



THE SUPERMARKET REVOLUTION

LOOKING AT HOW WE BUY OUR FOOD

Contributors examine whether the Supermarket Revolution in Food is good, bad or ugly for the world's farmers, consumers and retailers

“How we can feed ourselves sustainably in a low carbon economy?”



Wanzhuang Eco City © Vyonyx/Arup/Client SIIC

Climate change, water shortages, rising crude oil prices and an expanding population are beginning to question the resilience of our current farming and food supply systems.

In the near future localised food production – integrated into the city’s infrastructures – might well be a key factor in securing access to affordable and healthy food for new and existing communities.

Arup understands the need for localised integrated food production in a Slim City – the resource and carbon efficient cities of the future.

Our multi-disciplinary teams are assisting clients to set the bar for sustainable development, and are committed to help implement initiatives that strive to make a difference to society.

We assist local and state governments in identifying what food sustainability means and how it transfers into policies and projects.

Our model for planning sustainable cities has been developed and used to inform Arup planning projects worldwide - including masterplanned communities in Queensland and Victoria (Australia), Zuidas (The Netherlands), Chaiten and Noviciado (Chile), Baku City Development (Azerbaijan), Ebbsfleet and Northstowe (UK), Destiny (US), Wanzhuang and the Changxindian Community (China) and the design for the Low2No development in Helsinki (Finland).

3

The Supermarket Revolution and its causes

By Allan Fels

8

The Australian food processor: a threatened species

By David McKinna

11

Innovative successes through the value chain

By David Shearer



Front cover: The trolley – symbolic of the world's supermarkets.

Photo: iStockphoto



In the long run consumers may face lower-quality products, potentially less choice and almost certainly fewer Australian-made goods (page 8).

- 14 Change the mindset to benefit from Asia
- 15 Weathering the supermarket shock waves
- 16 Supermarkets cause “deep concern”
- 17 Australia’s strengths will back African food security
- 18 ICT key to innovation and productivity
- 19 Productivity is the problem – and innovation is the solution
- 20 Three steps to increase our innovation dividend
- 26 Conversations that count
- 45 ATSE in *Focus*

FOCUS

ATSE *Focus* is produced to stimulate discussion and public policy initiatives on key topics of interest to the Academy and the nation. Many articles are contributed by ATSE Fellows with expertise in these areas. Opinion pieces on topics of national interest, particularly the Academy’s key interest areas – climate change impact, water, energy and education – will be considered for publication. Items between 800 and 1500 words are preferred. Please address comments, suggested topics and article for publication to editor@atse.org.au.

Deadline for the receipt of copy for next edition of *Focus* is **16 January 2011**.

ATSE is an independent body of leading Australian engineers and scientists established to promote the application of scientific and engineering knowledge to practical purposes. ATSE *Focus* is produced to serve this goal.

Opinions expressed in this publication are those of the authors, and do not necessarily reflect the views of ATSE. Material published in *Focus* may be reproduced provided appropriate acknowledgement is given to the author and the Academy.

CEO: Dr Margaret Hartley FTSE

Editor: Bill Mackey

Technical Consultant: Dr Vaughan Beck FTSE

AUSTRALIAN ACADEMY OF TECHNOLOGICAL SCIENCES AND ENGINEERING (ATSE)

Address: Level 1, 1 Bowen Crescent, Melbourne

Postal Address: GPO Box 4055, Melbourne, Victoria 3001

Telephone: 03 9864 0900

Facsimile: 03 9864 0930

Email: editor@atse.org.au

ACN 008 520 394

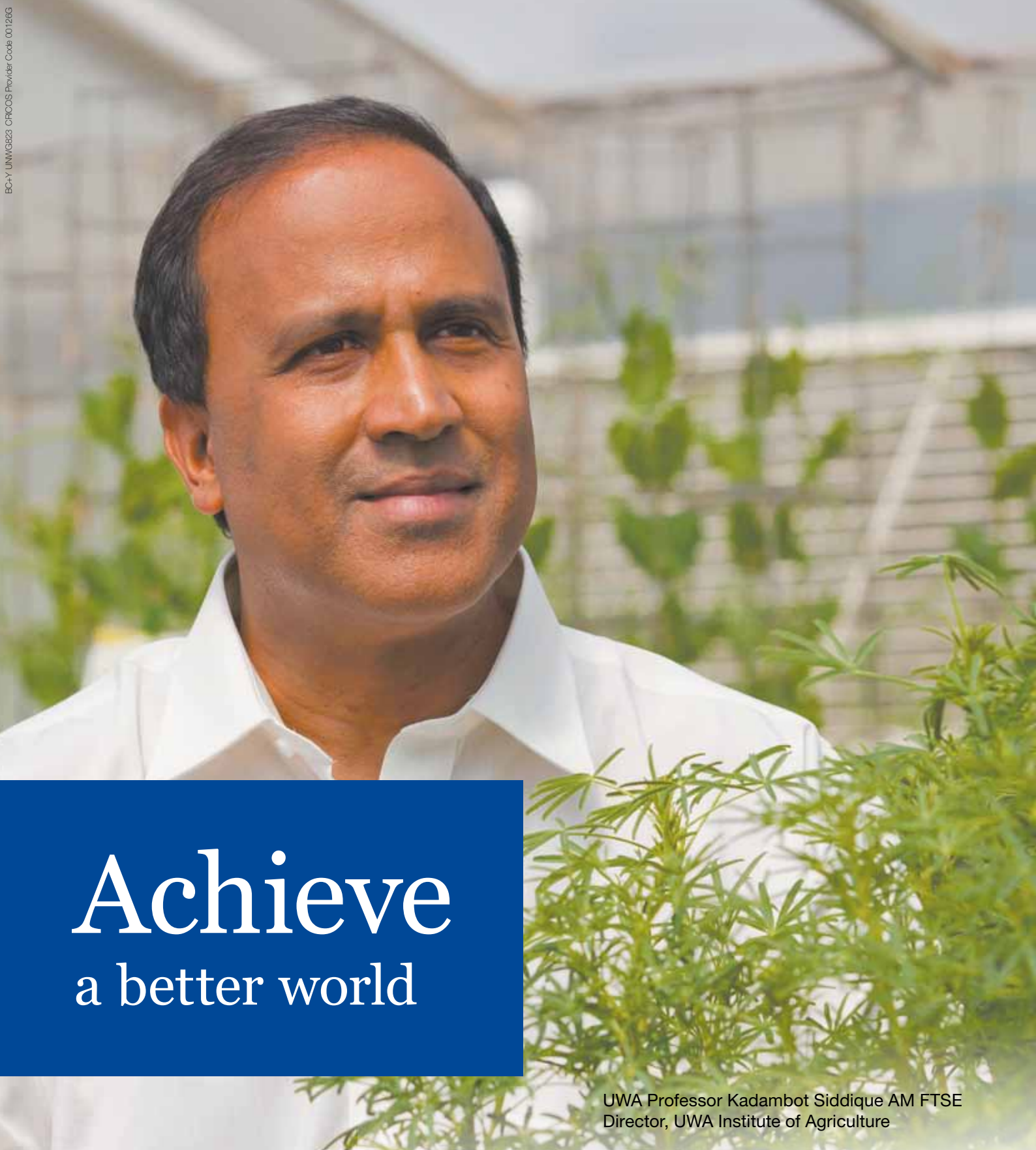
ABN 58 008 520 394

Print Post Publication No 341403/0025

ISSN 1326-8708

Design and production: Coretext 03 9670 1168 www.coretext.com.au





BC-Y UNW3823 CFCOS Provider Code 001260

Achieve a better world

UWA Professor Kadambot Siddique AM FTSE
Director, UWA Institute of Agriculture

As one of Australia's leading research universities, The University of Western Australia is committed to encouraging its academic staff to provide valuable assistance wherever on earth it's needed.

Internationally respected Chair in Agriculture and Director of UWA's Institute of Agriculture, Professor Kadambot Siddique, is one such academic. He is working with scientists in Iraq to identify, promote and disseminate the best crop varieties and farming systems for their climate; and he is also one of the Chief Investigators in the 'Seeds of Life' program in East Timor.

If you're looking to succeed at international standards of excellence and contribute to the global community, visit uwa.edu.au



THE UNIVERSITY OF
WESTERN AUSTRALIA
Achieve International Excellence

The Supermarket Revolution and its causes

Have supermarkets been allowed to grow without sufficient oversight and foresight by regulators and governments? Has the right competition approach been taken?



By Allan Fels

a.fels@anzsog.edu.au

The Australian grocery retail industry has become highly concentrated over the past few decades as a result of changes in shopping habits, a relaxed regulatory approach to mergers in the 1980s and company-specific factors such as bungled expansion strategies. Public concern and a general sense of unease about this high level of concentration has led to a number of regulatory and policy decisions being taken in recent years.

In the early 1980s there were four major retailers – Coles, Myer, Woolworths and Safeway. At that time, the independent sector accounted for more than 50 per cent of the share of grocery sales. Controversially, a proposal to merge Coles and Myer was approved by the competition regulator in 1985. In the same year Woolworths and Safeway merged, leaving just two major players competing with a third substantial retailer, Franklins. A considerable independent sector, which consisted mainly of small stores supplied by a range of wholesalers, completed the picture.

Two subsequent developments led to a high degree of

concentration. First, consumers changed their behaviour over time by choosing the larger supermarkets, which were largely run by Coles and Woolworths, over the smaller outlets. In the 1990s the Australian Competition Tribunal (probably correctly) decided not to oppose a wave of mergers amongst wholesalers. Second, a watershed occurred in 2001 when Franklins pulled out of the Australian market. No new entrant appeared to take its market share.

Today, Coles and Woolworths account for 80 per cent of the dry grocery market and the wholesaler Metcash supplies most of the remainder. Together, they account for around 87 per cent of all large supermarkets that are 2000m² or bigger. There has been entry on a small but growing scale by Aldi, which has about five per cent of the market after opening its first store in Australia in 2001.

This article draws on the presentation made by Professor Fels to the Crawford Fund 2011 Parliamentary Conference. Additional material is on the Crawford Fund website (www.crawfordfund.org).

The supermarket revolution and food security

The current debate around supermarkets is focusing on their pricing policies, but the issues related to the so-called 'supermarket revolution' are much broader, both in Australia and in the developing world.

The 2011 Crawford Fund annual development conference *The Supermarket Revolution in Food: Good, Bad or Ugly for the World's Farmers, Consumers and Retailers?* held in Canberra in August discussed some key issues:

- the extent to which the growing significance of supermarkets and a range of issues related to the marketing chain are impacting consumers,
 - producers and traders; and
 - what they also mean for world food supply, trade, security and scarcity.
- Key speakers included:
- President Haruhiko Kuroda of the Asian Development Bank;
 - Professor Thomas Reardon from Michigan State University;
 - Professor Allan Fels, the former chair of the ACCC, the Trade Practices Commission and the Prices Surveillance Authority;
 - Mr John Glover, Regional Head of Offer and Customer Management for Metro Cash & Carry International for Asia;
 - Dr David McKinna, a pre-eminent Australian

opinion-maker on agrifood issues;

- Mr Richard Lovell, General Manager, Charoen Pokphand Foods; and
- Dr David Shearer from ACIAR.

A number of presenters at the conference have authored article for this issue of *ATSE Focus*, which also addresses current domestic issues in relations to supermarket operations.

The Crawford Fund was established in 1987 by the Australian Academy of Technological Sciences and Engineering (ATSE). Its mission is to increase Australia's engagement in international agricultural research, development and education for the benefit of developing countries and Australia.

Another dynamic is the poor management of Coles over a number of years, although this seems to have changed recently with a new chief executive and ambitious plans to recoup market share with aggressive discounting campaigns. Woolworths, on the other hand, has steadily grown its market share and simultaneously increased its margins.

Market dominance aside, modern retail provides many undisputed benefits: an efficient supply chain, impressive choice, buyer power for consumers and supermarkets, the convenience of one-stop shopping, flexible opening hours, and – most importantly for consumers – lower prices on a wider range of products.

The risk is, however, that market share accumulates until a tipping point is reached. With firm grasps on the market, the big supermarkets may start easing off on the discounts and reaping increased margins. Or, they can grow their margins by cutting out the middlemen (the wholesalers) and selling generic brands for lower prices than branded goods. There is then the risk that the price of generic brands will increase once the supermarkets have cast aside branded goods and consumers are left with very little choice or ability to buy elsewhere.

With Coles kicking off a fierce discounting war in January this year, it appears that Australia is in the latter stage of market maturity. Coles and Woolworths are growing their dominance and margins by increasingly bypassing wholesalers and processors and buying direct from farmers. We have seen as much with the milk war, which poses a difficult challenge for policymakers given that producers are probably set to be forced to accept lower farm gate prices as a result.

On the other hand, common sense dictates that competition is at work if the supermarkets are jostling with the other mouths on the supply chain. This is healthy and good for consumers.

It is a difficult balancing act that is not unique. While the details vary from one country and market to another, it is clear that in every country there is a level of concern about supermarkets' buying and selling power.

The following questions arise: have supermarkets been allowed to grow without sufficient oversight and foresight by regulators and governments? Has the right competition approach been taken? Have laws, regulations and policy responses been effective?

Policy responses

Given the Australian experience of retail dominance in terms of market share and buyer power, several Parliamentary inquiries and regulatory reviews have set out to consider a range of policy responses and approaches. While they are reactive rather than proactive developments, they are worth

considering because they highlight the importance of anticipatory policies that prevent situations of market dominance and buyer power from emerging in the first place.

1 Merger law and divestiture

The merger law was reviewed and tightened in 1993. While the previous test had prohibited mergers that gave rise to dominance or increased dominance, this was replaced by a test that prohibited mergers that substantially lessened competition.

Since then a number of other options have been considered but not adopted. The most important was a proposal to introduce a 'creeping acquisition' test. This planned to address the problem of retail outlets gradually growing, store by store, to a position of dominance with negative consequences for competition.

2 Abuse of dominance

Another major policy option is to accept retail concentration but to regulate behaviour, in particular, by focusing on whether or not an abuse of market power has occurred. Over the years the law has been slightly tightened. In 1986 the *Trade Practices Act* was changed to enable the law to be applied to an abuse of market power rather than simply an abuse of dominance. As with the change in the merger law, the aim was to catch oligopoly misuse of market power, rather than just single firm abuse of market power.

While the ACCC has been successful in some cases, including Safeway, it has not succeeded in others. A noteworthy failure by the ACCC in 2003 was against Boral in the High Court of Australia. However, the ACCC has recently succeeded against Cabcharge, imposing record fines for predatory pricing and abuse of market power. The Federal Court Judge who approved the \$15 million settlement noted that the deterrent effect was significant.

Section 46 of the TPA, now section 46 of the *Competition and Consumer Act 2010*, is a complex provision that has been amended several times since 2007 to increase penalties and improve the ACCC's chances of success in bringing prosecutions under it. The court now has a list of factors that may be considered when determining whether a company has abused its market power, and the ACCC no longer has to prove that the company expected to be able to recoup its losses in later trading.

3 Price policy

Another possible response to retail dominance is to impose maximum price controls. In the 1970s price controls were imposed on major retailers, however, even then the operation was extremely complex and seemingly ineffectual. Given how complex the supermarket sector is these

days, no one talks of price or margin control in Australia.

However, the Labor Government directed the ACCC to hold a public inquiry into grocery prices in 2007–08. This was seen as a response to concern about farmers being squeezed by big supermarkets (directly or indirectly), low food prices, high prices of some groceries such as fruit and vegetables, and the future of small retailers given the large supermarkets' expansion into small express stores and an inability to compete on price.

There was some disappointment with the ACCC's treatment of the degree of competition between Woolworths and Coles, but the review did result in some important changes for consumers.

First, a mandatory, nationally consistent unit pricing regime was implemented in December 2009. It applies to grocery items sold by large supermarkets and is essentially a labelling system that shows prices per standard unit of measurement such as by volume or by weight.

The second change involved a monthly comparison of typical grocery baskets across Australia. The idea was to provide some transparency around the cost of groceries in different areas, given that there was evidence that the supermarkets charged dramatically different prices according to location (the presumption being that prices are linked to the affluence of the area in which supermarkets operate).

4 Code of Conduct

In 1998 Australia enacted provisions in a new Part IVB of the *Trade Practices Act 1974 (Cth)*, which provided for industry codes. These were of various kinds: purely voluntary; involuntary but once agreed legally enforceable by the ACCC and/or possibly by individuals in the industry; and fully mandatory, that is, enacted and enforced by the ACCC and/or possibly private parties.

The Retail Grocery Industry Code of Conduct was entrenched on a voluntary basis following a lengthy period of criticism of big retailers by small business interests.

In broad terms the Code does not seem to have affected the behaviour of big retailers and the pressure they are known to exert over suppliers to extract the best possible deals. The code has had no application to relationships between big manufacturers and retailers. To the extent that the code has been applied, it has been applied to big retailers and farmers and perhaps a smattering of small suppliers.

5 Unconscionable conduct

To put the legislative framework in context, the original common law doctrine concerning the sanctity of contract gradually changed to provide that in certain cases contracts are invalid if they were preceded by unconscionable conduct or involved unconscionable terms. In the early 1990s



Supermarkets
for Australian
staple foods.

the then *Trade Practices Act 1974* was amended to provide the ACCC with the power of enforcing the common law. While the law originally applied to relationships between consumers and business alone, at a later date the law was extended to transactions between big and small business.

The provisions apply in principle to buyer-seller relationships but in reality have not been used. Their relevance to date has mainly been to shopping centre-tenant relationships.

Policy challenges

Supermarkets pose policy challenges that the world's biggest emerging markets are only just starting to grapple with. Developed countries such as Australia have been dealing with these challenges for decades, and many lessons can be learned from their experiences.

Australia has, for the most part, managed the retail sector with soft regulatory hands. Market forces have shaped the size and construct of the retail sector over time, creating an environment conducive to all of the benefits of modern retail. Consumers and society more generally have indisputably benefited from the retailers' investment in supply chain management and more efficient business practices, as well as the lower prices and greater product choice that flow from economies of scale.

However, Australia provides evidence that there comes a tipping point when these retailers reach a position of dominance. Anticompetitive behaviour has been aired in Australian court rooms, and various policies have been implemented with limited success.

A possible generalisation from these experiences is that retailing can be thought of as developing through two stages. In the first stage, modern retailing is necessary in order to achieve major efficiencies in distribution. The dilemma

Food and nutrition for future health

As the University of South Australia's (UniSA) premier health and biomedical research concentration, the Sansom Institute brings together a diverse group of leading scientists who are dedicated to finding solutions to some of the most pressing health care challenges of the 21st century. One area is focused on uncovering new nutritional, food and dietary knowledge to deliver health benefits.

The Nutritional Physiology Research Centre (NPRC), within the Sansom Institute is playing a key role in delivering excellence in diet and lifestyle research. The Centre investigates the benefits of diet and exercise for health, cognitive performance and physical function; often working in partnership with the food industry.

Current projects include substantiating the health benefits of functional foods; optimising diet to improve health; and trialling the cardiometabolic health benefits of dietary lipids, particularly Omega-3 fatty acids, antioxidants, dairy and other foods in dietary intervention trials.

The Sansom and NPRC have successfully secured nationally competitive government funding and industry funding to support their nutritional research, delivering research outcomes which influence national and international food policy. They also have well established partnerships with major nutritional multinational companies, longstanding collaborations with other academic institutions and links with several Cooperative Research Centre's (CRC's).

UniSA is continuing to build its reputation as a leader in this field, and was one of only four Australian universities ranked as performing above world standard in dietetics and nutrition research in the first Excellence in Research for Australia assessment.

For more information about the Sansom Institute and its expertise across the public health spectrum, in linking research to positive health outcomes, visit unisa.edu.au/sansominstitute



Research at UniSA's Sansom Institute for Health Research and the Nutritional Physiology Research Centre is unlocking the benefits of food beyond its basic nutritional properties, which has implications for food and nutrition into the future.



University of
South Australia

is that when this happens it inevitably moves to stage two, a situation where an oligopoly, and quite possibly a duopoly, emerges. In turn this implies substantial seller and buyer power, which may operate against the public interest.

The lesson for developing economies is that effective competition policy needs to be in place well before the second stage is reached, both to deter anticompetitive behaviour and to evaluate the extent to which retail power is being used to unfairly disadvantage smaller retailers and their customers.

The sources of retail power need to be understood to ensure that abuses of power are curbed before they occur and weighed against the benefits brought by modern retailers, which must not be unduly hindered. ◀

PROFESSOR ALLAN FELS AO FASSA has been Dean of the Australia and New Zealand School of Government since July 2003. Prior to this he was Chairman of the Australian Competition and Consumer Commission (ACCC) from 1995 until 2003. Professor Fels was also Chairman of the former Trade Practices Commission (TPC) from 1991–95 and Chairman of the Prices Surveillance Authority from 1989–92. He is an Honorary Professor in the Faculty of Business and Economics at Monash University and became a Professorial Fellow in the Department of Political Science at the University of Melbourne in 2003. Professor Fels was the Co-Chairman of the Joint Group on Trade and Competition at the Organisation for Economic Co-Operation and Development (OECD) from 1996 until 2003. Professor Fels is also the Chairman of the National Mental Health Commission and the Chair of the Victorian Taxi Industry Inquiry.

FOOD AND GROCERY REFORMS VITAL – AFGC

Continuing a 'business-as-usual' approach with no policy reforms in Australia's \$108 billion food and grocery manufacturing sector will see industry become significantly less competitive by 2020 as falling growth translates into major job losses across the nation, according to a landmark new report.

Failing to provide tax incentives for investment, improve skills development or create a level playing field in the highly concentrated retail sector over the next decade could see industry shed 130,000 jobs, according to the 2020: *Industry at a Crossroads* report launched by the Australian Food and Grocery Council (AFGC) and A.T. Kearney.

"Industry turnover is forecast to decline by 0.2 per cent per annum over the coming decade, from \$108 billion to between \$105 billion and \$106 billion in 2020. Over that same period, retail demand is due to grow at 3.7 per cent per annum with the growth gap being increasingly filled by imports and retailers' private label products," the 2020 analysis said.

AFGC Chief Executive Kate Carnell said the 86-page report was commissioned by AFGC to investigate the intense challenges facing industry, future economic trends and key reforms needed to improve industry's sustainability, profitability and competitiveness.

"Australians and our political leaders overwhelmingly want a local, value-adding

food and grocery manufacturing sector – it's Australia's largest manufacturing industry that we can't live without," Ms Carnell said.

"Consumers want to be confident about buying affordable food and grocery brands, that they know and trust. I urge all political leaders – both Federal and State – to seriously consider this report and reconsider the current business-as-usual approach towards the sector."

Other key findings and trends outlined in the industry-first report, released at AFGC's Industry Leaders' Forum in Canberra, include:

- 55 per cent of surveyed food and grocery manufacturers were negative about the future of industry;
- if there are no policy reforms, industry's employment numbers could fall from 312,000 to around 180,000 by 2020 – a loss of up to 130,000 jobs;
- up to a further 6000 jobs are forecast to be lost in associated industries including agriculture;
- towns in regional NSW, Victoria and Queensland are expected to be hardest hit by employment losses;
- the retail environment is expected to remain as challenging, if not more challenging, for food and grocery manufacturers over the coming decade;
- the retail market is expected to remain highly concentrated, with Coles and Woolworths forecast to have a combined

supermarket share of more than 80 per cent in many categories; and

- private label products are forecast to grow strongly and could account for 40 to 50 per cent of total supermarket sales by 2020, consistent with developments in international markets.

Ms Carnell said Australia had a "golden opportunity" to show leadership towards industry and leverage the fact that Australia's economy is much healthier than most others in the world. "Australia has the capacity to produce high-quality, healthy food and groceries for Australia's growing population and to contribute to feeding the world. But this will not happen unless there is commitment from government, industry and consumers," she said.

A.T. Kearney Australia Vice-President Irvinder Goodhew said: "Using a combination of economic modelling, interviews and surveys with industry leaders, our report concludes that food and grocery manufacturing is facing pressures on many fronts. Retailer concentration, a high Australian dollar, low-cost-country manufacturing, energy prices, global commodity volatility and labour scarcity will continue to create challenges for the sector."

Ms Goodhew said that the tough retail environment and increasing competition from lower-cost manufacturing countries are some of the biggest issues for manufacturers.



Supermarkets – where the milk wars are fought.

PHOTO: ISTOCKPHOTO

The Australian food processor: a threatened species

The consumer is the winner in the short term, but in the long run faces lower quality products, potentially less choice and almost certainly fewer Australian-made goods.



By David McKinna

david@mckinna.com.au

The recent supermarket price war has again brought into the spotlight the market power of our major food retailers and its impact on Australia's food processing sector. High-profile announcements of food factory closures, that have become more common of late, suggest that Australia is losing its food processing industry and becoming relegated to the less profitable end of the supply chain – being a producer and first stage value-adder of commodities.

A further implication of this situation is that an increasing amount of our processed food is being imported.

The past 30 to 40 years has seen a massive power shift in the Australian food supply chain. While farmers held market power in the 1970s, the processors grabbed it in the mid 1980s. In the past few years, supermarkets have obviously prevailed.

Although it seems a distant memory, in the 1960s and 1970s, farming was profitable (albeit with the usual cycli-

cal fluctuations). Farmers held market power, by virtue of the statutory marketing authorities and grower-owned co-operatives whose sole *raison d'être* was to maximise farm gate prices. Central markets were vibrant and gave smaller growers an even trading platform.

But farming lost its gloss in the late 1980s. By then, statutory marketing authorities had become a political liability and were being phased out – one of the last being the sinking of AWB in the wake of the Iraq bribery scandal. Most agricultural cooperatives had to become corporatised to raise capital. Ultimately, almost all were taken over by multinational food companies. At this point the agenda shifted from maximising farm gate returns to delivering bottom line profits to the processor.

After a frenzied period of mergers and acquisitions in the 1990s, multinationals soon dominated the Australian food processing sector. They skilfully leveraged their global 'power brands' to drive high profits and reinvested a good portion of

those profits into marketing and product innovation.

The supermarkets could not afford to be without these power brands, which had become household staples. Consumers were happy to pay premium prices because of the brand's reputation for quality and consistency. In those days, private label programs were struggling – quality was low and the cringe factor was high. Private label purchases back then were hidden at the bottom of the shopping trolley. The brand was king.

The end of the halcyon days for food processors and their brands began in the early 2000s when supermarkets started to flex their muscles. The power transition was complete when Wesfarmers acquired Coles. Coles leveraged their market power to reduce buying prices and at the same time revamped their private label offering, making them a serious contender for market leadership.

Woolworths responded to every move with a counter attack, raising the stakes. The retailers' pursuit of market share at all costs has stripped massive value out of the whole Australian food supply chain. Producers have effectively had to 'dumb down' products to meet the lower price points mandated by the supermarkets (for example, lowering the quality of ingredients or changing the pack size).

The fundamental power shift to the retailers over the past decade means that Australia's two big supermarkets now form a formidable oligopsony.

In some grocery categories, they have more than 80 per cent market share. Typically, they account for 40 to 60 per cent of the revenue of any significant food processor in Australia. Losing the listing of a single product with just one of the two big supermarkets could have disastrous consequences for a food processor, as margins are now razor-thin. As a result, the loss of any production volume puts pressure on overhead recovery in the factory. Consequently, processors have no real alternative but to yield to supermarket market power.

The renaissance of private label in Australia (expedited by the arrival of Aldi) has tightened the screws on processors even further. Private label products now emulate the market leader, offering shoppers something as good as, or sometimes better, at a substantial saving. Supermarkets pass on part of those savings to the consumer (to build store traffic) and take the rest as profit.

It is fair to say that supermarkets are not blatantly profiteering from their market power. If anything, in the longer term they are reducing their own margins (and returns to their shareholders) by devaluing whole categories. Supermarket profit levels are actually modest relative to their sales turnover.

The consumer is the real winner here – in the short term. In the longer term consumers face lower quality, de-

engineered products, potentially less choice and almost certainly fewer Australian-made goods.

Increasingly, in a high Australian dollar environment, supermarkets are sourcing many of their private label products from overseas. Private label products take shelf space and sales away from the processors' branded goods, forcing them to discount and offer continual price promotions to defend their market share. This reduces processor profit margins and erodes the power of their brands to achieve a price premium.

Processors are reliant on these price premiums as they fund innovation and allow them to reinvest in the marketing programs needed to build the brand strength and compete with private label products. Without the ability to invest and fund branding and marketing, food processors begin a death spiral of margin loss.

The margin cuts have now got to the point where food companies are not achieving the return on invested capital required to fund reinvestment in their businesses, apart from some essential cost reduction investment. Food companies are reporting losses or reduced profits that make it hard for management to justify reinvestment. Increasingly food companies are having to source more inputs from overseas, (or outsource their production to an offshore supplier altogether) to compete in a market where they no longer hold the power base – a fact manifested in the recent closures of Australian food processing plants.

Although the move offshore by some processors has been attributed to the strong Australian dollar and Australia's higher labour costs, these are not the only causes. The real cause is the shift in market power.

Politicians and regulators aren't prepared to intervene because supermarkets are not acting illegally and consumers are, in the main, very happy with deflationary food prices. There is a limit, however, as to how far food processors can reduce prices. Perhaps at some point, the multinational processors will withdraw from the Australian market altogether. It is yet to be determined who will win that power play.

Although market power has clearly shifted along the supply chain to the supermarkets, it could well revert back to the farmer if forecasts of global food shortages transpire. The global demand for quality food products is forecast to grow exponentially over the next decade, on the back of the growing middle class in China and India. Australia is well placed to take advantage of this, a point that is increasingly being recognised by foreign investors who see Australian agrifood assets as being undervalued.

Unfortunately, even anticipating this next power shift, it is likely that Australia will be a producer and first stage value-adder only, rather than a downstream processor. A key reason for this will be the fact that most of our food processing facilities will have closed down and our food

marketers will be accustomed to sourcing the product for their brands from overseas.

The decline of Australia's food processing industry comes at a huge cost to the Australian economy because of its labour intensity. The multiplier effect of these jobs on the economy is significant. Most tragically, the burden is largely felt in regional Australia where small communities can be decimated by the loss of the local food processing plant. The social impact on these communities is as dire as the economic one.

Politicians still subscribe to the myth that Australia can be the 'the food bowl to Asia', that we will prosper by feeding the growing populations of our northern neighbours. While it is no myth that Australia can be globally competitive in commodities such as large scale production of proteins and grains, the outlook for processed foods and labour intensive products such as horticulture and viticulture is less optimistic. Australia has already lost many of these markets to competitor countries South Africa and in South America.

It is also highly unlikely that Australia could ever be the 'packaged food bowl to Asia' as our manufacturing costs are simply uncompetitive due to the labour and logistics challenges we face. In the past, multinational processors who have set up shop in Australia have been seduced by bountiful arable land and a developed retail market –

what they fail to factor is the enormous logistics reach and a relative small population base that limits the ability to achieve any economies of scale in manufacturing and challenges the very best supply chain managers.

From a dry economist's point of view, the plotting of industry cycles and shifts in market power is helpful for redirecting investment. However, this analysis also begs the question about what impact losing our food processing sector may have on our regional communities.

Any global economic analysis would support the contention that our agrifood processors are a threatened species. But what of the social implications when a small town, once reliant on that cannery or bottling plant, can no longer field a football team? ◀

DR DAVID MCKINNA is arguably Australia's pre-eminent opinion maker on agrifood issues. His views on the sector are regularly sought by media. He has been the quiet achiever behind some of Australia's best known agrifood case studies. Since completing a PhD in business and strategy in Cornell University, Dr McKinna has spent the best part of his career as principal of global strategy consultancy McKINNA *et al*. In addition to work in agrifood, McKINNA *et al* has a history of strategic 'trouble shooting' in sectors as diverse as banking, education, FMCG, retail, home improvement and public governance.

Excellence in delivering information

- **Australia's leading agri-science publisher**
- **Professionally written and produced publications**
- **Information products that showcase R&D at work**
- **Talk to us if you need to: reach new audiences
create effective communications
explain, engage and convince**



coretext
CONTENT MATTERS

Innovative successes through the value chain

Research needs to generate insights into rural development processes associated with standards and certification, to support improved smallholder engagement in global markets.



By David Shearer

david.shearer@aciagov.au

The global food crisis has had significant impact on the global food systems since 2007. This has been influenced by more rapid economic growth rates in the world's most populous countries, stagnating yields of major food crops in some of the world's most productive cropping systems – with yield plateaus evident for several cereal crops in some major producing countries – and a rapid rise in energy prices that have caused convergence of energy and agriculture.

Traditionally, economic development had its basis in land, labour and capital as factors of production. However, improved information and the development of technology through innovation has had a significant influence on economic development. This change from primary factors into information and technology has also played a significant role in the rise of value chains.

Importantly, it is now the case that investment in people provides a favourable environment for innovation and knowledge diffusion.

Value chains

Traditionally, agrifood markets operate by selling non-differentiated commodities using arms-length transactions such as auctions or pooled pricing mechanisms. Global trends in production, manufacturing and retailing have seen a shift as firms recognise the need to understand and target consumer preferences, which can be achieved more efficiently through closer coordination and integration of firms along a supply chain, which essentially led to what is considered a 'value chain' approach.

This approach has become important in both research and policy fields, with an increasing number of development organisations, NGOs and governments adopting it

to guide their development interventions. At the heart of value-chain analysis lies the idea of people and firms connected along a chain producing and bringing goods and services to end consumers through a complex set of activities.

Poor information flow in these complex systems and other obstacles often prevent farmers from entering into markets, or reducing the benefits they can obtain from entry. Value-chain initiatives are designed to overcome some of these obstacles and often to mobilise the knowledge and resources of key firms, such as retailers, to improve the opportunities and benefits of market entry for producers and providers of inputs and services.

Almost all donor-supported value-chain development projects work under the assumption that value-chain development will help reduce poverty – with farmers, particularly poor farmers, as the primary beneficiaries. It is assumed that there is under-utilised potential for improving the incomes of poor producers or the employment prospects of poor people.

By making value chains function more effectively, for example, by improving flows of knowledge and establishing linkages, it is expected that interventions will benefit the poor. However, apart from this general assumption about the connection between market engagement and poverty reduction, the approach to poverty reduction differs tremendously between interventions.

Global food and innovation

Global food production has historically grown faster than global population, reflecting increased availability of food per person. Between 1961 and 2008, world population grew by 117 per cent while food production grew by 179 per cent, with the associated declining real prices over a long period.

Global food requirements will continue to increase in

Contributions are welcome

Opinion pieces on topics of national interest will be considered for publication in *ATSE Focus*. Items between 800 and 1500 words are preferred. They must list full name, title/role, organisation (if relevant), city of residence and email address for publication. Please address to editor@atse.org.au

All Australian schools can now participate in STELR

The STELR Project is running in more than 250 schools across the country, involving more than 30,000 students. The STELR Project has been enthusiastically received by both teachers and students.

The STELR Concept

The STELR Project

- presents an exciting curriculum program that aims to reverse the low level of interest among students in science courses and careers
- targets students in Years 9 or 10 and their science teachers
- is a 6-to-10 week package involving inquiry-based activities
- engages students through investigations into global warming, climate change and renewable energy resources
- operates within the curriculum. It is intended for delivery to all students in the year level

STELR in action

STELR provides

- a comprehensive set of curriculum materials, including physical science and chemistry units
- teacher resources and student work books
- class sets of laboratory equipment to run hands-on, inquiry-based activities on solar and wind renewable energy resources (one class set caters for up to four classes)
- professional development seminars to be held in major centres in March 2012 (attendance by two teachers is required to ensure the effective use of the resources)
- on-going support throughout the year.

All Australian schools can now participate in this exciting project so don't miss this chance to take STELR to your students.

Find out more about STELR by visiting the web site www.stelr.org.au

To obtain a price list, contact STELR Project Manager Peter Pentland 03 9864 0906 or peter.pentland@atse.org.au



"Science teaching should be coupled with learning about technology in a 'hands on' manner, which the STELR program currently promotes. It would benefit Australian education for the STELR Project to be made available to more of our schools. This initiative would help ensure that more students chose careers in technological trades, engineering and the applied sciences, benefitting companies desiring a well-trained workforce drawn from local communities. I strongly recommend that you support the STELR Project."

— Professor Lyn Beazley AO FSTE, Chief Scientist of Western Australia.

 **ATSE**
STELR

coming years, as populations rise and as growing incomes promote both an increasing volume and a changing pattern of food consumption.

With this, a different pattern of food consumption has emerged, such as the higher demand for livestock products being stimulated by increasing disposable incomes. In Asia, demand growth for meat and edible oils outstripped population growth by a wide margin over the past 15 years. Demand for meat and dairy products – and associated feed grains – is expected to continue to expand more rapidly than demand for food grain.

In addition to changing food product preferences around the world, consumers are paying more attention to the food they eat, the value they get from it, and what it does for them and for the world around them. Food attributes that offer value to the consumer through good health, environmental stewardship, and ethical treatment of people and animals are therefore becoming more mainstream.

Market innovation

Related to this rise in consumer interest is a parallel rise in corporate interest, in part captured in corporate social responsibility programs which are driving many changes in the way that food systems operate. The focus of these is in the healthiness of food, the sustainability of food production, processing and transportation and the ethical treatment of supply-chain participants.

Research has found that these non-functional attributes work because they embody a value to the consumer that goes beyond satisfying hunger and nutritional requirements, allowing consumers to vote as shoppers at a time when they are feeling increasingly divorced from the food production system.

The feeling of being divorced from a production system is counter to the feeling of vulnerability when food safety concerns drive changes in consumer behaviour. Research focused on food biosecurity becomes a key part of the innovative response due to these consumer concerns.

Cost-effective biosecurity for smallholder commercial poultry operations in Indonesia has been the focus of recent Australian Centre for International Agricultural Research (ACIAR) research. It has used an innovative approach by incentives to improve smallholder practice change in a highly complex environment. An interesting market-driven aspect of this work emerged – marketing product with the aim of developing a clean market chain for meat and eggs from certified biosecure farms to be sold at premium prices in supermarkets.

Initial sales of chicken meat were about Rp30,000 a kilogram, with non-biosecure products selling for about Rp12,900/kg. However, not all benefits flow through to



Global food requirements are growing.

the producers, who bear a significant proportion of the costs. But, with significant productivity improvements of the biosecure farms, returns to smallholders improved regardless of the financial flow of profits.

The introduction of global sustainability standards and traceability systems to various commodity systems, including coffee, has undoubtedly led to significant restructuring of global value chains and the way in which smallholder farmers are engaging with international markets.

Over the past 10 years, schemes such as Fairtrade, Rainforest Alliance and Utz Certified, have been gradually introduced into global coffee systems and are now a common feature of the coffee industry.

An oft-stated assumption behind certification schemes is that they have been put in place to deliver social, economic and environmental benefits to producer communities, thereby attracting the interest of a number of international development agencies and NGOs. However, a growing body of research has more recently begun to question the tangible benefits for smallholder participants, and broader rural environments, from being enrolled in such schemes.

While market intervention in farm practices is expected to increase further, there is currently very little impartial evidence of actual smallholder benefits and an understanding of the constraints limiting smallholder engagement in such systems. Proponents of certification schemes, and industry participants in the schemes, are often aware of their limi-

tations, and are actively seeking solutions to ensuring that greater benefits flow to farmers and to the environment.

Research needs to generate insights into rural development processes associated with standards and certification, to support improved smallholder engagement in global markets and the development of appropriate policy to support this engagement. It will ascertain specific development benefits arising from value chain initiatives at the farm level, thus helping to inform the design of effective private sector development interventions in the future.

The old story of the supply chain, the 'push' aspect, was all about the product. It drove lean thinking with a focus on cost minimisation and efficient logistics. The new story has emerged being a 'pull-based' strategy, where the product is important and attributes of the product critical. Now with dynamic information flows and the need for trusted relationships, people are becoming more important in the

delivery of benefits.

What the research is starting to suggest is that the relationship aspect – the aspect reliant upon people and trust – is highly important, especially amongst younger producers, although this important aspect may be so new.

So, as food systems became more complex, the supply-chain approach focused on transactions and minimisation of cost, then value chains developed with a focus on delivering consumer requirements and improved engagement with markets, and now there is an increasing recognition of the importance of people in this complex flow of product and information which leads to the importance of trust.

Research shows that if policymakers wish to improve a group's emphasis on market penetration, the most important factors to develop is group trust. There is a significant, positive relationship between marketing support and group trust. Trust encourages people to work together for the common

CHANGE THE MINDSET TO BENEFIT FROM ASIA

■ Australia can reap the benefits of Asia's retail revolution and the rising incomes and demand for imported goods in its rapidly growing middle class, but it will need a change in the mindsets of Australia's farmers, exporters and producers and brand-building efforts in these markets.

This was the message from Mr John Glover, the Australian who is Regional Head of Offer and Customer Management at Asia Metro Cash and Carry International, the leading international cash-and-carry wholesaler.

"Modern retailers and wholesalers today are investing the major share of their development funds into the Asian marketplace to bring modern retail and wholesale concepts to the Asian consumer," he told the Crawford Fund 2011 Conference.

"With a large growth in urbanisation across Asia, the region represents huge opportunities as well as big challenges to international players to sustain growth and protect their international brands from food safety issues, environment and sustainability issues.

"At the same time, there is a growing demand in Asia for high-quality, safe goods, which presents a great opportunity for modern retail and wholesale formats.

"Companies need to recognise the necessity to promote sustainable production and consumption models in order to be successful in Asia in the next 20 to 50 years.

"In the fast-developing markets in Asia, international companies thus have the opportunity to leapfrog international best practices and to install sustainable concepts right from the start.

"Modern retailers and wholesalers are working closely with farmers and co-ops to improve food standards and quality, to employ sustainable farming and processing methods, and to create savings in the supply chain. This leads to improvements in the incomes and living standards of the farmers.

"Modern retail and wholesale chains are bringing high standards of food safety and traceability programs for both farming and processing industries.

"Global retailers are changing the face of retail and wholesale in Asia and developing markets and will invest in the future. The challenges are not just with them but with the willingness of others to change," he concluded.



good, and this can flow through to group members working together to improve their access to the cattle market.

Conclusion

The current activities globally following recent food security concerns are on track with the recognition of the importance of research and the contribution it makes to innovation in food systems. This innovation derived from research has always had a product focus, which will continue to be an important aspect of global food security.

The growth and use of value-chain approaches common amongst governments, donors, NGOs and the private sector is an important aspect. Recognition of the role the process – from producer to consumer – plays in continual improvement should remain as part of the response to overcoming food security concerns.

Importantly, as information and technology are inte-

grated into global food systems, the relationships between people and trust become an increasingly important aspect and should not be overlooked in supporting innovative successes in the value chain. ◀

DAVID SHEARER is Director, Corporate at the Australian Centre for International Agricultural Research (ACIAR), based in Canberra.

His primary role is to manage provision of corporate services to enable ACIAR to meet its corporate objectives and discharge its responsibilities. His international development career has focused in Asia and the Pacific, with activities to develop more competitive smallholder-based value chains and enable access to higher value markets. In 2010 he was awarded the Australian Davos Connection Australian Leadership Award, which recognises commitment to promoting the national dialogue through leadership, advocacy and innovation. Mr Shearer holds a Masters from Monash University's Graduate School of Business and a Masters in plant physiology.

WEATHERING THE SUPERMARKET SHOCK WAVES



Professor Thomas Reardon

■ A supermarket revolution has swept developing countries in the past two decades, spreading as much in that time as it had in five or six decades in wealthier countries, Professor Thomas Reardon told the Crawford Fund conference.

Professor Reardon, from Michigan State University, is a leading global expert in links between agrifood industry transformation and food security in Asia.

"In Asia, modern food retail sales are growing three to five times faster than GDP/capita," he said, explaining that supermarket growth was happening in different sets of three

waves, earliest in East Asia outside China, then South-East Asia, then South Asia:

- first in big cities, then medium cities, then even in rural towns;
- first among the richer consumers, then the middle class, then the working poor; and
- first in processed foods and rice, then semi-processed foods such as meat and dairy, last in fresh produce.

"Alongside these different waves of growth in supermarkets are waves of impacts," Professor Reardon said.

"The impacts are felt first by consumers, by pulling down food prices and pushing up

quality; then on traditional retail industries, by displacing small shops and, gradually, wetmarkets; and then on the food processing and wholesale sectors, where the impacts are strongest and most immediate; and, finally, impacting farmers.

"Farmers and processors face opportunities in the rise of supermarkets through broadening the markets open to them. The supermarkets' private standards for quality and safety, and quest for product differentiation, also deepen the markets for them.

"But the rise of supermarkets, in tandem with transformation in processing and wholesale, present farmers and small processors – especially small-scale, asset-poor firms – with stark challenges to meet tougher market requirements that demand new upgrading investments.

"Market transformation comes in parallel with a rise in government regulations for food safety, such as enacted in 2008 in China.

"Donor, government, NGO and private-sector programs have important roles to play in helping small farms and firms weather this 'double shock' – with the goal of helping what is a very rapid market transformation have the maximum benefit to the rural poor, while ensuring overall food security, and diet quality and diversity upgrade," he said.

SUPERMARKETS CAUSE “DEEP CONCERN”

Allegations of abuse of market power by two of Australia's biggest supermarkets are cause for deep concern, according to Innovation Minister Senator Kim Carr.

Senator Carr told a recent meeting of more than 100 food and grocery stakeholders in Canberra that it was a concern that should be shared by everyone who cares about manufacturing jobs or consumer choice.

“On the basis of the claims put to me, by reputable firms, there is serious cause for concern about an abuse of market power,” he said.

“I have given this information to the independent regulator, the ACCC.

“Everyone has seen their favourite Australian brands disappearing from supermarket shelves. The food industry is reluctant to speak out, and with good reason.

“For most food manufacturers, their main access to customers is through the supermarket chains. They control up to 80 per cent of retail food and grocery sales in this country. In practical terms, you deal with Coles and Woolworths, or you go out of business.

“I have received complaints that retailers

are exploiting that position by:

- auctioning off shelf space with a view to excluding competitors;
- extracting concessions in contract negotiations by denying access to shelves;
- arbitrarily deducting costs for stock-handling services – even if the services aren't required;
- forcing manufacturers to pay freight charges between supermarket warehouses and stores; and
- arbitrarily rescinding contracts with suppliers mid-term.

“Through their homebrands, the supermarkets compete directly with suppliers. Coles and Woolworths have significant market power.

“Some suppliers claim they must divulge their product plans 12 months in advance and supermarkets use this information to further weaken the competitiveness of brand name products,” Senator Carr said.

“Individual suppliers should not have to bear the pressure by themselves. Such a practice has the potential to cripple innovation,

destroy jobs and erode our capabilities as a food-producing nation.

Senator Carr said the global food manufacturer HJ Heinz was quoted in The Age on 1 November 2011 “criticising the market power of Coles and Woolworths for fostering an ‘inhospitable environment’ for suppliers as they stripped out brands and stocked their shelves with private-label products”.

“I am not the judge and jury on these matters. That is why I have given this information to the independent regulator,” he said.



Senator Kim Carr

Australia and China pursue global food security

Researchers from Australia and China have linked to improve global food security by mounting a scientific counterattack on the pests and diseases that ravage food and tree crops.

The Cooperative Research Centre for National Plant Biosecurity (CRCNPB) has developed memoranda of understanding with two leading Chinese science agencies and a university to mount joint research programs aimed at curbing losses of grain and other vital crops to insects, moulds and plant diseases.

“When we visited China to sign these agreements, we saw clear evidence of the massive reinvestment and technical tooling-up they are now making in food and agricultural science,” CEO of CRCNPB Dr Simon McKirdy said recently. “Compared with what’s happening in Australia, it is huge – and the new partnership means we now stand to benefit from their investment in science.”

The CRCNPB MoUs are with the Chinese Academy of Inspection and Quarantine and the Chinese Academy of State Administration of Grain and Northwest Agriculture and Forestry University. These provide primarily for increased joint research, and greater exchange of scientists and PhD students between the partners.

The initial research focus of the new collaboration will be in diagnostics – timely identification of plant pests and diseases – and in the management of pests in stored grain.

“Worldwide, humanity loses anywhere between 8 and 20 per cent of its annual grain harvest to insects and moulds – that’s enough food to feed every hungry person on the planet,” Dr McKirdy explained. “Australia is recognised as a world leader in dealing with insect pests in stored grain, and the Chinese are keen to partner with us in this area.”

ANSTO gets ‘starchy’

An Australian invention that monitors the behaviour of starches as they are cooked could revolutionise food manufacturing processes, helping food makers establish the best way to cook and process starches.

The neutron Rapid Visco Analyser (nRVA) was developed by scientists at the Australian Nuclear Science and Technology Organisation (ANSTO) who worked with manufacturer Perten Instruments to develop the nRVA.

Dr Elliot Gilbert, ANSTO food science project leader, explained that the nRVA analyses small samples – often starch – under controlled test routines.

“This is not a question of irradiating food but of exploring the properties of starch down to the molecular level. The nRVA could radically improve food manufacturing processes such as measuring flour and grain



Australia is to provide agricultural research and advice to African countries.

Australia's strengths will back African food security

The establishment of the Australian International Centre for Food Security is an exciting initiative based on Australia's recognised strengths in agricultural production, research and education, according to the Crawford Fund, an ATSE initiative.



Dr Elliot Gilbert

quality for breakfast cereals, snack and animal foods," Dr Gilbert said.

Innovation Minister Senator Kim Carr said: "This discovery could mean

manufacturers will be able to make food more efficiently, with lower energy input. It also gives manufacturers the power to consistently create starches with known health benefits, like those that have been proven to help counter bowel cancer.

"The nRVA uses neutrons from ANSTO's OPAL research reactor at Lucas Heights to enable manufacturers to better understand food at the molecular level," Senator Carr said. "This is a great example of collaboration between scientists and industry resulting in a new technology with the potential to benefit Australia."

The Australian Government announced at the recent CHOGM meeting in Perth it will set up the Australian International Centre for Food Security to provide valuable agricultural research and advice to African countries in need. It will provide more than \$36 million to establish the centre, which will be led by the Australian Centre for International Agricultural Research (ACIAR).

The new centre will be set up in Canberra and an office will be established in Africa to provide further support. As a first step, the centre will host an international conference, *Food Security in Africa: Bridging Research and Practice* next year, which will bring together a range of Australian and African research partners, as well as international experts, to identify opportunities for cooperation.

"Australia's strength in agriculture and agricultural research has been forged in tough environmental conditions by resilient farmers and brilliant scientists," said Dr Denis Blight AO, Executive Director of the Crawford Fund, in response to the Government's announcement.

"This new approach further consolidates Australia's credentials in international agricultural research through ACIAR and most recently through a new suite of partnerships between African and Australian scientists

working on important food security topics such as improving maize-legume farming systems, combating animal diseases and enhancing the nutritional quality of food.

"These important projects in Africa build on Australia's strengths as an agricultural research leader and innovator," he said.

Dr Blight noted that this announcement came 30 years after another CHOGM announcement by Prime Minister Malcolm Fraser in Melbourne in 1981 that led to the establishment of the now internationally renowned ACIAR, which will be leading the Australian International Centre for Food Security.

He said the initiative drew together important threads that were recurring themes in past and current Crawford Fund policy work. "The Fund is particularly gratified with the Centre's initial focus on sub-Saharan Africa, an alignment that we recommended in our 2008 report, *A food secure world: how Australia can help*.

"The proposed international conference on African food security, to set a strategic framework and forward work program for the new centre, will need a team approach, with AusAID, ACIAR, Australia's Federal and State research organisations and universities, and other public and private sector stakeholders to work with African partners to yield win-win opportunities for Africa and Australia, and ensure food security for generations to come," he said.

Prime Minister Gillard said Australia had an important role to play in supporting African countries confronting the challenge of food security and the new centre would offer greater support to help African countries strengthen their agricultural practices.

Australia has unique agricultural and scientific expertise and world-class teaching and research institutions were well-suited to African agriculture and food security, she said. This expertise includes dryland and tropical farming, climate change adaptation, commercialisation of agricultural research, and water and soil management.

The new centre would give farmers, government agencies and the private sector access to this expertise and other support from a large network of Australian, African and international research bodies.

ICT KEY TO INNOVATION AND PRODUCTIVITY

Australian productivity policy should focus on e-transformation in all sectors of the economy, according to a leading US innovation authority.

This means tackling tough issues – what the key information and communication technologies (ICT) and applications are for each sector and function (including what cross-cutting ICT platforms are needed); what the barriers to adoption and transformation are; and how public policies can spur e-transformation.

Dr Robert Atkinson told a seminar organised by ATSE in Melbourne in November that this focus on ICT was essential, given that it is the key technology driving productivity in Australia today.

Dr Atkinson, President of the Information Technology and Innovation Foundation in Washington and a Member of the US Department of Commerce's National Innovation and Competitiveness Strategy Advisory Board, argued that innovation powers productivity which, in turn, drives prosperity.

He also suggested that national growth policy must abandon the realms of macroeconomics and embrace specifics to determine opportunities and limitations.

"National growth policy can no longer be content to reside at the lofty levels of macroeconomics. It must delve into the specifics of firms, industries, technologies, processes and functions, examining what the limitations and opportunities are in each case."

Noting that innovation powers productivity



Dr Robert Atkinson addresses the seminar.

by both enabling the creation of new, higher value-added industries and allowing existing industries to become more efficient, he argued that the dynamics for each are quite different, requiring different policy approaches.

Dr Atkinson was the keynote speaker at the seminar, titled *Productivity, Innovation and Prosperity – The Great Australian Challenge* at the Melbourne Convention and Exhibition Centre. ATSE brought Dr Atkinson to Australia for the event, which was designed to inform the national debate on productivity, the role of science and technology and their necessary contribution to prosperity beyond the current mining investment boom – recognising the recent slow pace of productivity growth in Australia.

The event, organised by the Victorian Division of the Academy, attracted two Government ministers and an audience of

about 100. The Victorian Minister for Technology and Assistant Treasurer, Gordon Rich-Phillips MLC, opened the seminar and Senator Stephen Conroy, Minister for Broadband, Communications and the Digital Economy, delivered the lunch address 'Exploiting the opportunities from digital productivity'.

Prominent Australian speakers included:

- Dr Matthew Butlin, Chair, Victorian Competition and Efficiency Commission;
- Dr Nicholas Gruen, CEO of Lateral Economics;
- Dr Terry Cutler FTSE FAHA, Principal of Cutler & Co, Deputy Chair, CSIRO and chair of the Australian Government's 2008 Review of the National Innovation System;
- Ms Deena Shiff, Group MD, Applications and Ventures Group, Telstra;
- Professor Roy Green, Dean of the Business School, UTS; and
- Ms Patricia Kelly, Deputy Secretary, Department of Innovation, Industry, Science and Research.

ATSE President Professor Robion Batterham AO FEng FAA FTSE introduced both Ministers and session chairs were Mr Alan Kohler, prominent business journalist; Ms Cathy Foley PSM FTSE, President of STA; and Mr Tony Quick, Chairman, Defence Materials Technology Centre.

Panellists included Mr Alexander Gosling FTSE and Dr Alex Zelinsky FTSE.

• Key speakers will write articles for the February 2012 edition of ATSE Focus.



(From left) Senator Conroy, Dr Butlin, Dr Atkinson and Professor Batterham in the lunch break.

PRODUCTIVITY IS THE PROBLEM – AND INNOVATION IS THE SOLUTION



Senator Stephen Conroy delivers his lunch speech.

Australia's falling rate of productivity growth is reason for concern because productivity growth is the main driver of economic growth and future living standards and in the decade 2000–09 it averaged 1.4 per cent, down from 2.1 per cent in the preceding decade.

But if productivity is the problem then innovation goes a long way to being the solution.

This was the key message from Senator Stephen Conroy, Minister for Broadband, Communications and the Digital Economy, in his lunch address to the *Productivity, Innovation and Prosperity Seminar*.

"Fortunately, Australia is on the brink of an unprecedented surge of innovation with the National Broadband Network," he said. "The NBN will provide a new – and much-needed – platform for growth and opportunity. The NBN is a game-changer.

"High-speed broadband is a disruptive technology that is transforming almost every aspect of Australian life. It will transform how we work, do business, receive healthcare, learn and interact with each other.

"The NBN will deliver unprecedented opportunity to all Australians no matter where they live ... and enable all Australians to participate and prosper online. We will to reap the rewards of the digital economy ... because

the NBN will deliver high-speed broadband to every home, business, hospital, school and university," Senator Conroy said.

It would stimulate innovation and drive productivity and be a key to the nation's economic future, he said, noting new research in Europe had found that every doubling of broadband speed increases GDP by 0.3 per cent.

"High-speed broadband has enabled business transformations across the entire value chain in nearly all sectors and company types. This includes changes to how products and services are bought, sold, designed, produced and distributed.

"The NBN will deliver speeds of up to one gigabit per second. This will allow us to develop and maximise new methods, processes and products to drive efficiency, and increase productivity. It will challenge existing business models across the economy ... and level the playing field as location becomes increasingly irrelevant to service delivery and market reach.

"Australian businesses will no longer be limited to finding customers in a busy shopping mall or main street. They will soon be able to reach once unimaginable markets. Start-ups nation-wide are exploring the potential of the digital economy to boost productivity in new ways. The NBN will lower the barriers to market

entry and facilitate greater efficiency."

Senator Conroy said the internet was an increasingly critical driver of business growth, enhancing online marketing, demonstrating products and services, via real-time video interaction – and using cloud-based services to achieve operational and back office efficiencies.

"In health, high-quality video conferencing technologies will allow specialists to assess patients in regional and rural locations," he said.

"It will greatly reduce the need to travel for many consultations; such remote diagnosis and home-care will take pressure off our hospitals and aged-care facilities. Higher bandwidth will allow the rapid transfer of high-definition images and videos, resulting in faster diagnosis, and ubiquitous high-speed broadband will also facilitate better access to electronic health records.

"Scientists, too, will have better access to useful data in more locations. This will enable more remote work and a nation-wide high-speed platform to use when building smart sensor networks."

He said the National Digital Economy Strategy detailed how Australia would harness the NBN to participate and prosper and aimed to move the nation from 18th for broadband penetration among OECD nations into the top five OECD countries by 2020 in the portion of households that connect to broadband at home.

Noting ATSE's engagement in the productivity and innovation debate, Senator Conroy said Australia was standing on the cusp of a whole new economy – one anchored in innovation and creativity.

ATSE sponsors 'Feed or Fuel' Forum

To Feed or to Fuel – How is the Question was the theme of an Academy-sponsored Public Forum at the AusBiotech 2011 conference in Adelaide in October.

ATSE Fellow Dr David Topping, a leading CSIRO nutrition researcher, and Professor Geoffrey Fincher, a plant scientist from the University of Adelaide, discussed the impact of biotechnology on food, fuel and the future.

More than 150 members of the public attended, driving a lively dialogue between the speakers and members of the audience,

especially in regard to GM foods.

ATSE's sponsorship was recognised and appreciated by those attending.

ATSE Director Emeritus Professor Mike Miller AO chaired an Ausbiotech conference session titled 'Research as a Pipeline for Industry', which discussed pathways for research in the biotechnology sector to become successfully commercialised.

Dr David Topping (left) addresses the forum.



THREE STEPS TO INCREASE OUR INNOVATION DIVIDEND



The Innovation Dividend workshop at work.

Australia needs to take three steps to increase its dividend from emerging technologies by driving national prosperity through innovation, according to an Academy initiative.

The recent Academy workshop in Brisbane – *Increasing the innovation dividend from emerging technologies* – was attended by more than 50 innovation specialists from government, industry, academia, public sector research organisations (PSROs) and potential funding agencies.

The workshop communiqué says the nation must:

1. **Make innovation more attractive, especially for small-medium enterprises (SMEs);**
2. **Change the incentives for Australia's world-class researchers; and**
3. **Improve our innovation skills.**

Delegates at the workshop, supported by the University of Queensland's Australian Institute of Bioengineering and Nanotechnology (AIBN), noted that Australia ranked high on scientific publications but very low on measures of innovation and on collaboration between publicly funded research organisations and industry, particularly small-medium enterprises (SMEs).

To make innovation more attractive, the communiqué urged more government action including training, fostering of an innovative management culture and financial incentives to encourage companies to be innovative and lift productivity through the application of

new technologies.

It called for 'braver' processes than those currently in place, under which small companies would receive unmatched non-refundable grants for proof-of-concept work, potentially along the lines of the US Small Business Innovation Research (SBIR) scheme.

To give more incentives for Australia's world-class researchers, it recommended a complementary measure of research endeavour – one that recognised and rewarded activities that led to increased innovation by adoption of the inventive output of PSROs.

(It noted that Australia presently had a strong focus on measurement of readily quantifiable parameters, as in the Excellence in Research Australia (ERA) initiative. ERA is dominated by academic publications and it has become the prime determiner of university status and likely future funding and driver for academic recognition and appointments. Australia excels with academic publications on any measure in terms of number and quality – proof that what gets measured gets done.)

The communiqué said there was an urgent need for this complementary measure.

To improve innovation skills, the communiqué said Australia needed to develop, in both its public-sector researchers and those in industry, a better understanding of the innovative process and the ability to collaborate to ensure that the results of inventive public-

sector research are fully captured.

This collaboration should involve training periods in other organisations to foster relationships and understanding of goals.

Within each of these three 'headline' areas, the communiqué made a number of further recommendations.

1 To make innovation more attractive

To make innovation more attractive it suggested a number of financial incentives as well as procurement and incubation initiatives including a scheme complementary to Commercialisation Australia which would enable proof-of-concept to be established – for example, introduction of a variation of the US Small Business Innovation Research (SBIR) scheme or a government procurement-based 'Innovative Purchasing' scheme.

It also suggested:

- the R&D Tax Incentive be extended to cover productivity improvements through deployment of new technology;
- accelerated depreciation on investments to bring new-to-the-market products into service be adopted as a similar option to a model adopted abroad, where a tax holiday of up to 10 years was granted for new initiatives;
- members of superannuation funds be given the choice to select an option that would specify some funds going into an 'Innovation for Australia' fund of funds, which could be used to further the efforts of Commercialisation Australia and provide ongoing support for successful innovative projects receiving initial support under government schemes; and
- government innovation policies should be consistent to provide surety for industry and PSROs and maintained irrespective of the electoral cycle.

It suggested several procurement initiatives:

- Government procurement should be used more boldly as a 'market pull' lever to encourage and foster innovation in

Australia. For example:

- target a small percentage that must include innovation new to the market;
- revisit offset schemes, such as those in the 1980s, that enabled existing SMEs to enter international supply chains through multinational suppliers that were required to work with Australian industry; and
- insist NBN Co develop and enforce a local content provision in its procurement policy, so its multinational suppliers had to prove they were working with Australian resident SMEs for some proportion of hardware and software provision.

In the area of incubation reform, it suggested:

- incubation models other than start-up companies;
- SMEs engaged in the development of new technology be encouraged to consolidate to achieve critical mass and, where appropriate, to work with larger companies; and
- favourable taxation treatment of share transfers associated with such developments.

2 To improve research incentives

To improve research incentives it suggested measurement of the extent of application of Australia's publicly funded R&D for commercial, environmental or social outcomes should be measured and the funding formula to public-sector research institutions be modified to reflect success in the application of research.

It also suggested:

- collaboration be incentivised and rewarded and universities, in particular, rewarded for fostering collaboration, via mechanisms such as Third Stream funding – with this being a significant factor in staff assessment and promotion;
- greater use of intermediaries to facilitate linkage between industry and PSROs;
- universal contracts for collaborative R&D between industry and PSROs be developed with the accent on minimising the transaction cost and overcoming the risk-averse attitude of PSROs;
- the scope and budget of Government

R&D support programs be extended and research resource allocation processes be made far more efficient and rapid;

- modest funding (for example, \$50 million) be provided for partnerships similar to the UK Knowledge Transfer Partnerships (KTPs) which are directed to SMEs, and examination of ways to foster the existence of trusted intermediaries who can assist in bridging the gap between researchers and industry; and
- tax disincentives preventing researchers from participating in the profits flowing from innovation be removed.

Major ICT announcement at ATSE seminar

The Victorian Government used the ATSE Productivity, Innovation and Prosperity seminar to unveil its new \$85 million plan to support continuing growth, development and global competitiveness in Victoria's information and communications technology (ICT) sector, and promote ICT-enabled innovation across the economy.

Officially opening the ATSE seminar, the Victorian Minister for Technology Gordon Rich-Phillips said the ICT plan aimed to build Victoria's capability to support the application of ICT in other industries.

"The plan is part of the Coalition Government's suite of technology strategies under Victoria's Technology Plan for the Future, which reflects the government's approach to supporting technology and commitment to driving productivity growth in new ways," Mr Rich-Phillips said.

"The Coalition Government recognises the key role ICT plays in contributing to a competitive, productive and growing Victorian economy, building on Victoria's reputation as a leading centre for ICT.

"The ICT plan will support the sector in overcoming current and future challenges,

3 To improve innovation skills

To improve innovation skills the communiqué suggested skills training for SMEs in fostering of innovation be substantially extended, possibly using industry associations as vehicles for penetration of appropriate sectors; Public-sector research agencies be encouraged to have their staff spend sabbatical leave in industry; and tax incentives or other measures be developed to improve the attractiveness for skilled expatriates with experience in fostering innovation to return to Australia.

while promoting ICT-enabled innovation more broadly across Victorian industry and generating opportunities from technology convergence," Mr Rich-Phillips said.

A key component of the ICT plan was the \$11 million Digital Futures Fund to support collaborative projects in the ICT sector and with other partners to develop emerging ICT capabilities in Victoria, he said.

The Technology Trade and International Partnering Program would provide assistance for export-ready Victorian companies to attend recognised overseas ICT trade fairs and participate in trade missions.

The \$18 million Broadband Enabled-Innovation Program would provide grants to innovative projects to develop new ways of working and improving service delivery in business, government and the community through the use of high-capacity broadband.

Gordon Rich-Phillips opens the seminar.



OUR WATER MANAGEMENT DISCUSSED IN TAIWAN

Dr John Radcliffe AM FTSE, Chair of the Academy's Water Forum, led an Australian delegation of 12 water scientists and engineers to Taiwan in September.

They met with Taiwan water researchers and engineers, government officers and industry representatives in Taipei, Hsinchu, Tainan and Kaohsiung. Three roundtable discussions were held, followed by a two-day workshop – *Sustainable Water Environment* – at the Taiwan National Science Council in Taipei.

The visit and meetings were facilitated by the Taiwan National Science Council and the Australian Department of Innovation, Industry, Science and Research (DIISR). The delegation included Dr Tom Connor FTSE, representing the Vietnam Ministry of Natural Resources & Environment and Professor Graeme Dandy FTSE, School of Civil Environmental and Mining Engineering, University of Adelaide.

The visits covered the Taiwan Industrial Technology Research Institute (ITRI) in Hsinchu, the National Cheng Kung University in Tainan, the China Steel Company in Kaohsiung, the Taiwan National Science Council and National Taiwan University in Taipei.

On the final day, Australian and Taiwanese delegates jointly discussed their observations from the visits and presentations, identified future technology development opportunities



Dr John Radcliffe, Minister Stephen Shen and Dr Tom Connor at banquet hosted by Minister Shen.

and identified several joint research proposals.

Taiwan, with a population of 23 million, has an annual rainfall of 3000mm – rising to 8000mm in mountain areas – but water security is a serious issue as most of the rivers are short and steep and have high levels of turbidity after rain, especially after the frequent typhoons.

Although there is considerable irrigation in Taiwan, the governance of water rights is quite complex and variable, and limited attention has been given to the water needs of the natural environment. There are no environmental water allocations.

The Taiwan Government has been developing a proposal to generate a mega-environment department which would bring

together the current EPA, the Water Resources Agency and various other agencies and there was considerable interest in the Australian Intergovernmental Agreement on the National Water Initiative and in how Australia manages environmental water and catchments.

The Taiwan Minister for Environment Protection, Dr Stephen Shu-Hung Shen, met with the Australian delegation on three occasions, opening the Workshop, hosting a banquet and attending a major luncheon convened by the Australian Commerce and Industry Office in Taipei.

It is anticipated that the research proposals developed will be followed up by Taiwanese and Australian scientists involved.

Things happen all the time ...

Risk management was the theme of the address to the NSW Division 2011 Annual Meeting dinner, addressed by Mr Bill Hoyle, senior investigator with the US Chemical Safety Board, in Washington.

Speaking on 'Lessons from Major Accident Investigations', Mr Hoyle detailed some of the lessons learned from the CSB's investigations into more than 30 major incidents he has led.

These included the ongoing Deepwater

Horizon incident, which in 2010 killed 11 people and caused the largest oil spill in the history of US offshore oil production, and 2005 BP Texas City Refinery fire.

He helped establish the CSB in 1988. It is an independent US Government agency, is focused on making recommendations for prevention of incidents, has offices in Washington and Denver and has an annual budget of \$11 million.

He noted that the Deepwater Horizon disaster involved a number of companies

and the US Government and significant risk management failure. Contributing factors were past successes tending to downplay the risk of a catastrophic spill, failure of equipment that was considered extremely unlikely and emergency response planning not taken seriously enough by oil industry or regulators in the Gulf of Mexico.

He noted a key learning:

- Things that have not happened before happen all the time; and

TAKING A HARD LOOK AT NATURAL DISASTERS

Engineers and planners cannot rely on existing knowledge to completely address the problems of designing and preparing for natural disasters.

While true for developed nations, it is particularly true for developing nations, where cultural factors and resource limitations may render modern 'developed' technologies and practices inappropriate.

Innovative thinking is needed, as well as a willingness to understand local techniques and materials, in order to blend effectively traditional and Western knowledge.

Developers and regulators must rein in their tendencies to encourage the building of infrastructure close to today's sea level, water table or flood plains.

These were among the key out-takes from a recent seminar in Perth organised jointly by Engineers Australia (EA) and the WA Division of ATSE, titled *Earth Wind Fire Water – Engineering for Extreme Events*.

A number of strong messages emerged in presentations and discussions:

- engineering education and practice needs to accommodate the prospects of a greater frequency and greater severity of natural disasters;
- decision-makers, planners, engineers and architects need to work together to increase the rate of structural survival

following earthquakes, cyclones, bushfires, deluges and coastal inundation;

- regulators and the insurance industry need to consider limiting risk, recognising the compounding of hazard and frequency; and
- all parties need to re-embrace the Precautionary Principle, based upon sound data and well-established knowledge.

Discussions focused on changes needed in the education of scientists and engineers, and of governments and regulators and the general public that utilise their services, noting that the magnitude and frequency of global natural disasters appeared to be increasing and engineering needed to reduce the impact of both individual and compounded effects.

The seminar noted that engineers and scientists were not well prepared for working with uncertainty. 'Clients' were nearly always looking for the most economically viable solution, but decreasing the risk of damage from natural disasters usually increased the costs and such factors were often not taken into account as a result.

Other key messages included:

- professionals should be more willing to lay out the risks and consequences, and to offer a range of solutions that mitigated risks at different levels;
- engineers needed to understand

and manage the balance between risk and consequence in their design work and decisions, and to broaden their involvement in all stages in the development of infrastructure;

- engineers usually communicated through indirect channels that may not be sufficiently forceful;
- society had difficulty understanding 'risk' as a parameter worked with by engineers;
- news media reporting and language could be misleading; and
- government and insurance industry decisions could have a large impact on disaster mitigation, either by taking firm action to prevent development in areas prone to disaster or making prohibitive the cost of insuring in risky situations.

The seminar included four main presentations, each focusing on one of the extreme-event sub-themes under the shorthand titles, Earth, Wind, Fire and Water: **Earth** – *Planning and Design for Earthquakes: Consequences and Opportunities* – Mr Dave Brunsdon, New Zealand Society for Earthquake Engineering

Wind – *Advancing Cyclone Resistant Construction Practices with Local Communities in the Solomon Islands* – Mr Charles Boyle, Architect/Project Manager, Curtin University
Fire – *Lessons Learnt from the Recent Bushfires* – Mr Ralph Smith, Branch Manager, Bush Fire & Environmental Protection, Fire & Emergency Services Authority of WA

Water – *Coastal Hazards and the Design of Coastal Structures* – Winthrop Professor Charitha Pattiaratchi, UWA

The presentations were followed by a panel discussion that drew out common threads, identifying challenges and matters of concern, that apply broadly to Engineering and its role, responsibilities and contributions across all extreme natural events.

In addition to EA and ATSE members, the target audience of the seminar included people with a professional interest in the impact of the topic and the capacity to act on the subjects of the presentations including State government, local government, planners, academics, business and industry as well as the members of the general public.

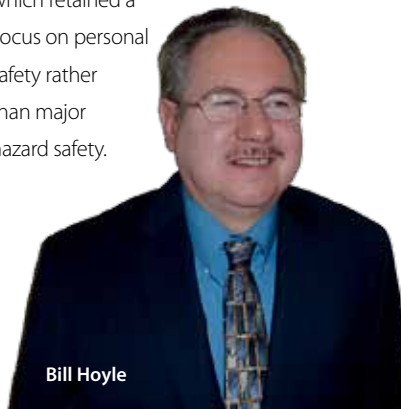
- Risk assessments that rely on probability do not offer protection from incidents that rarely happen or have not happened before.

Mr Hoyle highlighted the issue of confusing personal safety and major hazard safety, noting that BP and Transocean – the lead companies – primarily measured safety performance using worker injury data, with safety bonuses and awards largely based on injury data.

He noted that at the time of the incident BP executives were on the rig to commemorate its "outstanding" safety record and that Transocean celebrated 2010 as the "safest" year in its history.

He cited a failure to learn from the BP Texas

City Refinery fire, in that safety management system improvements made in refining were not implemented in offshore operations, which retained a Focus on personal safety rather than major hazard safety.



Bill Hoyle

Five steps to a balanced economy – Liveris

The key to Australia's economic future is a robust advanced manufacturing base that creates higher value-add products, especially those that use both its natural resources and human capital, according to the Chairman and CEO of Dow Chemical, Dr Andrew Liveris FTSE.

He told the national Future Jobs Forum in Canberra in October that this could happen only if the nation developed an advanced manufacturing plan and executed it "relentlessly".

Speaking live by webcast from the US, Mr Liveris, Australian born and educated, said manufacturing had the power to create jobs and value and growth to a degree that no other sector could, with an enormous multiplier effect, and unique to this sector, creating between three and five jobs outside a manufacturing plant for every job inside the plant.

"What I mean by advanced manufacturing is a sector that takes raw inputs, combines them with intellectual capability, and adds value to a functionality the world needs – such as water purification, fuel-efficient transportation, solar panels, wind turbines, advanced agro-products, light weight nano-materials and so on," he said.

"If we do this, as other countries have, our centres of innovation can become hubs of commerce. They will attract the best and the brightest. They will attract manufacturers who can commercialise products coming down the pipeline.

"This creates a virtuous cycle of economic activity, a supply chain of sustainable jobs, and the wealth of high value-add products."

Dr Liveris, co-Chair of US President Barack Obama's Advanced Manufacturing Partnership, said globalisation had been a force for both progress and destabilisation and had upended old economic models, creating imbalance where stability once reigned. Nations could not afford to just sit back and let the forces of globalisation drive them toward economic imbalance, he said.

"Passivity is not a growth strategy. Growth requires action; it requires considered and thoughtful intervention. When you look around the world, you see that the countries that are succeeding economically, even in these difficult times, are doing so by forming strategies for their future and executing against them."

Dr Liveris suggested a five-part campaign towards a balanced economy for Australia, to take advantage of the country's natural resources below ground and its "incredible intellectual resources above the ground" to build an Australian economy far less dependent on the prosperity of others.



Innovation

Australia had to invest in innovation – as innovation and R&D were the precursors of a vibrant advanced manufacturing sector – which would put Australia in the driver's seat for solving the greatest challenges the world will face over the next century.

"You cannot build a manufacturing base unless you build an innovation base alongside it," he said, "yet over the last decade, Australia has fallen from fifth to 20th in the World Economic Forum's Global Competitiveness Index, largely because our spending on innovation has fallen nearly 25 per cent since the early 1990s. This is a trend we have to reverse.

"That means incentivising R&D through tax benefits and direct grants, investing more in later-stage innovation, especially in demonstration projects, and focusing R&D spending specifically on advanced technologies.

"It also means establishing clear frameworks for increased collaboration across the industry. Australia must pick the sectors that will be vital to its future and support them aggressively with research and development.

"It is fundamentally true that most of the last century's greatest innovations started due to government incentivising researchers, whether in academia, through government institutions, or in the private sector," he said.

Advanced manufacturing

Building an advanced manufacturing sector would not start until Australia maximised its natural competitive advantages, especially energy. He noted Australia presently burned most of its natural gas for power, or liquefied it for export abroad, and advocated using it to create high-value chemicals and high-tech products producing, on average, an eight-times value add across the GDP of the entire economy.

"Today, Australia is one of the few gas-rich countries that has not adopted a strategy to use natural gas this way.

"Take Canada, for example, a country that uses its high-value gas streams for domestic industry. All you have to

do is visit the Province of Alberta to see the knock-on effect to the Western Canadian economy. Or take Saudi Arabia, which could be content to export oil and gas for another century. Instead, they are choosing to create a diversified economy to employ their citizens, and to diversify their export revenues.”

Global markets

Advanced manufacturing relied on global markets – so access to those markets was critical and Australia should accelerate negotiations with China, India, and the Gulf Cooperation Councils to get trade agreements signed, which focused on future markets, on exporting high-value products, not just resources.

Tax reform

To improve its business climate and attract investment Australia should also redesign its corporate tax system to strengthen international competitiveness and re-evaluate financial, environmental, and health care regulations to promote the greatest possible measure of competition, choice and growth.

Partnerships

Improving the climate for business also required genuine partnership between business and government, working with each other, not against each other, to create a strong framework for growth. He cited the US, where priority industry sectors were beginning to be identified and strategies are being developed in collaboration between the federal government, academia and industry focused on propelling the most impactful future technologies into the marketplace.

“We are evaluating nanotechnology, robotics and advanced materials development, among others, to prioritise collaborative projects that will create a hotbed of innovation and commercial success in these areas,” Dr Liveris said.

“That’s perhaps the most common thread running between countries that are succeeding in a global economy – a commitment to public private partnership.”

Dr Liveris also targeted education and immigration as two keys.

“Advanced manufacturing jobs are high-skilled jobs that tend to require a background in science, technology, engineering and math,” he said.

“Global businesses go where the talent is, and we need to make sure that place is Australia. That’s going to require developing a new curriculum for engineering education and job training. It’s going to require new teaching techniques, new innovations in classrooms. And it’s going to require the

recruitment of scores of qualified educators.

“We are also going to need to revisit our immigration policy. Australia has a small worker base. To build an economy run by the best and the brightest, we not only need an education system that can produce them, but an immigration system that can attract them.” ◀

China symposium on green materials and recycling

The development and handling of biomaterials and devices, especially at the nanoscale; initiatives to recycle hard and liquid waste from industry, including mining; and new materials in battery, solar and other clean energy technologies were some of the important topics addressed at an invitation only Symposium hosted by the Chinese Academy of Sciences (CAS), the Australian Academy of Technological Sciences and Engineering (ATSE) and the Australian Academy of Science (AAS) in Shanghai and Suzhou, China in November.

Entitled *Green Materials and the Recycling Economy*, the Symposium was the eighth high-level meeting between Australian and Chinese Academies since 2004 and was held at the CAS Suzhou Institute of Nanotechnology and Nanobionics.

The Australia China Symposia series is specifically designed to allow adequate time for networking and discussion amongst participants, technical visits and exchange of ideas leading to strong cooperative outcomes, including MOUs between research groups, staff and student exchange, joint publications, research projects, and the establishment of joint Australia China Centres.

Technical visits in Suzhou and Shanghai complemented the workshops and provided additional opportunities for possible research projects for the 21 Australian participants.

The Symposium commenced with a high level Plenary Session in Shanghai, officially opened by the President of the Chinese Academy of Sciences, Professor Bai Chunli, the President of ATSE, Professor Robin Batterham AO FREng FAA FTSE, and AAS President, Professor Suzanne Cory AC FRS FAA.

Australian workshop conveners were Professor Peter Gray FTSE (biomedical materials and devices at the nanoscale); Mr Ron Hardwick FTSE (recycling hard waste and liquids) and Professor C Jagadish FAA FTSE (new materials for clean energy).



The three Presidents.

Conversations that count

We have gone past the point of diminishing returns, focusing on things that can be measured, rather than on things that ought to be measured. Often the things that are the hardest to measure are the most transformative.



By Linda Kristjanson

lkristjanson@groupwise.swin.edu.au

In recent years, Australia has experienced a period of economic growth, buoyed by the minerals and energy boom. We were the only OECD country not to experience a recession during 2009, and our relatively low national debt, unemployment levels and GDP growth are the envy of major western economies today (OECD, 2010).

However, there are a number of challenges that impact on Australia's capacity to build its position in the global economy. Our productivity growth has flat-lined (even declined) in recent years (Productivity Commission, 2010). As noted in the 2010 Intergenerational Report, "If Australia's productivity growth could be increased above the long-run average, the economy would be bigger, living standards would be higher and fiscal pressure from the ageing of the population would be reduced" (Treasury).

This makes improving productivity an important issue from an economic and social perspective (Keating & Smith, 2011). There is a growing recognition that we need a bold investment in education, research and development to develop a sophisticated workforce that will lead to uplift in productivity and living standards.

At the same time, we face problems of a two-speed economy with the accompanying social ills that follow. We have an opportunity to learn from other countries and consider how we manage differences in earning capabilities and tensions that arise when a growing underclass has limited access to education and opportunities. And how will we ensure a social safety net needed in an ageing population?

We are experiencing cracks in our manufacturing economy, complex and poorly managed workforce requirements, and debates about energy and food futures. How will we address the depreciation in our primary industries so that we are not simply a hinterland of resources for others, without an ability to imagine and create a sustainable future for those that follow?

This is the uncertain and volatile context in which we find ourselves, prompting questions about the contributions that the academic community can make to these discussions.



Important conversations – panel discussion at the ATSE Productivity, Innovation and Prosperity seminar in Melbourne in November.

What conversations are we having?

In the past 10 years our national research agenda has focused on measurement exercises to provide an empirical reference set to guide research investment and offer greater accountability.

We have been looking closely at how we might better measure and subsequently reward, support and manage aspects of higher education, with many positive outcomes. However, it is my view that we have gone past the point of diminishing returns in this regard, focusing on things that can be measured, rather than on things that ought to be measured. Often the things that are the hardest to measure are the most transformative.

Measurement alone is not enough: it should be the first step to innovative action. We need to have conversations about how we maximise the use of scarce research funds by allocating them more sensibly. We can't claim to have or aspire to a world-class research and innovation system without measurements of quality, but we can't sustain world-class research if we don't recognise the limitations of metrics.

Base funding is critical to achieving higher education reform. We have not had a base funding review in 20 years. Acknowledging therefore that the new financial structure is likely to remain in place for another two decades, this is our opportunity to get it right. We must remember that China has recently committed four per cent of its GDP to education, while public spending on tertiary education in Australia represents 0.7 per cent of GDP – a third less than the OECD average (Universities Australia, January 2011).

While I share some satisfaction in relation to the recent

progress achieved in higher education (for example, the Bradley Review), I am concerned that we have become increasingly introspective, as we have grappled with a fast-paced series of discussion papers, complex policy settings, and intricate algorithms that are distracting us from bigger issues.

Conversations we are not having

As I reflect upon the “big picture” issues we will continue to face (for example, energy futures, food security, declining productivity), I find myself becoming increasingly aware of the conversations that we are not having – conversations that might form a broader, high-level framework to structure policy settings, actions and public discourse about our future.

I offer some specific examples.

- How do we manage our resources, workforce and economic policy settings to plan for Australia in 50 years?
- How do we mobilise various sectors to work more effectively to create an agreed-upon future for Australia that optimises talents, capabilities and insights from education, industry, not-for-profit sector, government?
- How do we create a future for Australia where there is a wide respect and deep enthusiasm for learning – including a focus on STEM courses, humanities and social sciences and the creative industries?
- How can we incorporate ethics more comprehensively into our disciplines – rather than treating it as a ‘bolt on’ which is remembered when there is media attention of ethical crises in fields such as journalism and business?
- How do we create a more innovative culture? What are the elements of innovative societies? A recent look at the most innovative countries in the world, listed us as 19th in the world, well behind smaller countries such as Israel and Denmark.

We must consider our responsibilities to prompt and progress these conversations. In our efforts to ensure an immediate future for ourselves, university leaders and researchers have sometimes forgotten or shied away from the privilege and the duty we have to provide forums for public debate and discourse on topics that warrant public attention.

We need to consider the extent to which existing and emerging policy settings discourage courageous inquiry, interdisciplinary investigation, high risk research questions, larger comprehensive programs of research, attention to complex, messy topics, and creative enterprise.

As an academic sector we need to focus our discussions on a few key topics that I believe will make a difference and position us well for a prosperous future:

- research infrastructure – and the need to create a sovereign wealth fund that might augment the EIF to ensure that we have the facilities to embark upon a sound knowledge-based economy;

- people – we are not spending enough on education. We need to invest in cleverness and it is essential to our future prosperity to encourage more students to pursue advanced qualifications; and

- innovation – we need to back ourselves. We have no depth in our innovation engine and activity and interest quickly evaporates when markets are tough. Never has it been more important to get more out of our science. We need to put science on a pedestal and invest in long-term innovation.

In a time of uncertainty it is more important than ever that universities, learned academies, and researchers fulfill our unique opportunity and responsibility to participate in public discussions that matter, by contributing empirically-based analyses and professional knowledge. Our traditions of scientific scepticism, methodological rigour and transparent testing of competing hypotheses are more important than ever and can form an anchor for public discourse on key issues that warrant comprehensive, grounded understanding.

We have an opportunity to make choices emanating from our prosperity that are broad, deep and complex. And so, during this time of abundance, how do we muster the partnerships among industry, academia and government to address difficult issues that confront our society?

Our future depends upon the comprehensiveness and the quality of our national narratives and forward-looking actions. ◀

This article is adapted from an address to the Annual Meeting of the Victorian Division of ATSE in October 2011.

References

- Keating, M. & Smith, C. (2011). *Critical Issues facing Australia to 2025. Summary of a Scenario Development Forum*. Academy Proceedings 1/2011. The Academy of the Social Sciences in Australia.
- Productivity Commission (2010). *Annual Report 2009-10*. Commonwealth of Australia: 59.
- Treasury. *Australia to 2050: Future Challenges*. Commonwealth of Australia: 22.

PROFESSOR LINDA KRISTJANSON is Vice-Chancellor of Swinburne University of Technology. Prior to this appointment she was Deputy Vice-Chancellor, Research & Development, at Curtin University. She served on the NHMRC (2003–06). In 2002 Professor Kristjanson was named the Australian Telstra Business Woman of the Year in recognition of her entrepreneurial work in health and science. She served on the Board of the International Centre for Radioastronomy Research and is a Non-Executive Director of the Australian Synchrotron Company Ltd. She chairs the Board of AuScope Ltd, a company formed through NCRIS funding to develop earth science research infrastructure.

Boosting road funding, efficiency, safety and effectiveness

Roads avoid all the economic and managerial lessons of the 20th century. Almost uniquely, they are under-priced, under-valued, and greatly over-used



By Max Lay

mmlay@bigpond.net.au

Our road systems and how we use them have changed dramatically over the past few centuries, and yet some problems persist and others reappear.

For most of human history, roads have been used by foot traffic and by cumbersome wagons hauled at walking pace. Such roads were built to provide some obvious advantage in commerce or conquest and were then grudgingly maintained by those who might gain some advantage from the passing traffic.

The user-pays principle was widely applied via tolls levied at toll gates or bridge crossings. We tend today to forget how widespread toll roads were – they were the norm rather than the exception. Most were in private hands and – once approved – were outside any government processes.

The Industrial Revolution greatly increased trade and saw major increases in toll roads. However, it also caused some contrary effects.

First, when the new steam engines were applied to moving freight and people, the engines were far too heavy to be carried on the existing road pavements or to move on the existing road alignments. The railway system was invented early in the 19th century and soon captured both the travel market and the public imagination.

Throughout the 19th century land transport expenditure was almost entirely on railways and canals. Toll roads went bankrupt and roads fell into ruinous decay. The only roads to be maintained were those feeding the railheads.

Cars foiled tolls

As if this were not enough, as things were worsening towards the end of the century, Karl Benz and Gottlieb Daimler invented the motor car. Their cars were relatively cheap, easy to use, as fast as trains, and their high power-to-weight ratio meant that they could travel anywhere – well, almost anywhere, as even they found most of the appalling roads impassable.

And they gave little hope to the toll industry, as they could circumnavigate or out-speed any attempts at toll collection.

If there was any thought that the horse and the ox would continue to be useful in transport, this was demolished by the success of motor transport in the First World War. So, soon after that war ended, the world had motor vehicles being mass-produced at affordable prices, an insatiable market for them, a terrible road system whose condition had been further worsened by the War, nations in economic doldrums with the Great Depression looming, and just a few remnants of the earlier user-pays toll system.

Ironically, at this same time great economists and commentators such as Pigou and the Webbs were highlighting the soundness of users paying at least the marginal costs of their activities. Throughout the 20th century this view gradually pervaded all public utilities, so that in most countries today roads are the only public service which is provided free with no price signals to produce rational decision-making by users.

Another great economic move of the 20th century was to ensure that resources were properly used by ensuring that they provided an adequate return on investment, and indeed were all tradable commodities. This is now a widespread principle, but once again few roads are seen as economic assets – indeed, most road managers see their roads as liabilities producing ever-increasing costs and liabilities, and no income or enhanced valuations.

Of course, many toll roads have been built around the world but they are a small proportion of the world's major roads. Their development peaked in the mid-20th century and there is often a strong public reaction to them. Many of the current generation have been imbued with the idea that roads, alone amongst public and private utilities, should free of any usage charge.

For example, I am frequently shocked when I hear public sector road managers say that they have no money to maintain a piece of road and that its condition will only worsen with time. In most jurisdictions, if directors of a public company allowed its usable assets to deteriorate in value, they would face stockholder anger and severe legal penalties.

Roads under-valued

So, after the road mire at the end of the 19th century, we have allowed roads to somehow avoid all the economic and managerial lessons of the 20th century. Almost uniquely, they are consequently under-priced, under-valued, and – as a result – greatly over-used.

And if this were not enough, the users of the roads operate independently of each other and of the road manager. The incredible technical advances of the 20th century are still little to be seen in the 21st century road systems. For example, radar was invented and well used during the Second World War. And yet even today, collision avoidance equipment is a rarity in road vehicles. Despite the simple technology, we have waited over half a century to see non-technical issues such as supplier liability overcome and even then in just a small proportion of the vehicle fleet.

One basic example of this is in vehicle identification systems. All vehicles have a unique identifier, often called a VIN. For decades now, it would have been possible to have a vehicle's VIN made thief-proof and readable by roadside device – for instance by embedding microchips in the parts of the vehicle.

Two practical applications of this approach would be to automatically detect vehicles behaving illegally and to charge vehicles for using a piece of road – the theme of this article.

Road pricing on all roads was first advocated by the famous economist Pigou in the early years of the 20th century. Since then none have questioned its logic, but many have doubted its political acceptability. I am aware of a number of governments that have instructed their staff not to even use the words 'road pricing'. As yet no government has introduced a system of universal road pricing, although a Dutch proposal withdrawn earlier this year would have done.

By the 1920s it was realised that a tax on fuel used would be an 'ideal' tax – it would be collected by the private sector and the motorist would blame the fuel seller and not the government. Treasury officials were quick to denounce the idea of 'hypothecating' these fuel taxes to the construction and maintenance of roads. This was despite the fact that the theory of marginal pricing – users should at least pay for the damage they cause when they use a product – was well established by the beginning of the 20th century.

Fuel taxes are blunt taxes as they are levied on users quite independently of the cost of building and maintaining that road, of the degree of congestion, and of the costs that the use imposes on others. As the recent Dutch trials showed, road pricing us-

ing readable vehicle VINs and GPS to locate the road being used can avoid all these problems.

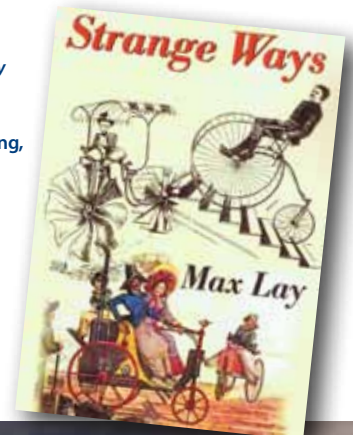
The prices imposed would then constructively influence the behaviour of both road users and road managers. The other problem with fuel taxes is that the move towards diverse power sources and fuels, as highlighted by the increasing use of electric cars, will see the traditional fuel tax base eroded. Governments may find themselves forced into rational pricing.

The road has been with us for at least three millennia, however for the past two centuries road managers and road users have not kept in step with major changes flowing from the industrial revolution. As a consequence the world has a road system that is shakily funded, poorly priced, inefficiently used and far less safe and effective than it could be.

The tools are now all available for us to correct these deficiencies and achieve far better outcomes, but their application will require strong leadership – politically, technically and commercially. ◀

DR MAX LAY AM FTSE is recognised for his leadership in the delivery of road infrastructure and the development of new contract management processes, and as an educator and historian. In July 2009 he was awarded the John Shaw gold medal by Roads Australia. He is the author of articles on roads and his *Handbook of Road Technology* is an international resource for students and professionals in transport planning, engineering, operations and economics. He has been associated with the design, construction and operation of many major motorways. He is a past President of the Australian Automobile Association and the Royal Automobile Club of Victoria.

Dr Lay's most recent book on roads, *Strange Ways* (a quirky look at our roads through the ages), can be ordered from www.eabooks.com.au



A modern road system in Victoria.

MORE FRESH SCIENTISTS ON SOME BIG ISSUES

Australia's Fresh Scientists for 2011 were selected from 80 nominees and were flown to Melbourne for a day of media training after which they presented their work to the media, school students, the general public, scientists, government and industry over three days in a 'boot camp' in science communication.

Fresh Science is a national program sponsored by the Australian Government that identifies and publicises new and interesting research being done by early-career scientists around the country.

Now in its 14th year, Fresh Science is designed to:

- enhance reporting of Australian science;
- highlight and encourage debate on the role of science in Australian society; and
- provide role models for the next generation of Australian scientists.

This edition of *Focus* takes a look at the work of five of the 2011 Fresh Scientists (see *Focus* 167/168 as well).

Details of all winners are at <http://freshscience.org.au>



Charis Teh and co-workers.

PHOTO: KAREN EDWARDS

MULTI-LAYERED ARMOUR PROTECTS AGAINST IMMUNE FAILURE

The human body incorporates multiple fail-safe mechanisms to protect it against the "friendly fire" from its immune system known as autoimmune disease, Charis Teh and colleagues at the John Curtin School of Medical Research (JCSMR) at the Australian National University have found.

The work should lead to a better

understanding of autoimmune conditions, she says, and may even provide new ways to target treatments. Autoimmune diseases collectively affect more than one in 20 Australians. As well as diabetes, they include rheumatoid arthritis, multiple sclerosis, thyroid disease, and lupus.

"Why the immune system sometimes

attacks different parts of our body is still poorly understood," Charis says. "Consequently, no specific prevention or treatment is yet available."

The JCSMR researchers, led by Charis' supervisors, Professor Chris Goodnow and Dr Anselm Enders, have focused their work on understanding the progress of a condition caused by a single genetic defect, Autoimmune Polyendocrine Syndrome 1. People with this disease often seem perfectly healthy before the first vital organ is attacked, usually in childhood – then come attacks on additional organs. Different organs are affected in different people, as is the age when problems begin varies.

By studying a mouse strain incorporating an equivalent gene defect, the researchers discovered that the immune system is engineered with a series of back-up systems against such friendly fire, like multiple layers of armour.

Normally, any immune cells that could attack organs in the body are eliminated within the thymus gland where they develop, before they are released into the bloodstream. In the mice with the Autoimmune Polyendocrine Syndrome 1 gene defect, this does not happen. Despite this, the mice remain healthy, because a backup mechanism steps in to disable the ability of the rogue cells to launch an attack on the body's tissue.

But when this backup mechanism is crippled by introducing a second genetic change, the mice succumb to a disastrous immune attack. Even then, many organs are still not attacked, suggesting they are protected by additional backup systems.

MATCH CANCERS AND TREATMENTS

New research has uncovered why certain cancers do not respond to conventional chemotherapy, highlighting the need to match treatments to cancers better.

Programmed cell death, or apoptosis, removes unwanted or dangerous cells from our bodies, protecting us against cancer and autoimmune diseases. The process is regulated by a family of genes called Bcl-2.

Cancer researcher Lina Happon and colleagues at the Walter and Eliza Hall Institute have identified three 'cell death' genes that are crucial for making anti-cancer drugs more effective at killing cancer cells. The discovery could be the first step in developing new cancer treatments that target only cancer cells.

Most current chemotherapy drugs do not distinguish between normal and cancerous cells, Lina says. This means when using them that collateral damage to healthy cells – the origin of side-effects – is unavoidable.

"By understanding which of the three genes we identified are required for successful drug

responses, researchers should be able to work out how conventional cancer therapies work, and why they sometimes fail," Lina says.

"Many anti-cancer drugs act by damaging the DNA in tumour cells, causing the cells to commit suicide. Until now we didn't know which genes were essential for this process."

Working with colleagues from WEHI's Molecular Genetics of Cancer division, she was able to identify that three Bcl-2 genes – puma, noxa and bim – tell cancer cells to commit suicide following treatment with conventional chemotherapy drugs.

"In our studies we found that puma, noxa and bim work together to instruct the cancer cell to die once its DNA has been damaged by chemotherapy drugs. But if certain combinations of these genes are missing or not functioning, the anti-cancer therapies are unable



Lina Happon at work in the laboratory. PHOTO: CZESIA MARKIEWICZ

to work effectively, so the cancer cells continue to survive and the tumour continues to grow."

Abnormalities within the Bcl-2 gene family are common in many human cancers, Lina says, and can often be responsible for resistance to chemotherapy treatments.

Her discovery has the potential to improve treatment through the development of more efficient, targeted therapies for blood, breast and ovarian cancers.

"We hope to be able to reduce unwarranted toxicity, ultimately improving the quality of life for patients."

Arteries carry life across the Indian Ocean

Research at the University of Melbourne and the Bureau of Meteorology has overturned conventional ideas of ocean circulation and revealed a new pattern of ocean circulation which will change our understanding of marine events.

Rather than moving simply in large clockwise (northern hemisphere) and anti-clockwise (southern hemisphere) gyres, the open waters of the south-east Indian Ocean are flowing east-west in bands, Prasanth Divakaran, a PhD candidate in the university's School of Earth Sciences, and his colleagues have shown.

The findings have important implications for our understanding of all sorts of ocean events from the movements of fish and marine life to the prediction of weather and climate.

"We found that ocean eddies – the marine analogues of atmospheric weather systems like tropical cyclones – form off Australia and begin

a three-year journey across the Indian Ocean along what we call 'ocean arteries', transporting seawater and biology with them," Prasanth says.

On the basis of initial studies of water movement, Prasanth analysed a model of the circulation of the south-east Indian Ocean using advanced computing and new software for visualising the results. He and his colleagues then checked their findings against satellite observations.

"New international satellites and modern technologies developed in Australia helped to reveal the previously unknown ocean circulation patterns," he says.

The results are also in keeping with some of the latest research from overseas, he says. The basin-wide ocean currents the researchers revealed are organised into alternating bands, which connect the north-south currents on the east and west side of the ocean.



Prasanth Divakaran PHOTO: MARK COULSON

Recent work on the lobster life cycle around Western Australia has shown that the probability of growing into an adult depends on which deep artery of ocean circulation the larvae are swept into. Understanding the impact of the arteries on ocean heat transport and climate is critical, says Prasanth, who presented his research at the recent XXV International Union of Geophysics and Geodesy General Assembly in Melbourne.

"Nature has known about these ocean arteries for centuries, but we humans have only just discovered them."

TAMMAR WALLABY'S CLEVER IMMUNE TRICKS REVEALED

Until now, it was a mystery why many marsupials have two thymuses – a key organ in the immune system – instead of the one typical in other mammals and humans. The thymus produces T-cells, the white blood cells that act as sentries to protect us from infection.

Postdoctoral researcher Dr Emily Wong, from the University of Sydney, and her colleagues have found that the two organs are identical, which suggests why they are there.

"The presence of two organs with identical function can allow the young to produce white blood cells rapidly, leading to faster development of immune defences," Emily says. "This may be especially critical in marsupials, as they are born at an immature stage without immune tissues. They need to develop an immune system very quickly while growing in the pouch."

"It used to be believed that the marsupial immune system was more primitive than that of humans and other mammals," Emily says.

"But, in fact, some aspects of the marsupial immune system appear more complex than our own – the two thymuses, for instance."

Using the latest DNA sequencing technology, Emily explored the genetic contents of the two organs in the Tamar wallaby.

"The sequencing allowed us to compare the genetic material in the two thymuses quickly and thoroughly," she says. "And we found they were the same."

The researchers selected the Tamar wallaby because it was the first Australian marsupial to have its entire genome sequenced and published. "The availability of the genome has allowed for unprecedented insights into the marsupial immune system." The Tamar wallaby genome project is a joint collaboration between Australian and US scientists.

Emily's research is part of a larger, ongoing project to understand how newborn marsupials survive in dirty pouches without an immune system.



The Tamar wallaby.

Emily Wong



Designer roots to counter drought

Recent discoveries by a University of Queensland agricultural scientist provide the basis for custom-designing plant roots. Her discovery is already being used by plant breeders to develop drought-resistant sorghum crops.

The shape of the root system plays an important role in sorghum's capacity to absorb water. Dr Vijaya Singh has demonstrated this is governed largely by a region of the plant genome that she has located. Her findings and techniques could well be transferrable to

other crop plants.

"Improving efficiency of water use in field crops is a global imperative for food security," Vijaya says. Sorghum is an important dryland cereal crop in parts of the developing world where drought is common and also in north-east Australia.

"Despite the fact that root systems are critical to water capture by plants and to drought adaptation, little attention has been paid to them because they are so difficult to study," Vijaya says.

So, she developed a technique of growing sorghum seedlings in narrow transparent Perspex containers and then scanning them to measure their root characteristics. She found the angle at which seedling roots strike out from their first branch point underground indicates the shape and function of the root system of the mature plant. And this "nodal root angle" is under genetic control.

"I used this discovery to locate the

controlling genetic regions," she says. "My results showed that strains with a wide nodal root angle at the seedling stage had a tendency to gather a greater proportion of their water at a distance, due to the broader spatial pattern of their root systems. Conversely, strains with a narrow nodal root angle had a greater capacity to extract water from depth immediately below the plant. This understanding will make it easier to design varieties better adapted to drought stress."

Vijaya's identification of the regions of the genome related to root system shape presents opportunities for improving drought adaptation through breeding.

"This could provide farmers with better grain yields, particularly in extreme drought years. Ultimately, this would help to stabilise farm income, which could improve the social and economic structures of rural communities."



Vijaya Singh

PHOTO: MARK COULSON



Ian Frazer

OUTSTANDING RESULTS FOR FRAZER HERPES VACCINE

A University of Queensland (UQ) start-up company, Coridon Pty Ltd, established to commercialise the work of Professor Ian Frazer FRS FAA FTSE in developing next generation DNA vaccines, has successfully completed pre-clinical efficacy testing of its prototype Herpes Simplex Virus 2 (HSV-2) vaccine, with outstanding results. The company will now look to progress the program into clinical studies.

Working at the UQ Diamantina Institute, Coridon is developing DNA vaccines for the prevention and treatment for a range of infectious diseases and cancers in humans, utilising the company's patented technology.

Collaborating with the University of Washington in Seattle, Coridon tested a number of different formulations of Coridon's prototype vaccine. These proved 100 per cent effective at protecting animals against HSV-2 infection. These results were presented at the 5th Vaccine and ISV Annual Global Congress in Seattle in October.

Professor Frazer said Coridon had now secured additional funding from major investor Allied Healthcare Group to begin manufacturing the vaccine and conduct preclinical safety studies before testing the vaccine in a phase I clinical study.

"The results of our herpes vaccine mark the beginning of an exciting period," Professor Frazer said. "Over the next 12 months, we expect pivotal data showing that our HSV vaccine, which incorporates Coridon optimisation technology, produces similar immune responses in the clinic to those seen in the animal trials."

Professor Frazer's work at Coridon follows the success of his discovery with the late Dr Jian Zhou of a basis for the cervical cancer vaccine Gardasil.

FACE RECOGNITION WINS AWARD

NICTA (National ICT Australia Ltd) face recognition technology that improves the speed and accuracy of identifying faces in CCTV footage has won the ICT R&D prize at the Asia-Pacific ICT Alliance Awards (APICTA) in Pattaya, Thailand.

NICTA's Face Search Engine vastly improves face recognition in grainy, low-quality video footage, potentially saving time in police investigations where CCTV footage is usually reviewed manually. NICTA's Face Search Engine also triggers automatic watchlist notifications in real time.

A NEED FOR SCALE IN CLOUD ADOPTION

Australian business, which shares both enthusiasm and concerns about cloud computing, can benefit from it, says Dr Craig Mudge, author of the ATSE report *Cloud Computing: Opportunities and Challenges for Australia*.

"SMEs can overcome some of the advantages that their bigger competitors have had in the past such as the capital-intensive hardware investments needed to provide service," Dr Mudge said recently.

"While SMEs are enthusiastic about cloud computing, they also have concerns. While some of these concerns would also be shared by larger companies, SMEs face greater difficulties in addressing them.

"Barriers to adoption of cloud computing by business include the cost of migration to a cloud model, fear of lock-in to one cloud service provider, data security and the lack of large-scale data centres in Australia."

He said some Australian companies were evaluating the cloud and some were using it already, often through Amazon Web Services.

"However, massive scale is needed to get the most business value from the cloud computing concept."

Dr Mudge was responding to the launch by Innovation Minister Kim Carr of a report – *The potential for cloud computing services in Australia* – prepared by Lateral Economics. According to the report, more than 71 per cent of Australian firms are already using some form of cloud service; a 31 per cent increase in the space of two years.

Senator Carr said while cloud computing was an emerging area with "immense potential" for Australian business, it also presented its fair share of challenges. "There are major issues around risk management, sovereignty, data security, privacy and service quality that need to be thoroughly debated," he said.

"A local cloud capability will give us a say in these issues. Our political stability, and the stability, transparency and integrity of our institutions, can set Australia apart in the industry," Senator Carr said.

The Government has tasked the IT Industry Innovation Council to conduct a more in-depth study into the nature of cloud computing in Australia.



Craig Mudge

Putting the spotlight on geo-engineering

The two approaches of climate geo-engineering are: intervention into the biogeochemical cycles of the key greenhouse gases and intervention into the radiative budget of the planet.



By Graeme Pearman

graemepearman@megalink.com.au

Recent interest in climate geo-engineering arises from the confluence of many factors. First, the clear evidence that the climate is changing with associated impacts. Second, efforts to reduce greenhouse gas emissions have so far fallen short of what is needed to avoid significant climate change through this century. While the science of climate change is constantly improving, there remain uncertainties. Some relate to an

inability to anticipate how complex systems such as ecosystems may respond to the multiple consequences of general global warming. Further there remains potential for such systems to respond rapidly in nonlinear ways.

The third factor is that while these are by no means certain outcomes, they constitute part of the risk of unconstrained emissions growth and there is a need to consider what happens if the issue is more serious or more urgent than currently perceived.

Fourth, the improved science provides us with the basis for at least exploring the opportunities for modifying the climate and thus nullifying to some extent the impact of the atmospheric accumulation of greenhouse gases, itself a form of unintentional geo-engineering.

Finally, the setting of emissions targets and the institution of a price on carbon has provided entrepreneurial and commercial impetus to establish companies, raise resour-

ATSE and the Australian Academy of Science held a joint conference titled *Geo-Engineering the Climate?: A Southern Hemisphere Perspective*, at the Shine Dome, Canberra¹ in September. The Conference was organised by the National Committee for Earth System Science and attended by 59 participants from Australia and New Zealand. It followed a major assessment of climate geo-engineering by the Royal Society and an international conference on the topic held in 2010 in California².

BALANCING THE SEA LEVEL 'BUDGET'

An international research team claims to have balanced the sea-level-rise budget by showing that the total amount of contributions to sea-level rise explains the measured rise over recent decades.

Scientists have accounted for all the contributions to global sea-level rise in a study that balances the sea-level rise 'budget' and explains the observed rise over recent decades.

In work led by CSIRO Wealth from Oceans Flagship scientists Drs John Church FTSE and Neil White and published in the American Geophysical Union's *Geophysical Research Letters*, the researchers also reviewed the related Earth's energy budget – confirming that 90 per

cent of the energy stored in the climate system resides in the ocean and this warming drives one component of sea-level rise.

The international research team found that the two largest contributions to observed sea-level rise since 1972 came from ocean thermal expansion (about 40 per cent) and glacier melting (another 35 per cent). The remainder was from changes in the ice sheets and terrestrial storage in reservoirs and extraction of groundwater from aquifers.

The new research resolves an issue evident in past IPCC Assessments in which the actual observed rise over recent decades was larger than the sum of contributions to sea-level rise, raising concern that the IPCC may

have underestimated future rise.

"There are many factors contributing to sea-level rise, including changing groundwater storage, thermal expansion of the oceans, and melting glaciers and ice sheets," Dr Church says.

"Closing the sea-level budget required accurate estimates of ocean warming, by far the largest storage of heat in the Earth's climate system.

"The sum of contributions has been less than the observed rise. To resolve this, we revisited the Earth's sea-level and energy budgets together using new and updated estimates of all contributing factors for the past few decades, and including a new

es and investigate the opportunities in the geo-engineering of the climate.

Climate geo-engineering incorporates two somewhat independent approaches: intervention into the biogeochemical cycles of the key greenhouse gases, in particular carbon dioxide (so-called CO₂ management or CDM); and intervention into the radiative budget of the planet, reducing the amount of solar radiation influencing the temperature (so-called solar radiation management or SRM).

In both cases, there exist a number of specific technologies that are being considered. In general, CDM is the preferred option in that it directly reverses the impact of the accumulation of greenhouse gases in the atmosphere, whilst SRM is seen as potentially much more problematic (Figure 1).

During the Academies' joint conference, papers were presented that looked in some depth at a selection of geo-engineering options including carbon dioxide removal via the accumulation of carbon in soils and in biochar; and the role of forestry in carbon capture and storage. Both of these options are already in use. In particular storage of carbon in soils is a key commitment in the Government's Securing a Clean Energy Future³ policy and even more so in the Liberal Party's policy of direct action on the environment and climate change⁴.

Some important constraints to the magnitudes of each of these options were raised at the Conference and need further consideration. The use of carbon capture and geo-sequestration was also described. Papers also dealt with the options for enhancement of ocean carbon uptake.

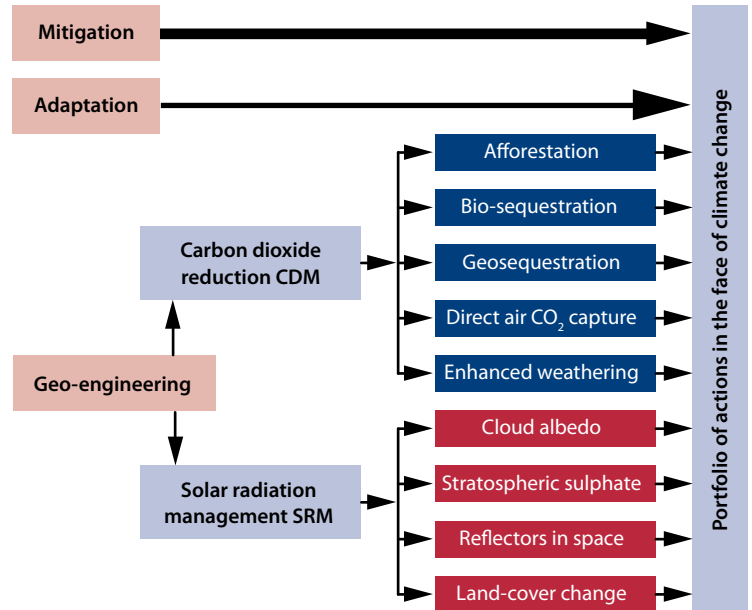


Figure 1 Reduction of greenhouse-gas emissions (mitigation) is by far the preferred approach to the management of the climate-change issue. It is likely to be the least expensive and least risky. Some adaptive management will be inevitably needed. Research and development related to potential geo-engineering options needs extreme caution, with attention to feasibility, costs, ethical and equity issues.

On the solar radiation management approaches, consideration was given to the use of stratospheric aerosol enhancement, both the advantages and disadvantages and including the potential interactions with the issue of stratospheric ozone depletion. The manipulation of the brightness of clouds through the use of tropospheric aerosol injections was described. Many other options have

estimate of groundwater depletion. This allowed us to balance the sea-level budget from 1972 to the present."

Dr Church said that sea-level rise and ocean warming had continued to increase up to the present time, in concert with increasing greenhouse gas concentrations. However, aerosols had the potential to partially mask the effects on global temperature of balancing the Earth's energy budget. An increase in aerosol emissions, probably from developing countries, and moderate volcanic activity were inferred from the result.

Drs Church and White are CSIRO scientists at The Centre for Australian Weather and Climate Research, a partnership between CSIRO and the Bureau of Meteorology. The

research team included scientists from the Antarctic Climate and Ecosystem Cooperative

Research Centre, Hobart, and Canadian, US, Dutch and British research agencies.

PHOTO: CHRIS CRERAR, CSIRO



been discussed in recent literature but were not explicitly addressed at the conference.

Many Conference participants expressed concern that geo-engineering may be seen as an alternative to emissions reduction. It was suggested that land clearing was initially viewed as an important option for Australia to reduce emissions. Yet in hindsight it could be argued this led to a lower level of priority in attending to the reduction of energy-related emissions through demand management, energy efficiency improvements and alternative energy sourcing.

Similarly, interest in carbon capture and sequestration (geosequestration) was also seen by some as an excuse for less immediate action to reduce emissions. Further it was suggested that there existed an unrealistic expectation on both sides of politics and by some technologists about the role bio-sequestration of carbon might play in emissions reduction.

The dilemma is that a polarisation of the debate on geo-engineering options may occur if vested interests in the status quo see it as an alternative to mitigating, while on the other hand a taboo on geo-engineering would deny the need for knowledge-building in the face of the potential that such technologies may turn out to be essential.

In any case, geo-engineering options should not be treated as reflecting equal potential danger or attractiveness when this is clearly not the case.

The concept of a portfolio approach is framed to hedge the risk that any one option may turn out to be technically, financially or ethically undesirable and longer-term resilience can be maintained through multiple options. It recognises that uncertainties exist for all options and that, strategically, resilience will be maximised by engaging, cautiously and responsibly, in as many options as possible. Further, of the wide range of options, many do not necessarily threaten undesirable national to global-scale impacts if they turn out through experience to be problematic, but all need to be considered against a rigorous set of criteria which are constantly reviewed.

These criteria should reflect community outcomes (not just of vested or political interests), reversibility of outcomes, and fundamental issues related to the rights of humans to intervene in Nature, to gamble with the future of ecosystems, the welfare of specific nations, and the ethical basis for such decisions.

Such criteria are needed urgently for the guidance of the research community, commercial investments and possible unilateral national actions. Papers were presented that considered ethical and governance issues arising from geo-engineering.

Other issues that emerged from the Conference included:

- improvement of knowledge related to a wide range of potential geo-engineering options is desirable but

should not be seen to indicate any commitment to their implementation;

- interest in potential geo-engineering options is not based on avoiding the task of greenhouse-gas emissions reduction and adaptation. Mitigation must remain the first and foremost option;
- geo-engineering options are diverse and many, and should not be placed in one basket. Each should be researched and its potential assessed on its own merits against rigorous and systematic assessment criteria⁵;
- relatively simplistic engineering criteria will not be sufficient to make such assessments. Geo-engineering requires the assessment of the physical and engineering viability of projects and their cost of implications. But importantly assessment must involve issues of equity, ethics, legalities and the human responsibilities to each other and to the biosphere;
- we urgently need national and international guidelines for the conduct of geo-engineering research and the potential implementation of such efforts; and
- together the Australian Academies might consider how, in an holistic way, they could progress the consideration of the issues that were dealt with for the first time in Australia at this Conference. ◀

Notes

- 1 Access to the papers presented: www.science.org.au/natcoms/nc-ess/documents/GESymposium.pdf
- 2 <http://royalsociety.org/document.asp?tip=0&id=8770>; and <http://www.climate.org/PDF/AsilomarConferenceReport.pdf>
- 3 www.cleanenergyfuture.gov.au/wp-content/uploads/2011/07/securing-a-clean-energy-future-summary.pdf
- 4 The 'Direct action on the environment and climate change' policy of the Australian Liberal Party is given at www.liberal.org.au/Latest-News/2010/02/02/Direct-action-on-the-environment-and-climate-change.aspx. It states that "The single largest opportunity for CO₂ emissions reduction in Australia is through bio-sequestration and the replenishment of soil carbon in particular. Significantly increasing soil carbon levels also boosts agricultural productivity and water efficiency".
- 5 For example see the see the UK House of Commons Oxford Principles, www.sbs.ox.ac.uk/centres/insis/news/Pages/geoengineering-regulation.aspx

DR GRAEME PEARMAN AM FAA FTSE is a Senior Research Fellow at Monash University. He trained as a biologist and was Chief of the CSIRO Division of Atmospheric Research from 1992 to 2002. He is an internationally recognised climate scientist with more than 150 academic publications to his credit. He was awarded a United Nations Environment Program Global 500 Award in 1989 and a Federation Medal in 2003 and has been an ATSE Fellow since 2005.

B-HERT Awards back links

A number of Australian organisations have been named winners of the 2011 Business/Higher Education Roundtable Collaborative Awards, announced in November. The Business/Higher Education Roundtable (B-HERT) awards commenced in 1998 to highlight at a national level the benefits of effective partnerships between industry and the tertiary education sector. The award categories showcase research and development, higher education and training, vocational education and training and community engagement.

The 2011 winner of the Ashley Goldsworthy Award for Sustained Collaboration between Business and Higher Education was won by Victoria University, which has established long-term relationships with a range of groups and organisations in the areas where it operates which cover research, education and training, and provision of community support.

Of particular value have been the innovative programs designed to assist disadvantaged groups, particularly migrants and refugees from cultural and linguistically diverse backgrounds. Collaborations extend also to sporting clubs, businesses, local government, employer bodies, police, health bodies and arts groups, covering both the higher education and TAFE sectors.

The award for Best R&D Collaboration went to Flinders University, University of Adelaide, University of South Australia and partners for their Medical Device Partnering Program. The best Higher Education and Training Collaboration award went to Australian Power Institute and its partners for their project Future Proofing Australia's Professional Power Engineering Capability.

Mr Peter Laver AM FTSE, the Chair of an independent expert judging panel, said he hoped the number of submissions would double in size as an indication of the continued increase in collaborative projects, which has been a key theme of the Academy over the past year.

UNIVERSITIES ON THE RUN

Six Australian regional universities have formed a new sector group named the Regional Universities Network, with University of Ballarat Vice-Chancellor Professor David Battersby as inaugural chair.

But Professor Battersby said the collaboration was prompted by increasing opportunities for collaboration in the sector, such as the Australian Government's \$51 million Collaborative Research Networks initiative to boost the research profiles of regional universities by funding collaboration.

The new Network comprises Central Queensland University, Southern Cross University, Ballarat, University of New England, University of Southern Queensland, and University of the Sunshine Coast. Charles Sturt University has stayed outside the group.



Talia Gaertner-Jones checks out UniSA on her phone.

UniSA STUDENTS CAN GO FOR THEIR PHONES

The University of South Australia has launched a new mobile phone technology that allows students to access information about their programs, assignments, results and facilities at the click of a button.

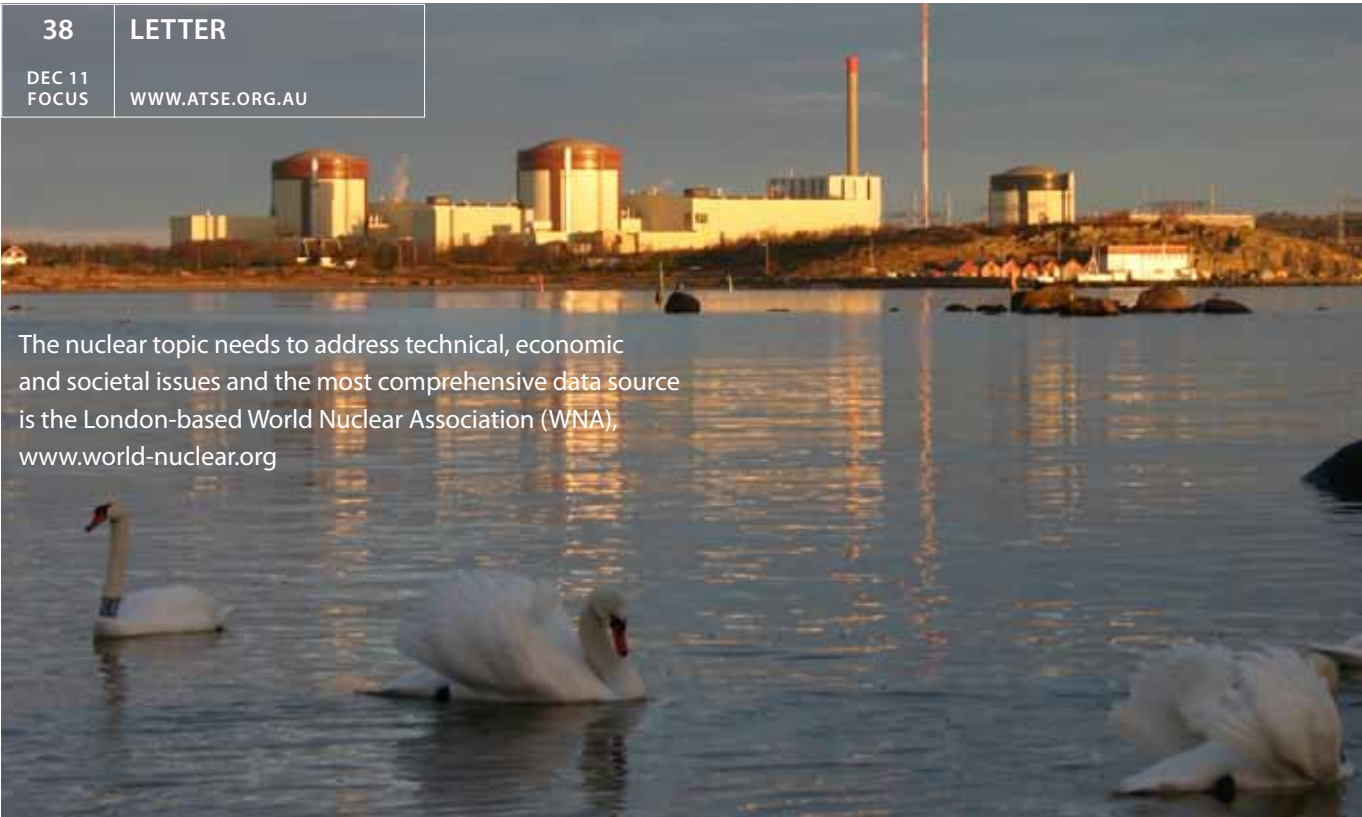
The portal lets students use their smartphones to view their results as soon as they are published and includes class information, exam timetables, current assignments and their due dates – and has a security speed dial button for student safety, library information, campus maps, contacts and directions to buildings.

Developed by UniSA's Information Strategy and Technology Services (ISRS), it complements UniSA's PC Finder application released recently for iPhone, iPad and Android devices. It is available to download free of charge from the iPhone App Store and the Android Market.

Director of ISTS, Paul Sherlock, said the new technology was designed to increase convenience for students and to enhance their learning experience. Mobile devices were a big part of students' daily.

"The mobile portal has all the information students need at their fingertips when they're on the move, including any important information or alerts they might need. It tells them which classes they have today and their current assignments and results, which appear for around 14 days after they have come out. It's tailored specifically to each student to give them the most relevant information.

"The PC Finder allows students to find the computing equipment they need quickly, so it will save them time while they are on campus. It uses the smartphone GPS to find the closest available computer on campus and provides information about opening hours, the hardware and software available on the computer, printer facilities and how to get there.



The nuclear topic needs to address technical, economic and societal issues and the most comprehensive data source is the London-based World Nuclear Association (WNA), www.world-nuclear.org

PHOTO: ANNICA ÖRNBERG

The Ringhals site in Sweden has four reactors that produce 20 per cent of Sweden's electricity. Ringhals AB is a subsidiary of Vattenfall AB, Sweden.

Nuclear power for Australia will be uranium-fuelled

I believe that Australia's first fleet (to coin a phrase) of nuclear power plants will be Advanced Light Water Reactors, each 1000 to 1200MWe capacity, fuelled by uranium (U-235, enriched to about four per cent).

The earliest possible on-line electricity production could be by say 2030, based on a schedule:

- 2016 Selection of technology and site
- 2020 Licensing and community acceptance complete
- 2021 Commencement of site works
- 2029 Reactor built and fuelled
- 2030 Nuclear power plant on line.

To meet this timetable the technology would need to be locked in by 2016 and the choice can only be from proven commercial technologies at that time. In different political settings both China and the United Arab Emirates have currently chosen Advanced Light Water Reactors and uranium fuel for their programs. (See WNA; Public Information Service; Country Briefings; China and United Arab Emirates).

There are many technologies that may mature beyond this decade but their development time will exclude them from any near-term selection. We need to be mindful that if our decisions are dependent upon the commercialisation of Generation IV, Thorium fuel, Small Reactors or Fast Neutron Reactors – this is tantamount to holding off our commitment to nuclear for decades.

"The use of thorium-based fuel cycles has been studied for about 40 years, but on a much smaller scale than uranium or uranium/plutonium cycles. Basic research and development has been conducted in Germany, India, Japan, Russia, the UK and the USA" (WNA) but it is yet to be commercially viable.

The China announcement of its Thorium program (*Wen Hui Bao* newspaper, 1 February 2011) includes the phrase "... if it works as planned, China may ...".

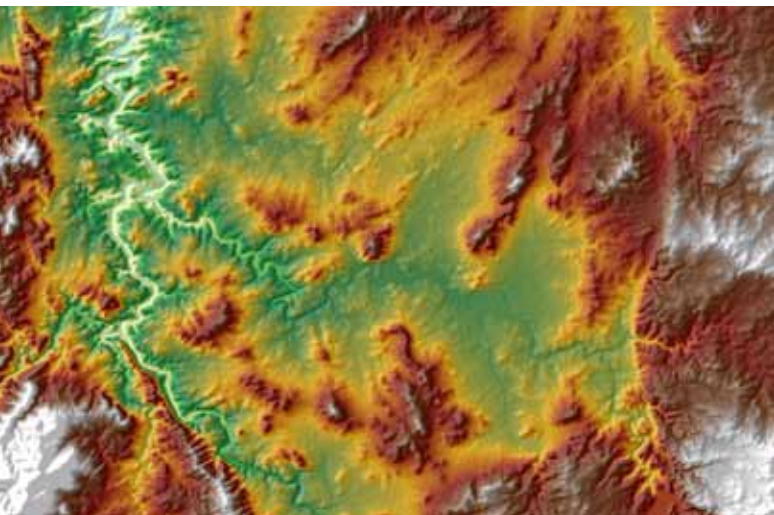
Australian scientists wishing to support Thorium could form associations with the thorium fuel researchers in other countries as thorium is abundant here, typically in the mineral monazite in beach sands. (*Australia has 19 per cent of the estimated world reasonably assured and inferred Thorium resources recoverable at up to \$80/kg Th* – see WNA; Public Information Service; Current and Future Nuclear Generation; Thorium).

For a new configuration of nuclear power plant or fuel type to evolve from concept to proven reality is a 20, 30 or even 40 year process – finalisation of the science and design; identifying participants; source of funds, a willing host community and country; licensing procedures; selection of provider; siting geotechnics; construction; commissioning and – say – at least 10 years of trouble-free operation.

At that stage the new item, if successful, could be added to the list of valid options. The four concepts mentioned above will not be valid choices this or possibly next decade. They will not have been able to demonstrate commercial viability by then. Scientists like to be at the cutting edge but engineers prefer a proven path.

I suggest we go forward with proven technologies. Other technologies can be considered after they have demonstrated their viability. As we enter the nuclear age there is no need for Australia to be used as a test-bed for new nuclear technologies or to wait for something that is currently over the horizon. Perhaps the energy potential of Thorium will be a proven option by the mid 21st century.

– DR IAN DUNCAN FTSE



MANAGING WATER VIA DIGITAL MAPPING

Australia's ability to manage our land and water will be greatly enhanced by new digital topographic information, providing the best ever way to map our continent.

The new 30-metre resolution hydrological Digital Elevation Model incorporates rivers and streams and is the last in a series of products based on the Shuttle Radar Topography Mission data collected by NASA during a Space Shuttle mission in 2000. It provides nearly 10 times finer resolution and thus much greater detail than previous Australian Digital Elevation Models.

Innovation Minister Senator Kim Carr said it would help farmers, businesses and the community. "CSIRO, the Australian National University, the Bureau of Meteorology, Geoscience Australia and the Defence Imagery and Geospatial Organisation have just completed building the finest resolution national computer model of Australia's ground surface topography and river networks," he said.

"The Digital Elevation Model is a fantastic tool for organisations like the Bureau of Meteorology, CSIRO and all levels of government to improve water resource management outcomes for Australia."

The director of CSIRO's Water for a Healthy Country Flagship, Dr Bill Young, said the new model was a vast improvement on previous terrain data, producing images of Australia's topography with much greater detail and accuracy than the current model.

"This new model provides the best ever maps of terrain shape and water flow paths across the continent and is expected to dramatically improve our understanding of Australia's landscape and water resources," Dr Young said.

"This 30-metre resolution model will not only revolutionise land and water management applications, but will also enable improvements in many other service areas – for example, calculating improved coverage of mobile phone towers or creating three-dimensional visualisations of the landscape for improved understanding of potential flood extents."

The acting Director of Meteorology, Dr Rob Vertessy, said that the new model would play a vital role in assisting the BoM to undertake

national water resources assessments and water accounting.

"This new national model will give Australians a reliable definition of stream networks and catchment boundaries needed to account for and forecast water movement through the landscape," Dr Vertessy said.

CSIRO LAUNCHES NEW WATER BOOK

CSIRO has launched a new book designed to inform business, government and the community about the importance of one of Australia's invaluable natural resources – water.

CSIRO's Chief Executive Dr Megan Clark FTSE launched *Water: Science and Solutions for Australia*, which provides the latest information on the status of Australia's water resources, their future prospects and the potential for using water more effectively to meet the growing demands of cities, agriculture, heavy industries and the environment.

"Australians have always had a strong sense of living in a dry continent, so they value their water resources highly," Dr Clark said.

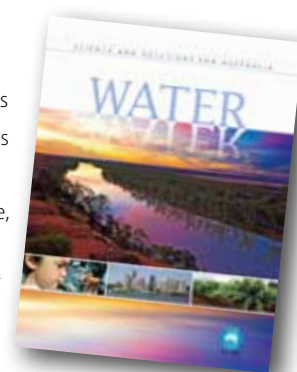
"Water is essential to support the economy, the natural environment and our way of life, but tensions between the differing uses of water is often at the heart of many conflicts over maintaining sustainable levels of water use.

"This publication draws upon the scientific literature to provide a broader audience with a clear picture of the water challenges and prospects facing Australia. It seeks to provide a bridge from the peer-reviewed scientific literature to a broader audience while providing the depth of science that this complex issue demands and deserves."

The book's 178 pages provide scientific insights including:

- overall, Australia has sufficient water resources to support its current uses, consuming six per cent of renewable water resources each year;
- demands on water resources are growing – increased urban populations, the booming minerals and gas sectors, and recognition of the need to provide water for the environment;
- climate change places an additional pressure on water resources but Australia's adaptability to droughts and floods will help the management of further adaptation for a few decades at least; and
- Australia is in a strong position to face its water challenges – it has safe and reliable supplies of water, achieved significant water reforms, solid institutions and many opportunities for innovation.

Water: Science and Solutions for Australia is the second book in CSIRO's 'Science and Solutions for Australia' series. *Climate Change: Science and Solutions for Australia* was the first and can be downloaded free (at www.csiro.au/resources/Climate-Change-Book.html).



***Water: Science and Solutions for Australia* can be downloaded free (at www.csiro.au/resources/Water-Book.html) or purchased from CSIRO Publishing for \$24.95.**

STELR helps support an extraordinary woman

By Jenny Sharwood

STELR Curriculum Co-ordinator

In this International Year of Chemistry, one woman has been celebrated above all others – Marie Curie. While she truly deserves to be honoured in this way, as this year comes to a close, another extraordinary woman scientist also deserves to be honoured. Indeed, in my view, she deserves the Nobel Peace Prize!

She is Dr Nouria Salehi OAM and is the senior physicist in the Department of Nuclear Medicine at the Royal

Melbourne Hospital. In November she was named Victorian Senior Australian of the year for 2012.

Nouria studied the International Baccalaureate in Afghanistan and completed an undergraduate degree at the University of Kabul, before moving to France to complete her PhD in nuclear medicine and other studies. She then spent some years lecturing at a French university and working in a university hospital, before returning home to Kabul to practise.

Not long after she returned home, she decided to move to Australia. This was indeed fortuitous timing. Soon after, the Russians came marching in and destroying everything she held dear.

What the Russians did not destroy, the Taliban did. The most significant impact the Taliban had, of course, was restricting the lives of women. As women were the main teachers, schools closed and a whole generation of children, millions of children, were denied an education. Instead many were given guns. No one received skills training, no teachers were being trained and women took their lives in their hands if they tried to learn how to read and write.

Enter Nouria. Since the Taliban were driven out, and in addition to her ongoing research in nuclear medicine, she has travelled to Afghanistan time and again, at the risk of her own life, to establish science teacher training



Teachers participating in the science teacher training course in Kabul, Afghanistan, established by Dr Nouria Salehi.

PHYSICS TOOK HER TO THE TOP

Dr Cathy Foley PSM FTSE is one of the country's top applied physicists, President of Science and Technology Australia (STA), which represents 68,000 scientists and technologists in Australia, Past President of the Australian Institute of Physics – and Chief of CSIRO's Division of Materials Science and Engineering, CSIRO's largest division, which has more than 850 researchers.

In 2009 she won the prestigious National Telstra Business Women's Award and this year has won the AUSIMM Mineral Industry Operating Technique Award (MIOTA). Both awards were given primarily for her invention of the method to make a highly sensitive magnetic field sensor using high temperature superconductors (HTSs). The sensor is the basis of the mineral exploration tool LANDTEM™, for which she led the initial development, in collaboration with BHP Billiton, and Canadian mining company Falconbridge.

This application was recently identified by *Nature Materials* as the

main success since the discovery of HTS materials in 1986. LANDTEM™ has since been licensed to an Australian start-up company, Outer-Rim Development, and has ultimately helped to unearth about \$6 billion of new mines worldwide.

Dr Foley is acknowledged for her business savvy as well. Not only did she take out the NSW and the national Nokia Business Innovation Award in the Telstra Women's Business Awards in 2009, she has also been acknowledged as a 'Distinguished Lecturer', by the IEEE Council of Superconductivity.

For her service to physics, the promotion of science and to women in science, she has received a Public Service Medal and a Eureka Prize. She is a plenary speaker, invited or keynote speaker at many national and international conferences and symposia and has been the chair of three international conferences. Apart from her invited work at

programs, apprenticeships, literacy programs and a range of other constructive initiatives to drive change and empower young people and women and their communities.

When I think of all she does, I am humbled. I would like to think that Marie Curie would be proud to know that someone who, like her, came to study in France, and whose professional work centres on using radioactive isotopes to heal people, also heals the souls of her own people and lifts them up again.

Recently the STELR team was very pleased to support Nouria's work by providing her with a set of our equipment and a copy all of our written resources to take to the science teachers participating in one of the fully accredited training courses she established.

Nouria has just returned from her latest trip to Kabul and told us that the teachers loved the idea of teaching about global warming and renewable energy and loved trying out our special STELR equipment. She has now established a project to have our student booklets and teacher resources materials translated into the local language. ◀



Dr Nouria Salehi

For more information about Nouria Salehi's work visit the website of the organisation she has established (www.aado.org.au).

If you would like to donate more STELR equipment to schools in Afghanistan, please contact the STELR Manager Peter Pentland (peter.pentland@atse.org.au).

If you are in Melbourne you can visit the restaurant Nouria established in 1983 to provide ongoing support to Afghan refugees – Afghan Gallery Restaurant, 327 Brunswick Street, Fitzroy.



Cathy Foley

conferences, she is the rapid communications editor of a high impact international journal in the field of superconductivity.

She has been an advocate for women in science since the 1980s, most recently running the

Women in Science and Engineering Summit at Parliament House, Canberra, where she invited 160 science leaders and policy makers to commit to making changes to increase the number of women at all levels. Her commitment to this cause has resulted from her own experience where she has had many 'firsts'.

Reprinted from Australasian Science.

FROM ZOOLOGIST TO CHIEF SCIENTIST

Professor Lyn Beazley AO FTSE was appointed Chief Scientist of Western Australia in 2006 and was re-appointed in 2009. She is also Professor in Zoology at the University of WA, where her research career has spanned 30 years.

Professor Beazley graduated from Oxford University and then undertook her doctorate at Edinburgh University. She transferred to Perth in 1976 and built up an internationally renowned research team that focused on recovery from brain damage. Her research also changed clinical practice in the treatment of infants at risk from pre-term delivery.

Professor Beazley has served on numerous peak bodies advising state and federal governments, such as the NHMRC Fellowships Committee (2006–09), and is a board member of Neurosciences

Australia. Internationally, she has served on a panel assessing research performance for the Swedish Research Council and is a member of the Education Committee of the International Brain Research Organisation. She was a Trustee of the WA Museum from 1999 until 2007.

She lists her career highlight as "seeing my research into protecting the foetal brain from injury while still maturing the lung, thus minimising respiratory distress in the newborn" and says she's struck no career barriers. Her mentor of choice was the Principal of Somerville College, Oxford, Dame Janet Vaughan, whose research into the body's uptake of radioactive isotopes was relevant in the wake of the nuclear threat during the Cold War. She chaired the UK committee that recommended blood donations should be free – in contrast to the US system or buying/paying for blood, with all the inherent equity issues.

Professor Beazley attributes her success to choosing the right partner in life (Clinical Professor Richard Tarala), her three wonderful daughters, hard work ("the harder you work, the luckier you get"), giving more than you ever think can be repaid (but it nearly always is!) and remembering the slogan 'Trust, Respect, Integrity'.

She says "as long as you and those you love are healthy, nothing's good or bad". She says her Eureka moment has not come yet and her future ambitions are to work to ensure science, technology, engineering and mathematics make a positive contribution to the health and social, cultural, environmental and economic life of WA, Australia and, if possible, the world.

Most importantly address the burgeoning skills shortage by encouraging education from toddlers onwards, both girls and boys, since education is a gift no one can take away.

Reprinted from Australasian Science.



New technology, old country – Chief Scientist Lyn Beazley on the road in outback WA.

Driving science to build the nation

Nations rise and fall on the outcomes of science and education, according to Australia's newest Nobel Laureate, astronomer Professor Brian Schmidt FAA, from the Australian National University.

"Improvements in our lives are largely due to technology powered by science and education," he told the Prime Minister's Prizes for Science awards dinner in Canberra in October.

"I guess the lack of political acknowledgement of this is because science and education do not run on a three-year cycle," he said, noting that it takes decades for policies to run their course, but they provide a similarly long legacy.

"The policy makers of this generation have a unique opportunity to shape the long-term prosperity of this country. Using the opportunities that arise from a prosperous, agile economy, Australia can ensure its future prosperity in a rapidly changing world through a strategic vision of and investment in education, science and technology.

"The education part of this triumvirate is straightforward. Australia needs a workforce educated commensurate with its wealth – to put it simply, the world's best educated workforce."

This was the engine of future prosperity, he said. It would cost money and take time but had to be at the top of Australia's agenda.

"Science is the building block of future technological breakthroughs. Basic science research creates revolutionary new ideas. It's a messy process, but it is the process that has taken our world from the Dark Ages to our current prosperity.

"Remember that the 2009 Prime Minister's Prize for Science recipient John O'Sullivan started out by trying to discover evaporating black holes. He never found any of them, but ended up helping to invent the Wi-Fi system we all now use. And the royalties flowing back to Australia from his work are just the beginning. His achievement has increased productivity not just Australia, but around the world." (Dr John Sullivan from CSIRO won a 2010 ATSE Clunies Ross Award for his work)

"Scientific research thrives in world-class institutions. Australia should strive to strengthen its universities and also to ensure that CSIRO remains the unique research institution it is. I can see nothing but good



Born and educated in the US, Professor Brian Schmidt has lived in Australia for 17 years and was awarded the first Malcolm McIntosh Prize for Physical Scientist of the Year in 2000.

emerging from working towards having at least one university in the top 10 internationally, and three in the top 50.

"Then there is the process of taking the science and technology to market. This traditionally has been hard. Australian companies have found it difficult to capitalise in our small domestic market – in both senses of the word.

"But this is an area in which the world order is changing. If Australia works with partners on a more international basis, it will be better able to transform its good ideas into goods and services in the global marketplace.

"Working internationally is challenging for governments – a posture here, a step there. Progress is painfully slow. But for scientists, it comes naturally. We routinely work together in the pursuit of knowledge. So science can be a conduit to take Australian industry to the world.

"The future for Australia is indeed bright – but it is not guaranteed. Capitalising on Australia's opportunities will not just happen, it requires strategic science and education policies that adapt to a changing world.

"And Australians will have to be willing to make significant changes in how they go about their business," he added.

For their role in revolutionising polymer science, Professors David Solomon AM FRS FAA FTSE and Ezio Rizzardo FRS FAA FTSE jointly received the 2011 Prime Minister's Prize for Science. See page 45.

BIRDS MEASURE SPEED TO AVOID CRASHES

The secret of how birds zip flawlessly through narrow spaces without crashing into obstacles has been unlocked by Australian scientists – and their discovery could be used to design 'bird-safe' buildings and windmills, and improve the versatility of pilotless aircraft.

Researchers at The Vision Centre have found that birds weave rapidly and safely through dense forests and narrow corridors by using their eyes to sense the speed of background image flow on both sides and adjust their flight according to it.

"As animals travel forward, things that are close seem to speed by, and things that are farther away seem to travel more slowly," says Professor Mandyam Srinivasan from The Vision Centre and University of Queensland, whose team made the discovery.

"It's the same for birds. We found that they try to achieve a safe 'balance' by ensuring that the background images are passing at the same speed in both eyes. This means that if the bird flies closer to obstacles on one side, the near eye will see things passing by faster while those seen by its other eye will pass more slowly. This imbalance prompts the bird to veer away to even out the speed of image flow in both eyes."

The Vision Centre is funded by the Australian Research Council as the ARC Centre of Excellence in Vision Science.



The Parkes telescope today.

PHOTO: DAVID MCLENNAGHAN, CSIRO

'The Dish' turns 50

CSIRO's Parkes radio telescope – best known for its role in receiving the television signals of the 1969 Moon landing, as shown in the film *The Dish* (2000) – turned 50 in October.

Planning for the telescope began in 1951, and built on Australia's strength in the new field of radio astronomy. British design, German engineering, and Australian and US funding created a telescope with new design features that NASA used as a model when it was building dishes for its own Deep Space Network.

Repeated upgrades have made the telescope 10,000 times more sensitive than when it was opened on that blustery day in 1961. Its surface panels, focus cabin, receiving equipment, pointing system, control panel and data processors have all been replaced.

Mapping our Galaxy and finding other galaxies, discovering magnetic fields and molecules in space, hunting for gravity waves have all been part of a day's work for Parkes. The telescope played a part in determining the nature of quasars, and has found most of the 2000 known pulsars — small spinning stars that still pose fundamental questions.

"Parkes is still one of the best-performing radio telescopes in the world," said Dr Phil Diamond, Chief of CSIRO Astronomy and Space Science, which runs The Dish. "The telescope is like a council worker's broom — it's had three new handles and two new brushes, but it's still the same broom," Dr Diamond said.

SECOND YEAR OF UWA-UQ COLLABORATION

Research projects at the University of Western Australia and the University of Queensland have received a total of more than \$425,000 in the second round of UWA-UQ Bilateral Research Collaboration Awards funding, with 27 projects funded from 46 applications received.

The latest grants underpin research in diverse areas ranging from bioenergy to new methods for healing wounds, blood flukes and an historical study of Australian goldfields. The awards offer up to \$20,000 to support joint projects between researchers at UWA and UQ fostering new collaborations or enhancing existing relationships.

UWA's Deputy Vice-Chancellor (Research), Professor Robyn Owens, said: "We are delighted with this strategic collaboration with the University of Queensland, which is already demonstrating significant research outcomes."

UQ's Deputy Vice-Chancellor (Research), Professor Max Lu FTSE, said: "We now have leading researchers from both sides of the continent working together on important projects in genomics, astronomy, literature and ecology."

Under the accord signed in October 2009, UWA and UQ agreed to "promote staff and student interchanges, especially of post-graduate students, post-doctoral and early-career researchers, collaborative research projects, joint workshops and the exchange of expertise and information on a regular basis".

The Research Selections 2011 report.

ANSTO'S YEAR OF DISCOVERY

Ever wonder what scientists are really getting up to behind the gates at the Australian Nuclear Science and Technology Organisation (ANSTO)?

Creating new imaging techniques for melanoma that could pave the way for potential treatments for skin cancer; better understanding evaporation in the Murray-Darling Basin and the melting of ice in the Antarctic; investigating cleaner and greener ways to make batteries – and new discoveries about cell membranes, crystals and even the history of China's Silk Road.

ANSTO is revealing all with the launch of a new publication, *Research Selections 2011*, which celebrates an amazing array of research success stories from the past year involving scientists at ANSTO and its collaborative partners from around the world. *Research Selections 2011* is the second edition of ANSTO's annual research publication, which provides the public and science community with a sneak peek at its latest projects and research.

ANSTO CEO Dr Adi Paterson FTSE said that the book demonstrates there's no limit to the types of discovery using nuclear techniques.

"Whether it's climate change, new medical advancements, or new ways to understand physics and materials, this book demonstrates how ANSTO is playing a vital role in finding new understandings about the world we are living in, as well as new insights about what the world is going to look like in the future," Dr Paterson said.

"For example, ANSTO research into the properties of batteries or magnets has the potential to transform all of the gadgets and machines that we use in our daily lives

"But ANSTO doesn't go it alone. We are always keen to harness the brainpower of the best and brightest through collaborations and partnerships. Nearly all of these case studies involve collaborations from around the world and other Australian universities and science organisations. By having world class facilities, we are able to attract the world's greatest minds, and take part in great scientific discoveries," he said.

ANSTO's *Research Selections 2011* is available online.





PHOTO: CHRISTIAN SPROGGE PHOTOGRAPHY

Komatsu Autonomous Haulage Trucks operating at Rio Tinto's West Angelas mine in the Pilbara, Western Australia.

150 trucks but no drivers at Rio

Rio Tinto will become the owner of the world's largest fleet of driverless trucks, following the signing in Tokyo in November of a deal to buy at least 150 from Komatsu over the next four years.

The new trucks, which will start arriving in 2012, will be used in Rio Tinto's Pilbara iron ore mines in WA and can be controlled from its Operations Centre in Perth more than 1500 kilometres away.

This is the latest development in Rio Tinto's Mine of the Future™ program, which introduces next-generation technologies for mining operations with the aim of reducing costs, increasing efficiency and improving health, safety and environmental performance.

Implementing autonomous haulage on this scale means more material can be moved more quickly and safely, creating a direct increase in productivity.

In Tokyo Rio Tinto chief executive Tom Albanese said "Autonomous haulage is an important component in our Mine of the Future™ program. These 150 new trucks will work with our pioneering Operations Centre that integrates and manages the logistics of 14 mines, three ports and two railways.

"These technologies are revolutionising the way large-scale mining is done, creating attractive hi-tech jobs, and helping us to improve safety and environmental performance and reduce carbon emissions."

Rio Tinto has been testing the Komatsu Autonomous Haulage System, the world's first commercial autonomous mining haulage system, in the Pilbara since December 2008.

SUBSEA SIMULATOR WINS AWARD

A giant flume capable of simulating cyclones to improve the stability of subsea oil and gas pipelines has won a major innovation award. Developed by engineers at the University of Western Australia, the Large O-tube Facility won the Woodside Oil and Gas Encouragement Award in this year's WA Innovator of the Year Awards.

Project leader Winthrop Professor Liang Cheng said the experimental facility simulated the effect of cyclones at seabed level, supporting new design methods for the stability of pipelines during storms.

The facility is a huge closed-loop flume with a base of natural seabed soil containing 60 tonnes of water which can be rapidly pumped back and forth simulating the underwater conditions during cyclones, he said.

The facility was designed and built by UWA. The instrumentation and control technology were designed and fabricated at UWA while the flume structure was made in China under UWA supervision.

Professor Cheng said pipeline seabed stability was a more significant design challenge in Australian waters compared to other regions worldwide.

"This is due to the need for large diameter gas trunklines to cross the continental shelf, which is covered with mobile sediment and subject to cyclones," he said. "The results will improve our assessments of pipeline stability and more efficient and safer design of WA's offshore infrastructure."

X-RAY VISION FOR MINERAL ORES

A new state-of-the-art x-ray imaging detector – smaller than a postage stamp – is the key to a powerful new method of characterising mineral ores.

The x-ray, photon-counting imaging device called Medipix can take high-resolution images of minerals, detailing the materials present in an ore sample. Unlike conventional x-ray films and cameras, the new technique measures the energy of individual incoming x-rays and adds colour to traditional black-and-white snapshots.

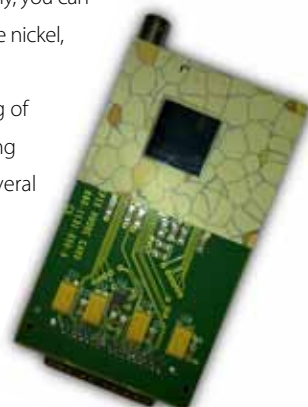
CSIRO research scientist Dr Josef Uher said the new technique could revolutionise micro-imaging, and the mining industry.

"In every single pixel of the detector, you gain information about what the x-ray spectrum looks like. If you analyse it properly, you can determine whether the materials in the sample were nickel, copper, zinc, gold or something else," Dr Uher said.

Medipix could provide near real-time imaging of ores for plant monitoring and control in the mining industry. It was designed in collaboration with several universities and laboratories led by the European Organisation of Nuclear Research (CERN).

The Medipix device, shown here with protective plastic around the ultra-sensitive chip.

PHOTO: CSIRO





**Professor Ezio Rizzardo (left) and
Professor David Solomon.**

Rizzardo and Solomon take Prime Minister's Prize

For their role in revolutionising polymer science, Professors David Solomon AM FRS FAA FTSE and Ezio Rizzardo FRS FAA FTSE jointly received the 2011 Prime Minister's Prize for Science.

In the coming years when you buy a tyre, lubricant, adhesive, paint, computer or any one of hundreds of other products, there's a good chance that some of its component materials will have been produced using revolutionary chemical theories and processes invented in Australia by research teams led by Professors Ezio Rizzardo and David Solomon.

Their techniques are employed in almost every university chemistry department, and in the laboratories and factories of DuPont, L'Oréal, IBM, 3M, Dulux and more than 60 other companies.

Their work has been cited more than 12,000 times in the scientific literature and is an integral part of more than 500 patents. The processes developed by the duo will influence the production of about half the polymers – mainly plastics – encountered in everyday life.

It would not have happened without the meeting of two great minds at CSIRO. One is David Solomon, who began working for a paint company in Sydney at 16. Now 81, he is still pursuing research as a professorial fellow at the University of Melbourne. The other is Ezio Rizzardo, who came to Australia from Italy as a teenager without a word of English. He entered the world of chemistry as a refugee from medicine, and is now a CSIRO fellow at the Division of Materials Science and Engineering in Melbourne.

Together they were able to harness the power of organic chemistry to provide unprecedented control over the structure, composition and properties of the polymers that are now used in almost every facet of our lives. In essence, they devised a means of custom-building plastics and other polymers for tasks at the cutting edge of technology – from producing plastic solar cells to delivering drugs precisely to their site of action in the body.

Many of the compounds developed using their techniques would have been inconceivable in the past. And their technologies are also transforming traditional

polymer applications such as paints, adhesives and lubricants.

"The impact of this outstanding body of work cannot be overstated," says Professor Craig Hawker, director of the Materials Research Laboratory at the University of California, Santa Barbara. "It is rewriting the book on polymer synthesis, dramatically impacting many diverse and important areas of academic and industrial research.

"Their creativity reaches out far beyond the stellar science. I see no limits to what can come from this work and am very proud to be able to say that it is home-grown Australian science through and through."

Ken Michael top WA engineer

Engineers Australia has named former WA Governor Dr Ken Michael AC FTSE as its 2011 WA Professional Engineer of the Year.

Dr Michael, who also served as Chancellor of the University of Western Australia, was honoured for outstanding leadership and contribution to engineering and the profession, and exemplary contribution to the wider community.

He completed his Bachelor of Engineering with First Class Honours in Civil Engineering at UWA in 1961, served as Commissioner of Main Roads in WA from 1991-97 and also chaired the East Perth Redevelopment Authority. He has been a Fellow since 1993.



Dr Ken Michael

Chemeca Medal for Max Lu

University of Queensland
Deputy Vice-Chancellor
(Research) Professor Max Lu
FTSE has won the prestigious
Chemeca Medal for 2011.

Professor Lu, a former
Director of ATSE, led a team of
UQ academics and a student
who scooped one-third of the
2011 Awards of Excellence in Chemical
Engineering – winning four of the 11 awards
presented at the Australasian Conference
on Chemical Engineering (Chemeca), in
September.

The Chemeca Medal is the most
prestigious award in the chemical
engineering profession in Australia and New
Zealand and is awarded to a prominent
Australian or New Zealand chemical
engineer who has made an outstanding
contribution, through achievement
or service, to the practice of chemical
engineering in its widest sense and who
continues to serve the profession.

The recipient of the award presents
a plenary lecture at the annual Chemeca
conference, which Professor Lu delivered to
an audience of more than 400 delegates.

UQ Vice-Chancellor Professor Paul
Greenfield AO FTSE presented the Chemeca
Medal to Professor Lu and said the awards
reflected the depth of talent in chemical
engineering, and were a promising sign for
UQ's role in improved sustainability.

The theme of this year's Chemeca was
'Engineering a Better World'. The conference
was hosted by The Institution Of Chemical
Engineers In Australia (IChemE), Engineers
Australia (EA), The Royal Australian Chemical
Institute (RACI) and The Institution Of
Chemical Engineers New Zealand (IChemE
in NZ). These bodies represent more than
100,000 engineers and chemists working
around the world.

Chemeca was opened by the NSW Chief



Paul Greenfield presents the Chemeca Medal to Max Lu.

Scientist and Engineer Professor Mary O'Kane
FTSE, a Vice President of ATSE. Sir William
Wakeham, from the Royal Academy of
Engineering, delivered the Rolf Prince Plenary
Lecture, honouring Emeritus Professor Rolf
Prince AM FEng FTSE.

Other ATSE speakers included Professor
Margaret Sheil FTSE, Mr Julian Segal FTSE and
Professor Hugh Durrant-Whyte FRS FAA FTSE.

Trevor Bird wins Lifetime Medal

Dr Trevor Bird FTSE has won the 2011 CSIRO
Medal for Lifetime Achievement – awarded
to individuals with a record of sustained and
meritorious achievement over a prolonged
period of CSIRO service.

Dr Bird received this award for inspirational
leadership and outstanding technical
contributions to the international satellite
industry and radio astronomy, particularly
design techniques and innovations for



Dr Trevor Bird receives his award from
CSIRO CEO Dr Megan Clark.

multibeam antennas now employed in both
applications world-wide.

Dr Bird, a Fellow since 1998, is an
internationally recognised scientist and
engineer who has provided inspirational
leadership for more than 30 years.

His computer-based methods for
antenna design led to innovations including
the first multibeam antenna for satellite earth
stations, where a single antenna receives
signals from many satellites. Multibeam
antennas are now used world-wide.

Dr Bird then applied a multibeam
approach to radio astronomy, developing
a feed system for CSIRO's Parkes radio
telescope which led to the first sighting of a
double pulsar and was instrumental in Parkes
being elected the world's most effective
telescope in 2006.

As testament to Dr Bird's record, he has
already received two CSIRO Medals, an IEEE
Third Millennium Medal and a Centenary
Medal for service to Australian society
in telecommunications. He was also the
first non-American Editor in Chief of the
leading international antennas journal *IEEE
Transactions on Antennas and Propagation*
and held that position for an unprecedented
period of two three-year terms.

Barry Jones

Former Federal Minister and longtime Fellow
– and the only Fellow of all four of Australia's
Learned Academies – Dr Barry Jones AO,
who chaired the Book Industry Strategy
Group, has presented its report to Innovation
Minister Senator Kim Carr.

Senator Carr said the Government would
give detailed consideration to a range of
recommendations aimed at dealing with the
dramatic changes affecting the Australian
book industry.

The Group consulted widely with the book
industry, librarians, educational institutions and
consumers in the preparation of the report,
which contains 21 recommendations.

The Group was established by Senator
Carr in April 2010 to examine the significant
challenges the industry faces, particularly
those arising from digital and online changes
affecting the book supply chain

Paterson and Cornish launch ANSTO-Monash link



Edwina Cornish



Adi Paterson

Two of Australia's scientific research heavyweights – Monash University and the Australian Nuclear Science and Technology Organisation (ANSTO) – will join forces to boost Australia's research efforts at home and abroad.

ANSTO CEO, Dr Adi Paterson FTSE said nuclear research opened up so many opportunities to better understand the world around us, from how plants store carbon to the origins of life.

"The fact that ANSTO and Monash University have many shared interests has become apparent through a number of individual research collaborations over the years," Dr Paterson said. "Experience shows that bringing together researchers from different fields brings together great outcomes for science.

"We're hopeful for example that through this collaboration we can do research which will improve existing medical imaging techniques to better understand how diseases affect the body."

Monash University Senior Deputy Vice-Chancellor and Deputy Vice-Chancellor, Research Professor Edwina Cornish FTSE said the broader research community would benefit from combining and making available the expertise of the two institutions.

"The university is delighted to be part of such an important collaboration which capitalises on our research strengths and those of ANSTO," Professor Cornish said.

"Monash University's linkages to many research capabilities in the Clayton area, such as the Australian Synchrotron, CSIRO, Monash Medical Centre and the Melbourne Centre for Nanofabrication, will

boost the significant research, education and infrastructure outcomes that will result from Monash and ANSTO working together," Professor Cornish said.

Welcoming the agreement, Innovation Minister Senator Kim Carr said he was pleased the new partnership would help facilitate knowledge sharing and create new training and development opportunities for our researchers.

"With ANSTO and Monash University researchers working together we can expect to see significant developments in key areas such as biomedical imaging, cancer therapy, accelerator and neutron science," Senator Carr said.

"The agreement is particularly good news for Australia's high-tech future, as the researchers and technicians of tomorrow can benefit as students from the collaborations of today."

Neil Turner wins China award

Winthrop Professor Neil Turner FTSE, from the University of Western Australia Institute of Agriculture, has received the prestigious Dunhuang Award from the Gansu People's Provincial Government as part of the 62nd anniversary of the foundation of the People's Republic of China.

Only available to foreigners, it was presented in China in October by the Gansu Province Governor before more than 300 foreign experts and Gansu government officials, to recognise Professor Turner's outstanding service and contribution to the joint UWA and Lanzhou University (LZU) economic, scientific, academic development and education program in Gansu.

Professor Turner, a former CSIRO Scientist and Director of the Centre for Legumes in Mediterranean Agriculture at UWA, who first visited China in 1989, has spent one month a year for several years at LZU, helping staff and postgraduates with their research and publications.

He said he greatly appreciated the honour, which reflected not only his work, but that of a numerous colleagues in UWA's Institute of

Agriculture, who also spent time in Gansu, plus colleagues at LZU.

Professor Turner praised Chinese agricultural progress, saying it had come a long way, including increasing wheat yields 900 per cent from 0.5 tonnes a hectare in 1960 to 4.5 t/ha in 2005, by introducing new cultivars, increasing fertiliser use and developing water-saving agriculture.

For two weeks in September, Professor Turner and UWA Institute of Agriculture Director, Professor Kadambot Siddique AM FTSE, worked with LZU developing plans to evaluate technologies to assist farmers to increase yields and incomes.

These include introducing improved cultivars of wheat and barley and grain and forage legumes to increase protein content and animal production, while maintaining soil health to withstand wind and water erosion.

UWA and LZU plan to develop a joint Centre for Dryland Agricultural Ecosystems to do collaborative research for the benefit of both WA and Gansu and encourage regular exchange of staff and students.

"We hope Gansu Provincial Government will prioritise support for an initiative which will give Australian researchers access to new facilities on root growth at LZU and give LZU researchers access to specialist facilities and expertise for drought research at UWA," Professor Turner said.

Professor Neil Turner (centre) at the award ceremony.



Women prominent among new ATSE Fellows

Leading researchers and business leaders in engineering, water, climate, energy, resources and medical technologies – including five women – are among the 31 Australian leaders in technological science, engineering and innovation elected as 2011 Fellows of the Academy.

The Academy also recognised a new Foreign Fellow in its annual election process.

Engineering figures include Professor Ian Cameron FTSE, Professor of Chemical Engineering, University of Queensland (UQ); Professor Buddhima Indraratna FTSE, Head, School of Civil Mining and Environmental Engineering, University of Wollongong; Professor Robin King FTSE, Higher Education Consultant and currently Executive Officer, Australian Council of Engineering Deans; Mr Peter Meurs FTSE, Director of Developments, Fortescue Metals Group Ltd; and Professor Mike Xie FTSE, Professor and Discipline Head, Civil Engineering, RMIT University.

Notable leaders in the water field include Professor Ana Deletic FTSE, Professor of Civil Engineering and Director, Centre for Water Sensitive Cities at Monash; Professor Jurg Keller FTSE, Director, Advanced Water Management Centre and Professor, School of Chemical Engineering, UQ; Mr Ken Matthews FTSE, Chair, Board of Governors, Committee for Economic Development of Australia (CEDA) and former Chair/CEO of the National Water Commission; and Dr John Williams FTSE, Commissioner, NSW Natural Resources Commission.

Medical technology figures include Professor Michael Cowley FTSE, Director, Monash Obesity and Diabetes Institute; Professor Nigel Lovell FTSE, Scientia Professor, Graduate School of Biomedical Engineering, University of NSW; Professor Christopher Parish FTSE, Leader, Cancer and Vascular Biology Group, Australian National University; Dr Tracie Ramsdale FTSE, Director, Alchemia Ltd; Professor Karen Reynolds FTSE, Professor of Biomedical Engineering, Flinders University; Professor Maree Smith FTSE, Executive

Director, Centre for Integrated Preclinical Drug Development, UQ; and Professor Ronald Trent FTSE, Foundation Professor of Medical Molecular Genetics, The University of Sydney.

ATSE's CEO, Dr Margaret Hartley FTSE, was among the 2011 Fellows, who were presented with Fellowship certificates at the AGM and Oration dinner in Melbourne in November.

The Foreign Fellow is Dr John Loughhead FEng FTSE, Executive Director, UK Energy Research Centre, whose career has been predominantly in industrial research and development for the electronics and electrical power industries.

[The full list follows.](#)

2011 Fellows

■ **Professor Ian Cameron FTSE (62)** – Professor of Chemical Engineering, UQ. Professor Cameron is a leading Australian engineering researcher and educator – highly regarded internationally – who has received the nation's most prestigious awards for addressing how engineering theory and practice can be integrated in a better university/industry partnership.

■ **Mr Andrew (Drew) Clarke FTSE (57)** – Secretary, Department of Resources, Energy and Tourism. Mr Clarke, Australia's most senior energy and resources public servant, is a significant leader and innovator in energy reform and the spatial sector.

He led the establishment of the Australian Government's \$5 billion Clean Energy Initiative, including the Global Carbon Capture and Storage Institute, Australian Centre for Renewable Energy, Australian Solar Institute, Australian Biofuel Research Institute, and the CCS and Solar Flagship Programs.

■ **Professor Michael Cowley FTSE (43)** – Director, Monash Obesity and Diabetes Institute. Professor Cowley's research into weight management, obesity and diabetes has led to significant medical breakthroughs and drug

design. He has been awarded the prestigious Commonwealth Science Minister's Prize for Life Scientist of the Year.

■ **Professor Ana Deletic FTSE (46)** – Professor of Civil Engineering and Director, Centre for Water Sensitive Cities, Monash University.

Biofiltration stormwater treatment technologies developed under Professor Deletic's leadership have been widely implemented across Australia and exported overseas to Singapore and Israel. Her work on stormwater harvesting is at the cutting edge in the world and she is one of the most widely published stormwater researchers of all time.

■ **Mr Murray Ellen FTSE (52)** – Director, S2 Corporation Pty Ltd.

Mr Ellen is a brilliant engineering entrepreneur who has built and licensed his products in Australia, Asia and the UK. He has applied his patented technology to many award-winning structures – foot bridges, large-span industrial commercial and dome structures.

■ **Professor David Griggs FTSE (53)** – Director, Monash Sustainability Institute and CEO Climate Works Australia. Professor Griggs is a global leader in providing rigorous scientific support for policy development and in developing and implementing practical reduction and mitigation solutions for climate change. He has been pivotal in raising awareness of climate change.

■ **Dr Margaret Hartley FTSE (57)** – former Director, NICNAS, and CEO, ATSE. Dr Hartley is recognised internationally for her leadership overseeing the regulation of chemicals in Australia as head of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS).

■ **Dr Douglas Haynes FTSE (67)** – Director, Douglas Haynes Discovery Pty Ltd. Dr Haynes is internationally recognised as one of the world's most successful mineral explorers, defining new ore discovery opportunities and appraising current projects using a global, holistic approach to data



Ana Deletic



Drew Clarke

analysis. He has held senior leadership roles in Western Mining Corporation (WMC) and BHP and developed a highly successful private consultancy.

■ **Mr Michael Heard FTSE (62)** – former MD and CEO Codan Ltd, now retired.

Mr Heard spent his career in applied R&D, engineering and management of manufacturing businesses, with the past 20 years spent transforming Codan from a small Adelaide radio manufacturer to one of Australia's great diversified technology product businesses, with worldwide sales.

■ **Professor David Hill FTSE (62)** – Ausgrid Chair of Electrical Engineering, University of Sydney.

Professor Hill has a wide range of research achievements across several areas of power systems modelling, analysis and control, as well as more fundamental work in systems stability, control and complex systems and networks. He has been a regular consultant to power utilities in Australia, New Zealand and Sweden.

■ **Professor Richard Hillis FTSE (47)** – CEO, CRC for Deep Exploration Technologies. Professor Hillis is nationally and internationally recognised as one of the world's leading researchers in tectonics and geomechanics, his work contributing significantly to the understanding of stresses in the Earth's crust. Which has been applied to petroleum exploration, carbon dioxide geosequestration and geothermal energy.

■ **Professor Peter Hodgson FTSE (54)** – ARC Laureate Fellow, Alfred Deakin Professor, Deakin University.

Professor Hodgson has established a world-class research and teaching facility at Deakin University during the past 15 years and built an important technological base in advanced manufacturing technology serving the broader Australian engineering community. He has attracted some 300 world-class scientists and research engineers to Deakin, some \$20 million in collaborative research funding and has an international research reputation.

■ **Professor Stephen Hopper FTSE (60)** – Director (CEO and Chief Scientist), Royal Botanic Gardens, Kew (UK).

Professor Hopper is an Australian plant

conservation biologist, well known for pioneering research leading to positive conservation outcomes in south-west Australia. As Director of Kew Gardens, he is working globally to help reduce the extent and impact of climate change on the plant species and to rescue species and habitats from destruction.

■ **Professor Buddhima Indraratna FTSE (51)** – Head, School of Civil Mining and Environmental Engineering, University of Wollongong.

Professor Indraratna's research encompasses a wide spectrum of

applications to theory and practice in geomechanics over two decades. He is world-renowned for his contributions to the conceptualisation and design innovation for stabilising soft foundations and novel analytical techniques and design procedures for high speed rail tracks.

■ **Professor Jurg Keller FTSE (49)** – Director, Advanced Water Management Centre and Professor, School of Chemical Engineering, UQ. Professor Keller is an internationally recognised



Jurg Keller

industry expert in water treatment and technologies, including water recycling and resource re-use, biochemical engineering, environmental process technologies, biological nutrient removal and bioelectrochemical process technologies.

Professor Keller and AWMC have become a major contributor to innovative water technologies and a respected advice group to the water industry.

■ **Professor Robin King FTSE (65)** – Higher Education Consultant (currently Executive Officer, Australian Council of Engineering Deans). Professor King is recognised as an international authority in engineering education practice, innovation and accreditation, contributing to several international bodies concerned with accreditation and quality assurance in engineering education. He researched and authored the benchmark 2007-08 review of the status of engineering education in Australia.

■ **Professor Robert Lawn FTSE (66)** –



Buddhima Indraratna

Foundation Professor of Tropical Crop Science, James Cook University.

Professor Lawn's research has underpinned the Australian soybean and mungbean industries. He led the conception, strategic planning, research and management of the first Sugar CRC, which enabled the sugar industry to reduce its environmental footprint and avoid excessive regulation. He has written or co-authored more than 260 scientific publications in some of the world's top agricultural journals.

■ **Professor Nigel Lovell FTSE (49)**

– Scientia Professor, Graduate School of Biomedical Engineering, UNSW. Professor Lovell is recognised for his outstanding contributions to the biomedical profession and the wider community through research, development, commercialisation and international clinical trialling of medical devices, including world-

leading telehealth systems for managing chronic disease and retinal neuroprosthesis for the vision impaired.

■ **Mr George Maltabarow FTSE (61)** – Managing Director, Ausgrid.

Mr Maltabarow leads the largest Australian electricity distribution company, chairs Energy Networks Australia and has personally influenced future directions and technologies in modern electricity supply systems. He understands the combination of commercial and technological changes taking place in the relationship between energy supplier and end user and has identified technological innovations to accelerate change.

■ **Professor Thomas Maschmeyer FTSE**

(45) – ARC professorial Future Fellow and Professor of Chemistry, University of Sydney. Professor Maschmeyer has international status for his ground-breaking research in materials and catalysts. He is an inventor with many patents, has applied his science to new commercial developments overseas and in Australia and has received many distinguished awards for science and technology.

■ **Mr Ken Matthews FTSE (59)** – Chair, Board of Governors, Committee for Economic Development of Australia (CEDA). Mr Matthews was Secretary of the

Department of Agriculture, Fisheries and Forestry and later of Transport and Regional Services, subsequently becoming Chair/CEO of the National Water Commission, responsible for driving acceptance and implementation of the National Water Initiative. He has worked consistently to grasp technological opportunities and enhance the role of science in policy making.

■ **Mr Peter Meurs FTSE (55)** – Director of Developments, Fortescue Metals Group Ltd. Mr Meurs is an engineer who worked in the offshore industry with Esso Australia



Peter Meurs

before he played a key role in the growth of engineering giant Worley Parsons, leading its WA operations. He recently joined Fortescue Metals FMGL to guide its technology, engineering and finance functions.

■ **Mr Lawrence Paratz FTSE (57)** – Non-Executive Director, Maxis Communications and Director, Sky Networks. Mr Paratz is a national and international leader in planning, managing and implementing major technology transformations in telecommunications. His achievements in Australia span from the first installations of digital switching and the earliest cellular wireless systems, through to senior responsibilities in major telecommunications infrastructure across a number of Asian countries.

■ **Professor Christopher Parish FTSE (67)** – Leader, Cancer and Vascular Biology Group, ANU. Professor Parish is an internationally recognised immunologist and cancer biologist. His immunological discoveries have had a major impact on our understanding of the immune system and on the design of new vaccines. His cancer research has resulted in the development of novel, carbohydrate-based, anti-cancer drugs that inhibit angiogenesis and cancer spread.

■ **Professor Allan Paull FTSE (52)** – Research Leader, Applied Hypersonics, DSTO. Professor Paull is known internationally for his achievements in advanced aeropropulsion,

working on engines with supersonic combustion (scramjets) to achieve supersonic combustion in flight to demonstrate the possibility of affordable development of hypersonic technology. He currently heads a \$50 million joint US/Australian flight program to develop technology for flight vehicles.

■ **Dr Tracie Ramsdale FTSE (49)** – Director, Alchemia Ltd.

Dr Tracie Ramsdale is a leader in Australia's biotechnology industry. She not only identified the chemistry of carbohydrates as a neglected opportunity for drug development but also invested her own money in a start-up company, Alchemia, which capitalised on that opportunity and will shortly market its first drug internationally. Alchemia's platform technology is now the basis for an ongoing pipeline of novel products.

■ **Professor Karen Reynolds FTSE (46)** – Professor of Biomedical

Engineering, Flinders University. Professor Reynolds' achievement in bridging the gulf in the medical devices field between academia and industry was recognised by her award of Professional Engineer of the Year in the 2010 Australian Excellence Awards. Her achievements include the establishment of spin-out companies and



Karen Reynolds

commercialisation licences, coordination of multi-sector initiatives and placements for undergraduate and research students.

■ **Professor Maree Smith FTSE (55)** – Executive Director, Centre for Integrated Preclinical Drug Development, UQ. Professor Smith is a role model of the successful researcher dedicated to ensuring her research is applied to the benefit of patients suffering intractable pain. Her research has resulted in two successful start-up companies, QRx Pharma Ltd and Spinifex Pty Ltd. Professor Smith was also instrumental in establishing the successful pre-clinical consulting company TetraQ.

■ **Professor Ronald Trent FTSE (65)** – Foundation Professor of Medical Molecular Genetics, University of Sydney.

Professor Trent has been pivotal to the establishment of molecular medicine as a new clinical discipline and of laboratory genetics as a new speciality within the Royal College of Pathologists of Australasia. His research work has led to the introduction of state-of-the-art genetic testing for Australian patients and he has played a key role as chair of NHMRC's two major human genetics committees.

■ **Dr John Williams FTSE (67)** – Commissioner, NSW Natural Resources Commission.

Dr Williams is a leading soil physicist/hydrologist, whose early work in soil hydrological properties provided the foundation for much of his later work on sustainable agriculture. He has actively engaged in the public debate around sustainable development as a foundation



John Williams

member of the Wentworth Group.

■ **Professor Mike Xie FTSE (48)** – Professor and Discipline Head, Civil Engineering, RMIT University.

Professor Xie has made outstanding contributions to the advancement of knowledge and successful applications of structural optimisation techniques. The techniques proposed by Professor Xie and the associated computer software developed by his research team have been used by numerous engineering firms and research institutions for design innovations in many countries around the world.



Mike Xie

2011 Foreign Fellow

■ **Dr John Loughhead FEng FTSE (65)** – Executive Director, UK Energy Research Centre.

Dr Loughhead's professional career has been predominantly in industrial R&D for the electronics and electrical power industries, including advanced, high-power industrial gas turbines, new energy conversion systems, spacecraft thermal management, electrical and materials development for electricity generation and transmission equipment, and electronic control systems.

“Inspirational teacher” wins ATSE SA Teacher Award



Meg Fay and David Klingberg at the presentation.

Ms Meg Fay, of Golden Grove High School, in Adelaide's outer suburbs, has won the South Australian Division's annual award, which recognised excellence in teaching Science, Technology, Engineering and Mathematics (STEM) in a SA secondary school.

The award recognises both the teacher and the school and SA Division Deputy Chair Mr David Klingberg AO FTSE presented the 2011 award, in the form of a trophy and framed certificate, to Ms Fay – and a cheque for \$2000 for the school – at the SA Science and Engineering Super Challenge, held at the Adelaide Super-Drome in September.

The Award recognised Ms Fay's outstanding performance as Science Coordinator at GGHS.

“Meg is an inspirational teacher and leader who is making a significant contribution to science teaching and learning at her school. Her dynamic leadership and influence on student enthusiasm for science pervade multiple science disciplines at all levels. She has reformed the school's approach to the

curriculum by introducing contemporary science and technology which students see as relevant to their daily lives and future careers. More students are selecting science courses in senior years as a result, and achievement levels have improved.

“Meg has also shown commendable initiative and creativity in leading new staff professional development programs on curriculum development and contemporary pedagogy.

“Through her leadership, Meg's influence in modern science teaching development extends also, through collaborative programs, to local feeder primary schools and to other neighbouring secondary schools.”

ATSE SA Division was a sponsor of this year's SA Challenge and Super Challenge events, in which 76 teams of more than 2000 year 9 and 10 students competed in Adelaide and Port Pirie over 10 days.

Cotton team takes a gong

The CSIRO 2011 Chairman's Medal has gone to its Cotton Breeding and Biotechnology Team for the major impact achieved on Australia's cotton production due to the breeding and deployment of the new cotton variety Sicot 71BRF.

In 2010-11, 80 per cent of the record Australian crop area was sown with Sicot 71BRF, which has achieved a new high for CSIRO in terms of local market share. It delivers a highly desirable package of both agronomic



Dr Greg Constable speaks for the Cotton Team at the presentation ceremony.

and genetically modified traits to Australian growers, with significant economic, social and environmental benefits to Australia.

Key members of the team are Dr Greg Constable FTSE and Dr Danny Llewellyn FTSE who – with Dr Gary Fitt FTSE – won an ATSE Clunies Ross Award for their cotton work in 2006. Dr Llewellyn is ATSE's ACT Division secretary.

Sicot 71BRF's broad adaptation, high yield, good quality and high disease resistance have led to very high adoption within just two years of its commercial release.

The Cotton Breeding and Biotechnology Team's research has shown that increased yield in cotton also increases water use efficiency, with more yield being obtained with the same water inputs.

Thorium and MSR technology advocated in Canberra

ANSTO CEO Dr Adi Paterson FTSE was a key speaker at a two-day seminar in Canberra in November highlighting thorium as a source for baseload energy supply and addressing the use of MSR (molten salt reactor) as a safe technology. Dr Paterson gave the opening address at the MSR Technology session.

New Fellow Dr Drew Clarke FTSE, Secretary of the Department of Resources, Energy and Tourism, spoke on 'The Energy Challenge' in the opening session, following the keynote address by the Minister for Resources, Energy and Tourism, the Hon Martin Ferguson AM.

Buddhima Indraratna

Geotechnical engineering expert and 2011 ATSE Fellow, Professor Buddhima Indraratna FTSE, from the University of Wollongong, has been awarded the 2011 Engineers Australia Transport Medal.

His research has led to new rail track design methods to improve the safety of rail transport that have already been applied in the Bulli and Newcastle areas of NSW and the control of acid soils which have saved millions of dollars of damage to agriculture and aquaculture in the Shoalhaven flood plain, also in NSW.

Dieter Plate an outstanding textile engineer

Dr Dieter Plate, former Assistant Chief, CSIRO Division of Wool Technology, died in Victoria on 16 September, aged 76.

China-born Dr Plate came to Australia in 1949 and took a physics degree at the University of Queensland before gaining



Dr Dieter Plate

his PhD in textile engineering at the University of Leeds in the UK.

A Fellow since 1989, Dr Plate spent most of his career with CSIRO, spending six years in the Division of Food Processing before

attending the University of Queensland. He joined the Textile Industry Division in Geelong in 1963 and served with CSIRO until 1993 – the last four years as Assistant Chief, Wool Technology.

Dr Plate "made distinguished research contributions and shown outstanding leadership in the field of textile engineering," according to his nomination papers for Fellowship.

"His research has led to some major advances in processing Australian wool.

"Foremost among these is the yarn-spinning system 'Sirospun', one of the most significant developments in worsted yarn production over the past 40 years.

"It is now used in many countries producing major cost savings in spinning and new outlets for Australian wool. Patents in many countries are earning substantial royalties for Australia," it concluded.

Dr Plate won the CSIRO Medal for Research Achievement in 1986 and the Sir Ian McLennan Achievement for Industry Award in 1988.

Ken takes science to Queensland schools

Ken Dutton-Regester is on a mission to motivate the students of today to become the scientists of tomorrow.

Ken, a Queensland Institute of Medical Research (QIMR) student, is Young Science Ambassador for the Academy of Technological Science and Engineering and travels to schools throughout Queensland to promote science and science education.

Ken's visit to Gympie, near Brisbane, was front-page news in the *Gympie Times*, which reported that Gympie State High School students loved what they heard from him.

Ken works in QIMR's Oncogenomics Laboratory researching the genetic mutations that lead to the development and progression of melanoma, with a hope to improve the treatment of patients with the disease.

"Many people have a misconception that choosing a career in science can be boring and limiting," Ken said.

"Choosing a career in science can offer a diverse range of job choices and the opportunity to work anywhere in the world.

"As an ATSE Young Science Ambassador I will be talking to local secondary students about my career path and will run experiments and demonstrations to highlight the opportunities available in pursuing science as a career.

"Unfortunately, there has been a real decline in the number of students choosing to study science at university, which is of concern – we need the next generation of scientists to foster Australia's reputation as a leader in science and research innovation.

"Science as a career is hard work, but it is also very rewarding, incredibly exciting gives you the chance to make a real difference to peoples' lives.

"I have been passionate about science since high school, so working at QIMR and working with leading researchers I get to work in my dream job every day.

"I get great personal satisfaction in knowing that my research into the genetics of melanoma may ultimately lead to the improvement of treatment strategies for patients with this disease."

Victor Finkel takes Rhodes honour

Dr Alan Finkel AM FTSE, Chancellor of Monash University and former ATSE Director, had more than one reason to be proud when a Monash graduate was named as the Victorian Rhodes Scholar.

It was the third year in a row the honour had gone to a Monash graduate – and the winner was named as Victor Finkel, his son, who will go to Oxford University to complete a Master of Public Policy and work to solve issues such as poverty and stunted economic development.

Mr Finkel, a management consultant, has degrees in both Music and Aerospace Engineering, majoring in aerodynamics and computational fluid dynamics.

Mr Finkel said he was delighted to be a Rhodes Scholar and with his experience in management, engineering and as a jazz musician he looked forward to the deepening of his understanding of how best to have an impact on the world.

"Studying for the new Master of Public Policy at Oxford will help me understand the complex intersections between economics, politics and science that shape our world today," Mr Finkel said.

Dr Finkel, describing the award as "one of my projects that turned out particularly well", said he and wife Lizzie "are still in shock".



Victor Finkel

You might not have **heard** of us but you have almost certainly **seen** our work.

When an earthquake triggered a devastating tsunami off the coast of Japan in March, the Australian Science Media Centre found expert scientists to talk to journalists.

As disaster followed at the Fukushima nuclear power plant, we were keeping journalists up to date.

We ran media briefings with nuclear scientists to give journalists the background knowledge they needed. We emailed journalists up-to-date expert comments to help decipher what was happening at the plant and set up interviews around the clock.

Thirteen different experts provided crucial context for hundreds of journalists and debunked popular myths at a time when the authorities were unable to comment. The experts we worked with were used in almost 4000 news items world-wide.

This is one example of what we do. We are independent and not-for-profit and we help get science heard when it matters most.

13 sets of expert comments released

A major component of what the AusSMC does is collating expert reactions to the biggest news stories of the day and sending them out swiftly to journalists.

In the four weeks following the quake, the AusSMC distributed 13 detailed Rapid Reactions containing expert analysis and commentary to over 700 registered journalists.

Throughout it all, we liaised closely with Science Media Centres in Japan, New Zealand, Canada and the UK, providing a non-stop flow of communication between scientists and the news media.

“Thanks for the briefing – love the technology... never experienced it before!”

Neil Keene, Daily Telegraph

“These (alerts) are unbelievably helpful.”

**Kate Stevenson, Producer,
3AW Breakfast with Ross and John**

120 media enquiries

As with any big story with a science angle, the AusSMC responded to daily enquiries from journalists looking for experts to interview.

In the first week of the crisis, we received 120 media enquiries from journalists in Australia and overseas, initially on the topic of earthquakes and tsunamis and, as the crisis unfolded, on nuclear power and radiation.

2 media briefings

For major news stories, the AusSMC can very quickly organise online media briefings featuring panels of top scientific experts. In the week following the earthquake we hosted two online briefings which 55 journalists attended.

“You guys are doing an awesome, urgent and valuable job. There’s a lot of nonsensical, inaccurate, contradictory and at times hysterical coverage out there. Yours is a welcome antidote. Keep it up!”

Wilson da Silva, Editor, COSMOS magazine





SWEET RESULTS

Researchers from The University of Queensland isolate native honey's healing properties

Honey sourced from an Australian native myrtle tree has been found to have powerful anti-bacterial properties that could be used to treat antibiotic-resistant bacterial infections that commonly occur in hospitals and nursing homes.

The research group led by the Queensland Alliance for Agriculture and Food Innovation (QAAFI), a partnership between The University of Queensland and the Queensland Government, found that Australian native myrtle honey had very high levels of the anti-bacterial compound, Methylglyoxal (MGO), and outperforms all medicinal honeys currently available on the market, including Manuka honeys.

The findings had shown anti-bacterial potency levels that could allow for the development of highly effective anti-bacterial treatments.

Honeys investigated were effective as anti-bacterial treatments when used in the range of 500 – 1750 mg/kg to prevent the growth of Methicillin-Resistant staphylococcus aureus (MRSA), a common bacterial infection in hospitals and community facilities where residents are immune challenged.

The potential of the honeys could ultimately result in a range of highly sought-after products that could provide enormous benefits for Australian and international medical fraternities and their patients.

The Federal Government's 2010 Excellence in Research for Australia (ERA) survey confirmed The University of Queensland as one of the nation's top two universities, measured on a combination of research quality and breadth. ERA reported that research at UQ is above world standard in more broad fields than at any other Australian university: this reflects UQ's leading global role in many areas of discovery. UQ's outstanding critical mass offers researchers significant interdisciplinary capability.

Join more than 4000 students currently pursuing a research higher degree at UQ.



GROUP OF EIGHT
MEMBER