costs indicated figures between a high in the US of \$6000/kW down to under \$2000/kW in China. While nuclear project costs are closely guarded there is little doubt they will fall significantly, in time approaching modern coal power stations. Indeed with carbon pricing or carbon capture and sequestration (CCS) as may be demanded, as well as much cheaper fuel, nuclear could soon offer economic large-

scale alternatives over 1000MW.

At smaller scale, say 10MW to 300MW, emerging Small Modular Reactors (SMRs) are perhaps most likely to offer economic nuclear power for Australia. SMRs will be production-line factory-built to standardised designs capable of component transport in conventional shipping containers. Site erection will be minimal with performance and quality standards assured. Refuelling for some SMR designs will be undertaken by reactor fuel load change-out by factory replacement, with no fuel handling on site.

Additional modules can readily be added to meet load growth. It can confidently be predicted that SMRs will offer a way forward where cost and operational challenges of large-scale reactors could be prohibitive.

Widely held predictions abound of climate change arising from increasing atmospheric carbon dioxide from electricity generation and transport fuels. Prudent foresight suggests that all low-emission generation sources should be considered.

The oft-cited target of 80 per cent carbon emissions reduction by 2050 suggests that nuclear power, with zero carbon emissions, should be a candidate technology, a proposition confirmed by CSIRO's eFutures modelling that cannot intelligently be ignored.

Given Australia's commitment to challenging atmospheric carbon reduction targets, it is clear that significant bipartisan political cooperation is needed to address openly the challenging issues of nuclear power reactor siting, plant costs, operational and community safety, appropriate regulation, human resource development, the disposal or re-use of high level wastes and more.

The South Australian Royal Commission offers an encouraging step towards rational debate. ☺

*Mr Martin Thomas AM FTSE has had a lifetime career in energy consulting, concluding as a Principal of Sinclair Knight Merz. He was founding Managing Director of the Cooperative Research Centre for Renewable Energy (ACRE) and has served as Chair of Austenergy, the NSW Electricity Council and the Sydney 2000 Olympic Energy Panel. He won the Engineers Australia's Peter Nicol Russell Memorial Medal in 2008 and was a member of the 2006 UMPNER taskforce. He is a past President of the Institution of Engineers Australia and of the Australian Institute of Energy (AIE) and a past Vice-President ATSE.*



# NEWS

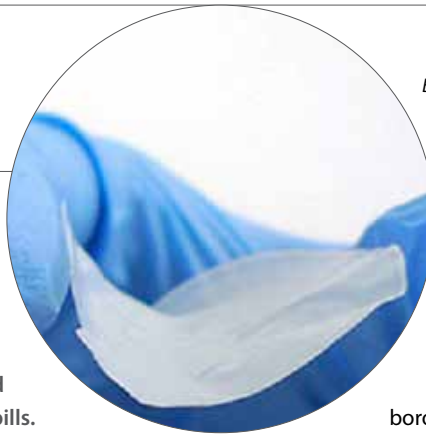
## New way to mop up oil spills

Deakin University scientists have manufactured a revolutionary material that can clean up oil spills.

The major breakthrough material, which literally absorbs oil like a sponge, is ready to be trialled by industry, after two years of refinement in the laboratory at Deakin's Institute for Frontier Materials (IFM).

Professor Ying (Ian) Chen, the project team leader, said the material was the most exciting advancement in oil spill clean-up technology in decades. "Current methods of cleaning up oil spills are inefficient and unsophisticated, taking too long, and causing ongoing and expensive damage, which is why the development of our technology was supported by the Australian Research Council.

"In 2013 we developed the first stage of the material, but it was simply a powder. This powder had absorption capabilities, but you



*Boron nitride nanosheets.*

cannot simply throw powder onto oil – you need to be able to bind that powder into a sponge so that we can soak the oil up, and also separate it from water," Professor Chen said.

"The ground-breaking material is called a boron nitride nanosheet, which is made up of flakes that are just several nanometers (one billionth of a metre) in thickness," said IFM scientist Dr Weiwei Lei. "The material contains tiny holes that provide the surface area to absorb oils and organic solvents up to 33 times its own weight."

The research team, which included scientists from Drexel University, Philadelphia, and the Missouri University of Science and Technology, started with boron nitride powder (known as 'white graphite') and broke it into atomically thin sheets that were then used to make a sponge.

The nanotechnology team at IFM has been working on boron nitride nanomaterials for two decades and is an internationally recognised leader in boron nitride nanotubes and nanosheets.



*The Nyngan PV plant.*

With more than two million solar panels now feeding power into the national electricity grid, AGL Energy Ltd and First Solar have completed Australia's two biggest solar photovoltaic plants at Nyngan and Broken Hill, in NSW.

The 102MW Nyngan and 53MW Broken Hill solar plants together produce approximately 360,000MWh of renewable energy annually, enough to power more than 50,000 average Australian homes.

They were built with \$166.7 million support from the Australian Renewable Energy Agency (ARENA).

ARENA's acting CEO Ian Kay joined AGL Managing Director and CEO Andy Vesey, Federal Minister for the Environment Greg Hunt, NSW Minister for Industry, Resources and Energy Anthony Roberts, Federal Member for Parkes Mark Coulton, First Solar's Asia-Pacific Regional Manager Jack Curtis, Bogan Shire Council Mayor Ray Donald and other community representatives at the Nyngan site to mark the occasion in January.

Mr Kay said AGL and First Solar's trailblazing efforts at Nyngan and Broken Hill had delivered valuable knowledge about the challenges of designing, constructing and commissioning projects of that scale.

"Ultimately, this momentum will allow us to capitalise on

Australia's world-leading solar resource and speed up the transition to renewable energy for our electricity needs."

AGL is one of Australia's leading integrated energy companies and is the largest ASX-listed owner, operator and developer of renewable energy generation in the country. First Solar is a leading global provider of comprehensive photovoltaic (PV) solar systems, which use its advanced module and system technology.

## COAL STILL THE KEY TO COOL, SAYS MCA

The Minerals Council of Australia took advantage of savage January temperatures to remind Australia that coal remains key to a cooler Australian summer.

It noted that, as Australia sweltered, with major cities recording temperatures in the mid-30s and many towns around 40°C, the electricity network underpinned by coal-fired power generation provided the largest share of the nation's energy requirements.

Of the 33,700MW of plant in operation at 3.35 pm (AEST) on 19 January, coal accounted for 22,338MW – or 66 per cent of the total. If gas was included, fossil fuels sources supplied 84 per cent of Australia's total electricity generation, at that time, it said in a statement.

Coal was even more dominant in NSW and Queensland, where it accounted for 80 per cent and 73 per cent of generation respectively.

After coal and gas the next most important generation contributor was hydro power at 8.5 per cent share, with lower contributions from solar and wind at 5.0 and 2.5 per cent respectively.

"It's easy to take for granted but coal keeps households, whole of industry, hospitals, trains, educational facilities, tourism and retail and entertainment operational all year round and it is available every hour of the day," it said. "The scale, reliability and accessibility of coal-fired power is particularly important on hot summer days, providing vital and often lifesaving air conditioning and refrigeration requirements."

In South Australia, where the government wants 50 per cent of the state's electricity to come from renewables by 2025, coal provided 24 per cent of electricity and, with gas included, fossil fuels supplied 88 per cent of all electricity in the state at that specific time.

## Bioprinting goes online at UoW

Professor Gordon Wallace FAA FTSE, whose work is at the forefront of biomedical science, was at the forefront of biomedical news recently.

Professor Wallace, who heads the UoW-headquartered Australian Research Council Centre of Excellence for Electromaterials Science (ACES), at the University of Wollongong, led a four-week online course, Bioprinting: 3D Body Parts, launched by UoW's Australian Institute for Innovative Materials (AIIM) in partnership with global online learning platform FutureLearn.

"We started this journey only a few short years ago by taking off-the-shelf office printers and having our engineers rebuild them to be able to print a bio-ink embedded with human cells that we had just developed," Professor Wallace said.

"In the short time since, revolutionary scientific advances in 3D-printing technology and the development of amazing biomaterials, which can seamlessly integrate into the body, means we may be only a few years away from a time when every major hospital will contain 3D printing capabilities.

"This emerging field of biofabrication is being made possible through connections between medicine and technology and we are now seeing previously unimaginable developments, such as prosthetic limbs controlled by thought alone, and bionic implants to restore lost senses, and of course – 3D printing of human organs."

The course was aimed at high school leavers considering studying the course at university or current undergraduates. Course case studies included the 3D printing of personalised titanium hip implants using selective laser melting, the creation of made-to-fit masks for facial transplant recipients using hot melt extrusion, and the potential for lab-grown organs structured through the ink-jet printing of living cells.

## PROSPERITY RESTS ON MATHS, CHUBB SAYS

Australia's former Chief Scientist, Professor Ian Chubb AC FTSE, has warned that without university mathematics prerequisites the nation risks failing the test of future prosperity. The warning was issued as part of featured coverage in the current issue of *The Update*, the newsletter of the Australian Mathematical Sciences Institute (AMSI). Professor Chubb was one of five STEM leaders invited to lend their voice to the issue of university mathematics prerequisites, including former ATSE President and new Chief Scientist Dr Alan Finkel AO FTSE.

"Mathematics prerequisites attached to university courses send signals that influence student choices. Currently, we are failing the test of the future, discouraging students from performing at their level of potential," Professor Chubb says.

According to AMSI's 2015 Discipline Profile, only 14 per cent of Australian science degrees require students to have intermediate mathematics skills. With Year 12 higher-level mathematics participation continuing to decline, AMSI Director Professor Geoff Prince has been sounding the warning bells about the consequences of retreating from mathematics prerequisites.

## AN INDEX FOR INNOVATORS

School principals will have more than 250 science, technology, engineering and mathematics programs for students at their fingertips, with the release of the first national STEM Programme Index.

SPI 2016 is an accessible guide to business, university, government and community-led initiatives putting students on the fast track to the future. It includes in-class, after-school, holiday, residential and online activities, catering to a wide and growing range of students.

"The opportunities of the future will be made through STEM, for Australia and the Australians with the skills to thrive through change," said retiring Chief Scientist Professor Ian Chubb AC FTSE.

"We all have a stake in great STEM education, and we ought to cooperate in bringing it about."

The new resource was compiled by the Australian Industry Group and the Office of the Chief Scientist, as part of the STEM Skills Partnerships program. It responds to growing interest from the business community, and among STEM professionals, in sharing the task of building the future economy.

SPI 2016 is available at the Chief Scientist's website.

## HEAVY-LIFT FLIGHTS TO ANTARCTICA

The Australian Antarctic Division and Royal Australian Air Force flew a raft of proof-of-concept flights over the summer, with a C-17A Globemaster III delivering heavy-lift cargo to Wilkins Aerodrome in support of the Australian Antarctic program. The inaugural C-17A flight flew the 3450 kilometres in just over five hours, landing at Wilkins Aerodrome near Casey station where it unloaded 12,340 kilograms of cargo.



Gordon Wallace – printing the future.





BY BRUCE THOM  
bruce.thom@sydney.edu.au

# Coastal management: building with nature

The proactive approach of the Dutch has resulted in innovative designs encapsulated in the concept of 'Building with Nature', which they hope to export to other countries.

**T**he traditional approach to managing risk in urbanised coastal areas has been to emphasise protection of built assets. An example of this approach is seen in existing coastal legislation in NSW, the *Coastal Protection Act 1979*. Such an approach is seen in many parts of the world and has resulted in both successful and failed attempts to protect public infrastructure and private property from the damaging impacts of extreme storm events resulting from flooding and wave erosion of low-lying coastal lands.

Agencies of governments such as the US Army Corps of Engineers and the Delta Program in the Netherlands have invested enormous resources in developing structures and practices to withstand such impacts in different coastal situations for both known historical events and those likely to be exacerbated by climate change.

Storms of the late 1960s and 1970s in eastern Australia led NSW and Queensland governments to establish coastal engineering groups to help drive statewide policies to meet the challenge of coastal erosion and inundation. Even though these groups no longer exist, the traditional approach focused on defending lands from the invasion of the sea has remained a priority of successive governments, often at the expense of nature.

Over the past decade a new approach has emerged in coastal management that seeks to build *with* nature and not *on* or *in* nature. This approach has become a more formal part of the Dutch way to address the ever-present threat to the nation from the sea. In the words of the Government Commissioner for the Delta Program, Wim J. Kuijken: "Where



*Coastal erosion at Kingscliff, NSW, in 2011.*

possible, we strive to reach our objectives by making use of natural processes, creating integrated solutions that are flexible, that help to safeguard our economy and boost our ecology, that are both cost-effective and sustainable, and that make our country safer and more attractive as a place to live."

## US ARMY

There are several key points that come out of this statement which are reflected in new programs in the US and the UK. The US Army Corps of Engineers is developing the 'Engineering with Nature' concept, while the Environment Agency in the UK has adopted the strategy of 'Managed Coastal Retreat', also referred to as 'Managed Re-alignment'.

In 2013, I met with officers of both agencies. The Chief of the Institute of Water Resources of the Corps, Dr Charlie Chesnutt, explained the new vision for his group as a "cultural change" looking at "integrated solutions" involving a more interdisciplinary-systems approach with more inter-agency collaboration, and a need to foster creative solutions in project design.

Nick Hardiman of the UK Environment Agency in Bristol stressed the new rationale of the Government for the application of "no active intervention in coastal defences or operations" (NAI) in certain places. The aim is to offer a longer-term approach that allows for more "flexibility" within any given Shoreline

Management Plan (SMP); this involves a switch from 'hold the line' to NAI in the second SMP 'epoch' of 20 to 50 years this century. It is interesting that some places which now have an NAI policy may in the future lose it, while other places may gain it, but overall there will be this shift away from existing management interventions in the next generation of more ecologically friendly SMPs.

It is the scope and scale of projects in the Netherlands that is most impressive. The proactive approach of the Dutch has resulted in innovative designs encapsulated in the concept of 'Building with Nature', which they hope to export to other countries through an understanding of particular environmental conditions in those countries.

At one scale is the enormous Deftland Sand Engine project, which not only attempts to counter coastal erosion, but also provides opportunities for natural conservation and recreation. This project seeks to derive such benefits from sand nourishment using waves, winds and longshore currents to spread the sand along the coast. The Dutch see the sand engine project as a focal point for coastal research and innovative coastal management.

Other projects include encouraging wetland growth around the shores of the delta lakes in ways that will continue to support diverse ecosystems and protection of low-lying lands as the sea level continues to rise. In areas



of estuaries more open to the sea, a project has been designed at a sufficiently large scale to show how oyster reefs can mitigate tidal flat erosion while creating new habitats. Projects such as these operate at the interface between ecosystems and infrastructure.

Building with Nature goes beyond the state-of-the-art in project design and implementation. It triggers new questions for which there are no clear answers, but highlights issues such as the timescale for ecosystems to adapt or recover as processes keep changing. For some this means two things: first, that the concept must ensure that the new generation of ecological researchers should look at the long-term positive benefits on nature of ecological engineering; and second, that the concept requires active engagement of government agencies, academia and private partners with practical experience in infrastructure development.

As an integrated program its emphasis on innovation rather than research alone, involving think tanks such as EcoShape, has created networks for application and dissemination of knowledge.

In the words of Emeritus Professor J. William Kamphuis of Queens University in Ontario: *"Building with Nature is a unique example of how universities and applied research institutes can develop new knowledge in direct contact with end users ... a strong point is the program's ongoing efforts to document and share the research findings. The OpenEarth system for sharing data, models and tools (www.openearth.nl), co-developed by EcoShape, is a great step forward, as is EcoShape's wiki-based Building with Nature guidelines (www.ecoshape.nl) ... the program has set an example that is worthy of broader follow-up."*

## THINGS ARE CHANGING

Application of concepts such as Building with Nature in Australia may seem a long way off. Even in the US, the Corps of Engineers is faced with financial and accountability constraints that place time conditions on individual projects that conflict with the principles of connectivity of systems and time needed to show sustainability of outcomes. Historically, this has been a problem for many of us at the state level in Australia.

Added to this issue is the lack of coordination in planning and implementation

across government agencies, as well as difficulties in sustained collaboration with the private sector and academia. We have lived in a world characterised by 'Disintegrated Coastal Zone Management'. However, there are signs that things are changing.

Coastal reforms introduced late 2015 in NSW by the Minister for Planning, the Hon Rob Stokes, highlight the need for a new approach that should encourage innovation, flexibility and integrated solutions in order to foster the principles of ecologically sustainable development as defined in the objectives of the draft Coastal Management Bill. This new legislation is supported by a new Coastal Management State Environmental Planning Policy, and a new Coastal Manual.

A key aspect of the NSW reforms is to ensure that, in future, land-use planning and coastal management practices are informed by the best available science. Local councils are to develop Coastal Management Programs (CMPs) that recognise the dynamic and ambulatory nature of coastal environments, and identify the nature of risk associated with coastal hazards on both open coast and within estuaries and coastal lakes.

The sediment compartment approach used successfully in the UK will be employed

so that councils will benefit from knowledge of sediment transport systems both within and between councils.

The draft legislation provides for a new Coastal Council that will be technically based and be in a position to offer advice on coastal processes and impacts, as well as audit council performance in implementing their CMPs. This will be one mechanism designed to generate sharing of knowledge, innovation, sustainable use of coastal resources and improved resilience to economic, social and physical forces that are likely to challenge coastal managers and users in future decades.

There is sufficient scope in the reforms to encourage what the Dutch have termed the 'golden triangle' of private partners involved in infrastructure and other development, federal, state and local government agencies, and knowledge institutes. ☺

*Emeritus Professor Bruce Thom AM FTSE is a Member of the Coastal Expert Panel advising the NSW Minister for Planning. He is a member of the Wentworth Group of Concerned Scientists and President of the Australian Coastal Society. He is also former Vice Chancellor of the University of New England and former Chair of the Australian State of the Environment Committee. Professor Thom has written widely in the areas of coastal management, coastal land use planning, coastal geology and geomorphology.*

## EA CALLS FOR AN AGGRESSIVE POLICY FRAMEWORK

Engineers Australia has released its 2016 *State of the Engineering Profession* report, which calls for the Australian Government to show leadership in shaping a prosperous future for the nation.

The Report says that, to drive medium to long-term growth, Australia needs an aggressive policy framework based on growing our productivity and increasing our self-reliance, and calls for governments to develop policies that positively influence Australia's engineering capability through investment in education in engineering, technology and science, as well as the effective use of migrant engineers.

It urges governments to provide long-term infrastructure planning in Australia, independent of the short-term political cycle, with a bipartisan funding model, to deliver long-lasting benefits for the Australian community. It also proposes that governments develop positive and coherent industry policy to renew the nation's ageing industrial base, driving innovation and productivity, by taking the lead through defence procurement and energy policy decisions.

EA says that, without an aggressive policy framework, businesses will continue to be reluctant to invest and state and territory governments will lack direction.

Engineers play a vital role in society, said EA 2016 National President Mr John McIntosh. "Our role as drivers of innovation places engineers among the major contributors to standard-of-living growth in the world's major economies," he said. "Our challenge as a profession is to take this message to the community and to governments, to emphasise our role and our contribution."



# ATSE IN FOCUS

## Six named in Honours List

Six Fellows were named in the Australia Day Honours List, including two Fellows named in the top bracket of Australians honoured.

**Professor Chennupati Jagadish** AC FAA FTSE, from the Department of Electronic Materials Engineering at the Australian National University, was named a Companion of the Order of Australia. His citation noted his eminent service to physics and engineering, particularly in the field of nanotechnology, to education as a leading academic, researcher, author and mentor, and through executive roles with national and international scientific advisory institutions.

**Emeritus Professor Mary O'Kane** AC FTSE, the NSW Chief Scientist and Engineer, was also named a Companion of the Order of Australia. Her citation noted her eminent service to science and engineering, as a contributor to national policy development and governance, to the promotion of technology research and future energy supply, to higher education, and as a role model for young scientists.

**Professor Marilyn Anderson** AO FAA FTSE, Chief Scientific Officer and Director of Hexima Ltd and La Trobe University professor, was named an Officer of the Order,

Chennupati Jagadish



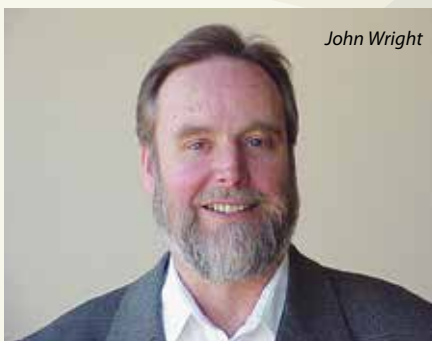
Drew Clarke



Craig Mudge



John Wright



for distinguished service to science, and to higher education, particularly to biochemistry and molecular biology, as an academic and researcher, and to professional associations.

**Mr Drew Clarke** AO PSM FTSE, the Prime Minister's Chief of Staff and former Secretary of the Department of Broadband, Communications and the Digital Economy, became an Officer of the Order, for distinguished service to public administration, to communications and energy policy initiatives and reform, and to the spatial information industry.

**Dr Craig Mudge** AO FTSE, a CSIRO computing expert who spent 10 years in Silicon Valley and is internationally known for his broad computing expertise, became an Officer of the Order, for distinguished service to science, particularly through pioneering initiatives in the information technology sector, as a researcher and author, and as a mentor of young scientists.

**Dr John Wright** AM FTSE, a former Academy Director and inaugural Director of the CSIRO Energy Transformed Flagship Program, was named a Member of the Order for significant service to science and engineering, particularly to renewable energy technology, and to professional organisations.

## MARTIN GREEN WINS WARK MEDAL

ATSE Fellow Professor Martin Green AM FRS FAA FTSE, from the University of NSW, has won the Academy of Science's 2016 Ian Wark Medal and Lecture for his world-record breaking work improving solar efficiency.

Professor Green, Director of the Australian Centre for Advanced Photovoltaics (ACAP) at UNSW, is an acknowledged world-leader in his field and sometimes referred to as the 'father of photovoltaics'.

Several generations of his group's technology have been successfully commercialised including, most recently, the Passivated Emitter and Rear Cell (PERC) that produced the first 25 per cent efficient silicon cell in 2008 and accounted for the largest share of new manufacturing capacity added worldwide in 2014.

Professor Green's fundamental and applied research has led to significant economic benefits both in Australia and worldwide.



Martin Green

■ ACAP comprises the Australian partners of the Australia-US Institute for Advanced Photovoltaics (AUSIAPV), which is developing the next generations of photovoltaic technology, providing a pipeline of opportunities for performance increase and cost reduction. Headquartered at UNSW's School of Photovoltaic and Renewable Energy Engineering, the Centre includes research groups at CSIRO, ANU, the University of Melbourne, the University of Queensland and Monash University. AUSIAPV links ACAP with NSF/DOE Energy Research Center for Quantum Energy and Sustainable Technologies (QESST), based at Arizona State University, the National Renewable Energy Laboratory, Sandia National Laboratories, The Molecular Foundry at Lawrence Berkeley National Laboratories, Stanford University, Georgia Institute of Technology and the University of California – Santa Barbara.

# ATSE IN FOCUS

## Edwina Cornish joins CSIRO Board

Professor Edwina Cornish AO FTSE, Provost and Senior Vice-President of Monash University, has been appointed a member of the CSIRO Board for five years.

Announcing her appointment, Industry, Innovation and Science Minister Christopher Pyne said Professor Cornish's vast experience at the interface between government, research, science and the higher education sector would be of great value to the CSIRO Board.

"Professor Cornish's experience in innovation, collaboration and commercialisation will be of tremendous value to CSIRO as it builds on its strategic goals and forges greater collaboration between science and industry," he said.

He said Professor Cornish was an experienced board member and would bring strong business, industry and financial skills to the CSIRO Board. Her expertise included large organisation management and development, commercialisation of research and broad knowledge of innovation and higher education research issues.

Professor Cornish played a key role in building one of Australia's first biotechnology companies, Florigene Ltd, which developed and successfully commercialised the world's first genetically modified flowers under her leadership.

"Professor Cornish's appointment means the board gains a brilliant and dedicated academic and administrator," Mr Pyne said.

Professor Edwina Cornish is inaugural Provost at Monash University. As the chief academic officer the Provost and Senior Vice-President is responsible for setting the university's academic strategy and priorities with a view to improving education, research and financial performance; oversight of faculties, academic-related portfolios and university-wide centres and institutes; leading academic staffing strategies, including recruitment, probation, performance management, promotion, reward and recognition and fostering interdisciplinary areas of excellence and collaboration.

Professor Cornish was appointed to the

position of Deputy Vice-Chancellor (Research) at Monash University in February 2004. In August 2009 she was appointed Senior Deputy Vice-Chancellor. In 2012 she was appointed to the role of Provost and Senior

Vice-President of the university.

She is an experienced board member and current board memberships include the Museums Board of Victoria, the Indian Institute of Technology Bombay-Monash Research Academy and the ClimateWorks Australia Board. Former board memberships include on the

Board of the Australian Research Council (2001-04)

and the AusIndustry Board (1994-96). Professor Cornish has also served on the Prime Minister's Science and Engineering Council (appointed in 1996) and the Victorian Government Science and Engineering Technology Taskforce.



Edwina Cornish

## CHRIS ROBERTS IS EA'S 2015 PROFESSIONAL ENGINEER

Sydney engineer Dr Chris Roberts FTSE, the former CEO of Cochlear Ltd, has been named 2015 Professional Engineer of the Year by Engineers Australia.

EA noted that "during Christopher's leadership of Cochlear, over 170,000 people were given the gift of hearing through their bionic ear's world-class design, which is durable, comfortable and provides an unrivalled listening experience. Furthermore, Christopher prioritised research and development at Cochlear, investing hundreds of millions of dollars and developing a network of over 100 research partners worldwide".

EA also described Dr Roberts as "a

remarkable engineer with over 37 years' experience in international medical device businesses, who has worked at the forefront of dialysis, pacemakers, respiratory and sleep medicine and now cochlear implants".



Chris Roberts

As the President and former CEO of Cochlear, Dr Roberts was responsible for managing a global leader in solutions for the hearing impaired with 2600 employees both in Australia and around the world.

Since 2004, when he assumed this role, more than 170,000 people, young and old, have been given this gift of hearing.

Through his leadership, Cochlear has more than 100 research partners across the world. The company invests approximately 13 per cent of its annual revenue in R&D. In the past five years this has amounted to more than \$500 million, which would rank him as presiding over one of the largest research funds in Australia.

He is a member of the NSW Innovation and Productivity Council, the Business Council of Australia Innovation Taskforce, the UNSW Faculty of Medicine Advisory Council, Macquarie University Foundation Board of Patrons and the UTS Vice-Chancellor's Industrial Advisory Board.

## ALAN FINKEL PICKS UP MOUNTBATTEN MEDAL

Australia's Chief Scientist and past Academy President Dr Alan Finkel AO FTSE was presented with the 2015 Mountbatten Medal from the Institution of Engineering and Technology in London recently. The award recognised his "research in science and engineering, technical and academic leadership, entrepreneurship and philanthropy, and dedication to science and engineering education". The Mountbatten Medal, established in 1992, is awarded for a sustained, outstanding contribution to the promotion of electronics or information technology and their application. IET is the world's biggest multidisciplinary professional engineering institution.



IET President Ms Naomi Climer presents the Mountbatten Medal to Alan Finkel.



# ATSE IN FOCUS

## Peter Nicol Russell Medal to Eric Neal

Sir Eric Neal AC CVO FTSE, a Fellow since 1981, former SA Governor, head of Boral and widely respected company director, has been awarded Engineers Australia's highest award, the Peter Nicol Russell Memorial Medal – Career Achievement Award for his "overwhelming contribution" to the engineering profession and the Australian community.

"Sir Eric's engineering contribution to the community culminated in the 14 years he was Chief Executive Officer and Managing Director of Boral Ltd, and Director of its subsidiaries in Australia, the UK, the USA and Pacific Islands," said National President of Engineers Australia Dr David Cruickshanks-Boyd.



(From left) EA CEO Stephen Durkin, David Cruickshanks-Boyd, Sir Eric Neal and EA Deputy President John McIntosh

"Sir Eric was Chief Commissioner of the City of Sydney in 1987-88, and served as South Australian Governor for five years.

"Sir Eric helped establish Flinders University as a world-class establishment when he was

Chancellor from 2002–10, and served on the Senate of the University of New South Wales. He has been awarded Honorary Doctorates from the University of Sydney, University of South Australia and Flinders University.

"Sir Eric is also the Principal Patron of the Freemasons Foundation Centre for Men's Health at the University of Adelaide and one of only nine Honorary Fellows of the Australian Institute of Building.

Sir Eric trained as an engineer at the South Australian School of Mines (now part of the University of SA) and became a successful businessman. Apart from his role at Boral he was also a Director of John Fairfax Holdings, BHP, Coca-Cola Amatil and AMP, as well as Chair of Westpac.

## MERYL WILLIAMS WINS CRAWFORD MEDAL

Dr Meryl Williams FTSE was awarded the 2015 Crawford Fund Medal, recognising her service to Australian and international fisheries, aquaculture, aquatic resource conservation, and agricultural research and development.

A tribute to her ongoing passion and commitment to improving global food security, and her significant contribution to international agricultural research, is available on the Crawford Fund's YouTube site ([www.youtube.com/user/CrawfordFund](http://www.youtube.com/user/CrawfordFund)).

Her Crawford Fund Medal citation notes her extensive and continuing contributions to international research in fisheries and aquaculture.

"Meryl works tirelessly in advocacy for international fisheries in relation to human resources.

Currently her focus is on women and gender in aquaculture and fisheries, as well as on the advance of knowledge, information and science to ensure that fish production is both fair and responsible.

"Through a career spanning more than 30 years, Meryl has published widely on aspects of fish harvesting and fisheries management around the world. Her recent work emphasises fish in relation to food security

and nutrition. She emphasises that fish can be a key ingredient in feeding the world's expected nine billion people if fisheries are subject to sound management and policy.

"Meryl has enormous influence through her membership of boards and advisory committees, both international and Australian.

For instance, she is currently the Vice Chair of the Scientific Advisory Committee of the International Seafood Sustainability Foundation and a member of the board of Aquaculture without Frontiers (Australia). And as an Honorary Life Member of the Asian Fisheries Society (AFS), she is leading the AFS project to develop an online information system for Asia-Pacific fisheries

and aquaculture, called AsiaPacific-FishWatch. Meryl also initiated the long running series of global symposia on women/gender in fisheries and aquaculture and maintains the related global website [Genderaquafish.org](http://Genderaquafish.org).

"Among numerous previous positions, Meryl has been Chair of the Commission of the Australian Centre for International Agricultural Research (ACIAR), vice-chair of the Scientific and Technical Advisory Committee of the Global Environment Facility (GEF-STAP),

and has led a number of key international evaluation teams including evaluating the World Bank fishery program, and FAO's support for the implementation of the Code of Conduct for Responsible Fisheries.

"As Director General of the WorldFish Center (1994 to 2004), Meryl concentrated the focus of WorldFish on eradicating poverty, improving people's nutrition, and reducing pressure on the environment."

## MIN GU MOVES TO RMIT

ARC Laureate Fellow Professor Min Gu, until recently Director of the Centre of Micro-Photonics at Swinburne University of Technology, became Associate Deputy Vice Chancellor for Research Innovation and Entrepreneurship (ADVC RI&E) at RMIT University on 4 January. In addition to this role he now leads a research team in photonics at RMIT. Professor Gu was awarded the 2015 Boas Medal by the Australian Institute of Physics.

Recent Boas Medal winners include Professor Chennupati Jagadish FAA FTSE (2013), Professor Ben Eggleton FTSE (2011) and Professor Michael Tobar FAA FTSE (2006).



Meryl Williams receives the award from the Chair of the Council of the Australian Institute of Marine Science, the Hon Penelope Wensley.



# ATSE IN FOCUS



## Catherine Livingstone next UTS Chancellor

*Catherine Livingstone addresses the 2012 Clunies Ross dinner.*

and Saluda Medical Pty Ltd (from 2013); President of the Australian Museum Trust (from 2012); Member of The Growth Centres Advisory Committee (from 2015) and the Commonwealth Science Council (from 2014).

"It has been a great privilege to serve as UTS Chancellor since December 2004," Professor Sara said.

"To be part of the university's amazing transformation and to be recognised as the highest performing university under 50 years of age in Australia (and among the top 25 globally) is an achievement the likes of which we can all be very proud."

Between Professor Sara's retirement in February, and Ms Livingstone taking up the role in December 2016, UTS has elected current Deputy Chancellor, Mr Brian Wilson, as interim Chancellor.

Dr Ron Sandland AM FTSE is UTS Pro-Chancellor and Dr Marilyn Sleigh FTSE is a member of the UTS Council.

Ms Livingstone was also named The *Australian Financial Review* Business Person of the Year 2015 in December. The publication said she won from a "handful of business figures who, in different ways, have most significantly changed their industries, shifted the national debate and delivered for investors".

She joins the list of "50 leaders, builders, pioneers and stirrers that was drawn up to celebrate the masthead's first half century of daily publication".

Telstra Chair, President of the Business Council of Australia and innovation advocate Ms Catherine Livingstone AO FAA FTSE will become Chancellor of the University of Technology Sydney in December, following the retirement in February of Professor Vicki Sara AO FTSE after 12 years in the role.

UTS Vice-Chancellor Attila Brungs said Ms Livingstone's election would further strengthen the university's demonstrated performance and ongoing commitment to working alongside business in R&D, as well as in creating the next generation of Australia's skilled workforce.

Ms Livingstone said she saw the new position as an opportunity to play a different but equally significant role in helping Australia create future wealth and prosperity, and drive innovation.

"Our Prime Minister rightly says that

change is opportunity. I believe Australia will only seize the opportunity presented by the unprecedented change currently sweeping the world if its university and industry sectors can be far more effective collaborators," she said.

"This is a responsibility of both business and university, and will require a shift in mindset by both. This shift is already happening at UTS, and among their many partners in the Ultimo creative and start-up precinct. I am excited to be a part of that." Ms Livingstone was the Chief Executive of Cochlear Ltd (1994 to 2000) and Chair of CSIRO (2001–06. She has also served on the boards of Goodman Fielder Ltd and Rural Press Ltd.

Other recent significant directorships and appointments held by Ms Livingstone include: Director of Worley Parsons Ltd (from 2007), Macquarie Bank Ltd (2003–13) and Macquarie Group Ltd (2007–13), The George Institute for Global Health (from 2012)

## TREVOR BIRD ON ANTENNAS AND ARRAYS

Professor Trevor Bird FTSE has recently published a new book, *Fundamentals of Aperture Antennas and Arrays: From Theory to Design, Fabrication and Testing*, through John Wiley & Sons Ltd.

It relates to antennas (or aerials) in common use today, such as reflectors for satellite communications and radiotelescopes, horns and lenses, and is based on his career working principally at CSIRO in Australia, and in the UK and the US.

The book is directed at upper-level undergraduates and postgraduates, as well as readers moving from academia into industry, those commencing careers as wireless engineers or for practising engineers.

## MICHELLE SIMMONS JOINS AAAS

ATSE new Fellow Professor Michelle Simmons FAA FTSE from the University of NSW, known for her ground-breaking research developing atomic-scale electronics, has been named a Fellow of the American Association for the Advancement of Science.

Professor Simmons is an ARC Laureate Fellow and Director of the ARC Centre of Excellence for Quantum Computation and Communication Technology at UNSW.

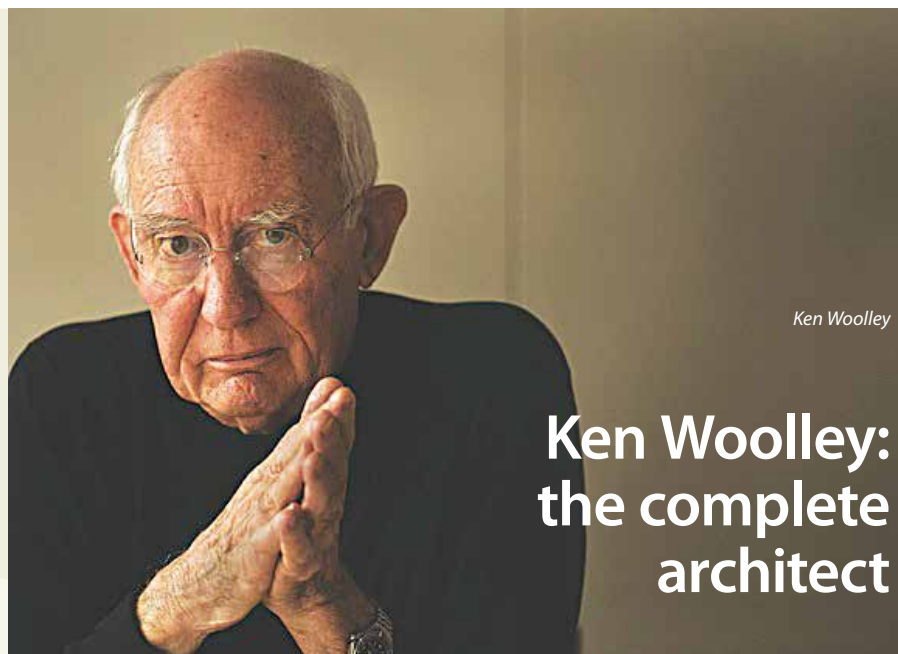
She leads a team of 180 researchers developing a radical, uniquely powerful quantum computing technology that aims to interface with completely secure communication systems.

As a consequence of both her leadership of the Centre and her own ground-breaking research program, Australian researchers are now at the international forefront of classical and quantum computing technologies in silicon.

Her research has important implications for the semiconductor industry and is anticipated to be transformational in the field of quantum computation.

The AAAS is the world's largest general scientific society and publisher of the journal *Science*.

# ATSE IN FOCUS



Ken Woolley

## Ken Woolley: the complete architect

Ken Woolley, progenitor of the influential 'Sydney School' of architecture, was arguably the most complete architect of Australia's modern era, according to *Architecture Australia*, the national magazine of the Australian Institute of Architects.

"He designed buildings of every type and scale – from small homes and project houses to office towers, apartments, churches, corporate HQ's and civic squares, for public and private clients from prestigious to poor," *Architecture Australia* noted.

"He was the quintessential Sydney architect;

almost all of his work can be found within 40 km of the Sydney Town Hall (for which he designed an office tower and public square).

"He was a founder of the 'The Sydney School' in houses, and notably his AS Hook Gold Medal address in 1994 was entitled 'State of the Art in Sydney'. Every building he designed was different (there being no 'starchitect' repetition or house style) but each one seems right for its place and purpose, particularly as they respond to the sharp sunlight and forceful topography of Sydney.

"His design approach, particularly the planning, was rooted in the modern humanism of his early study and travels, together with

sensitive but uncompromising forms and materiality, often with stepping outlines following the underlying Sydney sandstone.

"We have lost a great architect," *Architecture Australia* concluded.

Mr Kenneth Woolley AM FTSE, a Fellow since 2000, died in Sydney on 25 November 2015, aged 82.

Growing up in suburban Kingsford, he showed a talent for art and music, winning honours at the Sydney Conservatorium of Music at the age of 10. From Sydney Boys High School he won a traineeship at the NSW Public Works Department and graduated in 1955 from the University of Sydney with the University Medal, the Sulman Medal, the Stephenson and Turner Medal, and the Byera Hadley Travelling Scholarship that paid for overseas travel and study.

This took him to Europe – an experience that strongly influenced his life's work, which included landmark commercial and public buildings, as well as residential building designs which were widely built during the 1960s and 1970s by Pettit and Sevitt, regarded as innovative house builders at the time.

His career was studded with awards and his 2000 Fellowship nominations noted that he was an "architect with the highest of reputations" whose commercial buildings had been "widely acclaimed" and who had developed a "fine reputation" for housing designs "that made a laudable contribution to raising the quality of commercially available houses in Australia".

## MAX LU GOES TO SURREY

Professor Max Lu FAA FTSE, Provost and Senior Vice President of the University of Queensland, will become Vice-Chancellor of the University of Surrey in April, after nearly 20 years at UQ.

An internationally known chemical engineer and nanotechnologist, Professor Lu will become Surrey's fifth Vice-Chancellor, replacing Professor Sir Christopher Snowden.

Recognised among Australia's Top 100 Most Influential Engineers, Professor Lu is one of only 150 double highly cited academics in the world, with over 500 peer-reviewed articles published in top journals, attracting more than 31,000 citations.

He is also the co-inventor of more than 20 international patents and has received numerous prestigious awards throughout his career, including the China International Science and Technology Award, Queensland Greats Award and the International Mesosstructured Materials Association Lifetime Achievement Award.

After completing his PhD, Professor Lu spent three years in Singapore as a lecturer at Nanyang Technological University. He joined UQ in 1994,

and has held positions of senior lecturer, associate professor, professor and Chair of Nanotechnology in Chemical Engineering.

He won the prestigious ARC Federation Fellowship twice, in 2003 and 2008.

Prior to taking up the role of UQ Provost and Senior Vice-President in March 2014, Professor Lu served as Deputy Vice-Chancellor (Research) from 2009, and acting Senior Deputy Vice-Chancellor from December 2011 to October 2012.

He held the position of Pro-Vice-Chancellor (Research Linkages) from October 2008 to April 2009, following his seven-year service as the Foundation Director of the ARC Centre of Excellence for Functional Nanomaterials.



Max Lu



# ATSE IN FOCUS

## Leighton Medal to Ian Rae



*Ian Rae*

Professor Ian Rae FTSE, former Academy Technical Director and later President of the Royal Australian Chemical Institute (RACI), has been awarded RACI's Leighton Memorial Medal for 2015.

The Leighton Medal, which commemorates the distinguished career of AE Leighton, is "the Institute's most prestigious medal and is awarded in recognition of eminent services to chemistry in Australia in the broadest sense, including research, technology and service to the RACI, public service and national leadership".

AE Leighton died in 1961 after a distinguished career as a chemist, technologist and administrator.

He was a staunch supporter of the RACI and during his frequent visits to England in the early years of the RACI, carried out an enormous amount of work to secure the RACI's Royal Charter.

He was one of the first group of Fellows elected (June 1920) and served as Victorian Branch President in 1920–22. He was President of RACI in 1952–53.

## SWISS DOCTORATE FOR MARK RANDOLPH

Internationally recognised geotechnical engineer Professor Mark Randolph FRS FREng FAA FTSE has received another accolade for his expertise in offshore geotechnics.

Professor Randolph, from The University of Western Australia's Centre for Offshore Foundations Systems (COFS), was awarded an honorary doctorate by a prestigious Swiss university for his crucial contributions to the field of offshore geotechnics and developing

novel methods for offshore site investigation techniques.

One of three researchers worldwide to receive the honorary doctorate from ETH Zurich for outstanding achievements in science and teaching, Professor Randolph is also Fugro Chair in Geotechnics at UWA and was WA Scientist of the Year in 2013.

Professor Mark Cassidy FTSE, director of COFS, said the honorary doctorate highlighted the international impact of Professor Randolph's work over many years.

"His leadership has established Perth as an internationally recognised hub for excellence in geotechnical engineering and attracted many world-leading companies as well as academics," Professor Cassidy said.

Founded in 1855, ETH Zurich is one of the world's leading universities in technology and the natural sciences.

## EA HONOURS ROSE AMAL AND ROBIN KING

Two Fellows have been named by Engineers Australia as Honorary Fellows.

Professor Rose Amal FAA FTSE, University of NSW Scientia Professor and ARC Laureate Fellow, was the Director of the ARC Centre of Excellence for Functional Nanomaterials (2010–

13). She is recognised as a pioneer and leading authority in the fields of fine particle technology, photocatalysis and functional nanomaterials, having made significant contributions to these



*Robin King*

related areas of research over the past 20 years. Her current research focuses on designing nanomaterial systems for solar and chemical energy conversion applications.

Professor Amal has received numerous prestigious awards including being listed in the Top 100 Australia's Most Influential Engineers in 2012, 2013, 2014 and 2015, the ExxonMobil Award (2012), the NSW Science and Engineering Award – Emerging Research (2011) and the Freehills Innovation Award (2008).

Former ATSE Education Forum Chair Professor Robin King FTSE has been elected an Honorary Fellow of Engineers Australia.

The EA Citation notes: "Professor Robin King is a distinguished engineering academic who has made a significant contribution to the engineering profession and community. His contributions have been through his academic work in several universities, and as a higher education consultant and volunteer.

"He has served as Chair of Engineer Australia's Accreditation Board, and as Engineers Australia's delegate to the International Engineering Alliance and Chair of the Sydney Accord.

"He has also contributed to several other organisations, including AAEE, ATSE and the Australian Council of Engineering Deans."

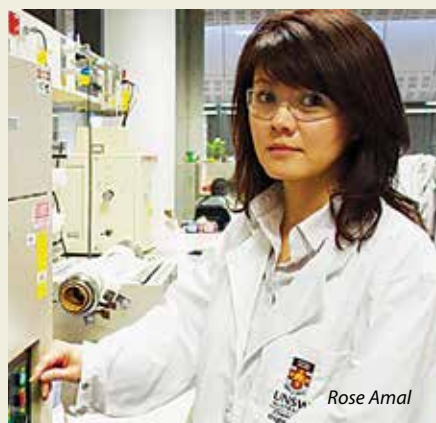
## LINDSAY FALVEY TO CHAIR ILRI BOARD

Professor Lindsay Falvey FTSE has been elected to chair the Board of the International Livestock Research Institute, the premier livestock research body for the poorer nations of the world.

As one of 15 'green revolution' centres of the Consultative Group for International Agricultural Research (CGIAR), ILRI conducts leading scientific research oriented to livestock producers across Africa, Asia and elsewhere.

Professor Falvey is a leading livestock specialist who has wide experience over some 40 years, which includes corporate governance, academic leadership and international research.

He has been CEO of Coffey-MPW, Chair of Agriculture and Dean of the (now) Faculty of Veterinary and Agricultural Science at the University of Melbourne and Director of Hassad Australia.



*Rose Amal*

# ATSE IN FOCUS

## Don Mentz: a dynamic leader who mentored many

Don Mentz established a stellar reputation as an administrator at both national and international level, heading a number of Australian Government agencies, working for the Asian Development Bank, serving as Director General of the Commonwealth Agricultural Bureaux and heading The Crawford Fund (1999 to 2002).

Mr Donald Mentz AM FTSE died in Townsville on 30 October 2015, aged 82.

He started his career as an agronomist in the Victorian public service before moving to Darwin in 1960 with the Commonwealth Department of Territories and by 1965 was acting director of the Agriculture Branch before transferring to Canberra where he led the Department of Territories' forestry, fisheries and water resources section.

When the Department was disbanded in 1968, he was reassigned to the Department of External Territories and became an assistant secretary (1969–72) and then first assistant secretary, Economic Affairs Division (1972–73). Like many others he was swept up in the arrangements for independence of Papua New Guinea. During those years and in subsequent roles he visited PNG more than 50 times and became a member of the board of directors of the PNG Investment Corporation.

Just before PNG independence, the Department of External Territories was abolished and he moved into the newly created Australian Development Assistance Agency (ADAA), becoming head of the division that administered ADAA's policy development, administrative services and assistance to multilateral programs and non-government organisations.

In 1975 he led the Australian delegation to the second meeting of interested governments on the formation of the International Fund for Agricultural Development (IFAD) and in 1979 became Director, Country Development, Asian Development Bank, based in Manila, until 1981.

Returning to Canberra he was briefly (1981–82) Deputy Secretary in the Department of Business and Consumer

Affairs before returning to the Department of Territories and Local Government (1983–84) as Deputy Secretary and later acting Secretary of the Department.

In 1985 he became director general of the Commonwealth Agricultural Bureaux (CAB) – the precursor of the modern CABI – in the UK. At that time CAB was a non-profit organisation, funded by 29 member countries, with a staff of about 400. He centralised the dispersed bureaux to a single location and established CABI's Development Fund,

through which donors could help developing countries purchase CABI's services.

Mr Mentz developed an interest in the Crawford Fund during his years at CABI and had been a member of the small team that reviewed the Fund in 1993. He improved management practices and processes and substantially renovated the Crawford Fund.

Mr Tim Fischer AC FTSE described him as a dynamic leader who delivered much and mentored many.

"He was a colourful personality, always engaged and looking ahead, always ahead of the game", Tim said. "He would often give a wry smile and on most occasions it was followed by a pertinent observation that cut to the chase."

### FELLOWS JOIN MINING RESEARCH BOARD

Two Fellows joined the board of the Minerals Research Institute of Western Australia (MRIWA) from 1 February.

Emeritus Professor Mark Bush FTSE, retiring WA Division chair, and Ms Denise

Goldsworthy FTSE, chair of the Mineral Resources Forum, will join former WA Division chair Dr Peter Lilly FTSE on the MRIWA Board, which he chairs.

Announcing the appointments, WA Mines and Petroleum Minister Bill Marmion said the appointment would help drive exciting scientific discoveries and the development of new resource businesses.

"An important mandate for this institute is to enable research and its commercialisation," Mr Marmion said.

"The new appointments will build on the great work already under way, linking MRIWA even more closely with the resources, innovation and finance sectors."

"Professor Bush is a respected senior researcher with long service at The University of Western Australia, Engineers Australia and the Australian Academy of Technology and Engineering," the Minister said.

"Ms Goldsworthy brings immense corporate know-how to the board, from her experience on the development of autonomous haul trucks in the Pilbara, to her current business focus on change management and challenging the status quo."

### US HONOURS FOR TWO FELLOWS

Professor Andrew Holmes FAA FTSE, President of AAS, and Professor Chennupati Jagadish FAA FTSE, of the ANU, have been elected among 168 new Fellows of the US National Academy of Inventors. The new Fellows bring the total number of NAI Fellows to 582, representing more than 190 research universities and government and non-profit research institutes. NAI Fellows include 27 Nobel Laureates.



Don Mentz



Denise Goldsworthy



Peter Lilly



Mark Bush



Andrew Holmes

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**dream large**







# Creating change in cancer treatment

**What happens when skin cancer treatment works well for a third of patients, but poorly for the other two-thirds? And what if that drug is the best – and sometimes the only one available?**

For The University of Queensland Diamantina Institute (UQDI) researcher Dr Fiona Simpson, the answer is easy: find a better drug, or find a way to support that drug to make it more effective.

Dr Simpson lost her mother to cancer, and this experience, combined with advice from UQ's Professor Ian Frazer to 'do something translational' with her research, has led her to study how patients respond to targeted cancer therapy antibodies. Dr Simpson and her team aim to find out how to change patients from treatment non-responders into responders and ultimately to prevent cancer from recurring.

So far Dr Simpson and her team have discovered a connection between how tumour cells present signalling molecules on their surfaces and then how therapeutic antibodies bind to them, which in turn changes the level of immune cell activation, leading to tumour cell killing. They have found a way to use small molecule inhibitors to create 'good patterns' that force tumours to leave more receptors on cell surfaces. This provides more targets on which antibodies can

act, bringing the immune cells in to attack the tumour and hopefully reducing the recurrence of cancer in the future.

The collaboration between UQDI and the Princess Alexandra Hospital (PAH) has enabled the crucial access to clinicians, patients and tumour samples required for Dr Simpson's research, and clinical trials are currently underway at the PAH.

UQDI is part of the Translational Research Institute and is based at the PAH in Brisbane, enabling UQDI's strong clinical interactions. UQDI is an internationally recognised research facility and students of UQDI are given the chance to undertake research in an environment dedicated to the pursuit of excellence, where researchers challenge the frontiers of biomedical and translational science. For more information visit [di.uq.edu.au](http://di.uq.edu.au)

The Federal Government's 2015 Excellence in Research for Australia exercise confirmed The University of Queensland as one of the nation's top three universities, measured by the quality of its comprehensive range of specialised research fields. UQ's outstanding critical mass offers researchers significant interdisciplinary capability.

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