

FOCUS

INTERNATIONAL EDITION

NUMBER 2
FEBRUARY 2011

AUSTRALIA / CHINA

COOPERATING FOR A BRIGHTER FUTURE

Contributors look at the 30-year relationship and
its impact on collaborative achievements

Four countries, 100 engineers
and specialists, 20 disciplines.
Beijing's National Aquatic
Centre, a true collaboration
between Australia and China.



National Aquatics Centre, Beijing | © Ben McMillan

Delivering innovative and sustainable designs that reinvent the built environment

Arup brings together professionals on a uniquely global scale. The depth of expertise and the sheer numbers of specialists allow Arup to take on complex, strategic projects that no other firm could have delivered.

Arup has a healthy mix of people with very different perspectives and from many cultures, working together, learning from each other and generously sharing their knowledge and ideas.

International team-working is the stuff of everyday life for its people, who take advantage of the skills networks within the firm that allow easy collaboration between colleagues who may be on opposite sides of the world, but are working on the same or similar projects.

The result is solutions that work for clients and for the people who use them and live or work in and around them.

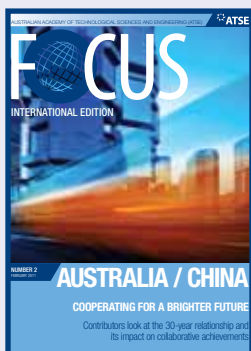
Australia and China working together

The Academy has an established track record in delivering high-quality science and technology bilateral activities with China over the past 30 years.

Our strong linkages with the Chinese and Australian academies and government agencies have been vital in developing productive relationships and activities.

The 2010 year was a high point in this relationship, with a number of high-level exchanges, the 2010 Australia–China Symposium and the Australia–China Science and Technology Week at the Shanghai Expo, which included three major international workshops.

This edition of *Focus* marks this important relationship between China and Australia.



Front cover: Traffic streams past tower buildings in Hongkong's CBD.
Photo: iStockphoto



Professor Lu Yongxiang and Senator Kim Carr celebrate the 30th anniversary of the Australia–China science cooperation treaty (see page 19) PHOTO: IRENE DOWDY

- 5 Global links in S&T for a better world
- 7 ATSE hosts Chinese Engineering Academy visit
- 10 Science cooperation holds the key to a brighter future
- 13 The Australia–China science and research partnership
- 14 Can Australia save the world?
- 17 CSIRO and China
- 19 True partners in science and research
- 21 Stronger collaborations hold a key to prosperity
- 25 Solid foundation for future collaboration
- 32 ATSE in *Focus*

FOCUS

ATSE *Focus International* is produced to highlight Australia's relationship with the international community in the areas of science and technology and the Academy's role in engaging with partner countries. It will be produced from time to time to reflect a key aspect or development in the science and technology relationship between Australia and another nation.

Its purpose is to stimulate interest, discussion and development of research and research application opportunities for the benefit of both nations, and the world. Articles are contributed by ATSE Fellows with particular expertise in topic areas and by key figures in the relationship.

Please address comments, suggested topics and article for publication to editor@atse.org.au.

ATSE is an independent body of eminent Australian engineers and scientists established to promote the application of scientific and engineering knowledge to practical purposes. ATSE *Focus International* 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 International* may be reproduced provided appropriate acknowledgement is given to the author and the Academy.

CEO: Dr Margaret Hartley
Editor: Bill Mackey

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 1838-0921

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





Achieve the best of both worlds. Join us.

The University of Western Australia has been developing a close and very productive relationship with China over many years. UWA is the home of the first Confucius Institute in Australia; we have strong academic links with Zhejiang University, Shanghai Jiao Tong University and Nanjing University; in 2010, we hosted the third Australia-China-Japan Symposium; our commitment to teaching Asian languages has strengthened; and five of Australia's last six ambassadors to China have been UWA graduates. To find out more about the opportunities to join us in strengthening the UWA-China connection, visit www.uwa.edu.au



**THE UNIVERSITY OF
WESTERN AUSTRALIA**
Achieve International Excellence

Global links in S&T for a better world

ATSE has an established track record in delivering high-quality bilateral activities with China over the past 30 years.



By Michael Manton

The Australian Government's International Science Linkages – Science Academies Program (ISL-SAP) program is a major mechanism to promote significant international networking and collaborative opportunities, and it underpins the Academy's international program.

Through its program of missions, workshops and delegations, ATSE's International Strategy Group is strengthening Australia's access to global science, engineering and technology (SET) and maximising the benefits of Australia's science base and its global linkages.

We have had a very active and productive year in strengthening overseas linkages, particularly with China, through the strong contribution by the ATSE Fellowship.

Our strong linkages with the Chinese Academy of Engineering (CAE), the Chinese Academy of Sciences (CAS), the Chinese Ministry of Science and Technology (MOST), the Australia–China Council (ACC) and more recently through the Shanghai Association for Science and Technology were vital to the development of productive activities.

ATSE has an established track record in delivering high-quality bilateral activities with China over the past 30 years. Since 2006, nearly 50 Australian and Chinese future leaders have participated in the Australia China Young Scientist Exchange Program series, and these programs have led to increased S&T linkages through the establishment of two joint Australia China Research Centres, strategic partnerships, staff and student exchanges, valuable training and the shared expertise and facilities between Australia and China.

The Australian Academy of Science (AAS) and ATSE, in association with the Australia–China Council and the Chinese Academy of Sciences, offered funding through the Next Step Initiative that linked to the Australian China Symposium Series to provide funds for five Australian and Chinese researchers to facilitate follow-up negotiation to develop and establish S&T collaborative projects arising from the 2009 China Australia Symposium.

ATSE's established partnership with the Australian Government was a key aspect in strengthening international engagement. The Government continued to support investment in national and international research, innovation and commercial cooperation. This has led to the ISL-SAP program being recognised as a major enabling mechanism to promote significant international networking and collaborative opportunities.

ATSE international activities during the year included:

- workshops to enable the exchange of technical information and identification of collaborative activities;
- missions of invited experts from industry, academia and government agencies to develop new alliances; and
- visits to universities, research institutes and industry in other countries to build productive alliances.

Ministry of Science and Technology

Since the 1980s ATSE has maintained strong linkages with the People's Republic of China through the Ministry of Science and Technology (MOST). Recent activities with MOST have included the very successful Australia China Young Scientist Exchange Scheme, which was established in 2006, involving a two-week exchange visit program between Australian and Chinese Young Scientists.

Professor

Penny

Sackett

addresses

the Climate

Change

Workshop in

Shanghai.



Chinese Academy of Engineering

In March 1998 ATSE signed a Memorandum of Understanding with the Chinese Academy of Engineering (CAE), China's foremost academic and advisory institution in engineering and technological science. Activities have consisted of a strategic program of joint missions and workshops, including Coalbed Methane Technology, Clean Power from Coal, Sustainable Renewable Energy, ICT and Minerals Processing, as there is great potential for bilateral cooperation and joint policy research. ATSE hosted the visit to Australia in November 2011 by Professor Zhou Ji, President of the Chinese Academy of Engineering, who led a small CAE Delegation on a round of top-level meetings, delivered a lecture to an Academy audience and attended the ATSE Annual General Meeting in Sydney.

Chinese Academy of Sciences

CAS is China's leading academic research agency, with 108 scientific research institutions focusing on natural science, technological science and high-tech innovation, and a staff of more than 58,000, of whom 39,000 are scientific personnel. Arising from recent successful interactions, ATSE and CAS signed a Memorandum of Understanding to facilitate S&T cooperation between the two Academies in September 2008. The President of CAS, Professor Lu Yongxiang, attended the Australia China Symposium held in Adelaide in November 2010.

Annual Australia China Symposia Series

Since 2004 ATSE and AAS, on behalf of the Australian Department of Innovation, Industry, Science and Research (DIISR), have organised the Australian China Symposia Series. The program for each Symposium is specifically designed to allow adequate time for networking and discussion amongst participants and a particular focus is that many of the Workshop participants are under 45 years of age, to encourage the future scientific leaders of our region.

Topics of previous Symposia have included:

- ecosystem management, environment and energy, sustainable agriculture and water;
- biotechnology and nanotechnology;
- renewable energy, traditional energy resources and transportation fuels;
- sustaining global ecosystems, covering sustainable water, land, air and energy, and health and the environment;
- remote sensing; and
- sustainability of deltaic and coastal zone systems.

The 2010 Australia China Symposium held in Adelaide focused on climate change impacts on food security; food safety, nutrition and human health; and agricultural productivity, biosecurity and future demand for food. It

was attended by the presidents of AAS and ATSE, along with 24 Australian scientists and 20 Chinese scientists.

Shanghai Expo 2010

Attendance at the Australia–China Science and Technology Week reflected the importance of the event: Chief Scientist for Australia, Professor Penny Sackett; the Deputy Secretary of DIISR, Ms Patricia Kelly; ATSE President, Professor Robin Batterham AO FREng FAA FTSE; a large number of Fellows of both Learned Academies; and numerous senior business executives, research leaders and bureaucrats from both countries.

Three major International Workshops were conducted: 'Impacts of Climate Change of Future Urban Societies', which I chaired; 'Nanotechnology Benefiting Society', chaired by Dr Calum Drummond FTSE and Professor Max Lu FTSE; and 'Biotechnology Improving Food Production, Food Quality and Human Health', chaired by Dr Jim Peacock AC FRS FAA FTSE and Professor John Shine. They generated considerable interest and new understanding of the issues and opportunities by participants from both countries.

Australia was most grateful for the very strong support received from the Shanghai Association for Science and Technology, the Chinese Academy of Sciences, the Shanghai Nanotechnology Promotion Centre and the Chinese Ministry of Science and Technology.

The Australian Government and the Chinese Ministry of Science and Technology hosted a successful high-level reception at the Australian Pavilion to mark 30 years of bilateral partnership in science and technology between China and Australia. Professor Penny Sackett launched the ATSE Report *Climate Change and the Urban Environment*, which enjoyed good news media pick-up in Australia.

Future links

The science and technology links between the two nations have proven durable and effective. With all of the pathways established between Australia and China – sound connections between researchers, joint centres and academies – now is the time for Australia and China to commit to a substantial SET funding source to strategically shape our mutual future, building prosperity through science and technology innovation. ◀

PROFESSOR MICHAEL MANTON FTSE is Chair, International Strategy Group, ATSE. He was a research scientist for a decade in the CSIRO Division of Cloud Physics then, in 1984, became Chief of the Bureau of Meteorology Research Centre. Retiring from that position in 2006, he has had a part-time position as professor in the School of Mathematical Sciences at Monash University since. He has been a Director of ATSE since 2008.

ATSE hosts Chinese Engineering Academy visit

The Australian Academy of Technological Sciences and Engineering (ATSE) hosted the visit to Australia in November 2010 by Professor Zhou Ji, President of the Chinese Academy of Engineering, who led a small CAE delegation on a round of top-level meetings and delivered a lecture to an Academy audience and attended the ATSE Annual General Meeting (AGM) in Sydney.

Professor Zhou has served President of Huazhong University of Science and Technology (HUST), Director-General of the Hubei Provincial Department of Science and Technology, Mayor of Wuhan city and Minister of Education.

He met Senator Kim Carr, Minister for Innovation, Industry, Science and Research; Professor Margaret Sheil FTSE, CEO of Australian Research Council; Professor Penny Sackett, Chief Scientist of Australia; and Professor Peter Dowd FTSE, Chair of the Deans of Engineering committee of the Group of Eight universities. He also lunched with the NSW Governor, Professor Marie Bashir AC CVO FTSE, and Academy guests and delivered a lecture to an ATSE audience in Sydney, following the Academy's half-yearly Assembly meeting.

He met with NSW Chief Scientist and Engineer, Dr Mary O'Kane FTSE, and attended ATSE's AGM in Sydney and its AGM dinner and Oration.

Professor Zhou then visited Perth for meetings with University of Western Australia (UWA) leaders – including Vice-Chancellor Professor Alan Robson AM FTSE and Professor Dongke Zhang FTSE, Winthrop Professor of Chemical Engineering – and the WA Education Minister Elizabeth Constable, before returning to China.

He visited the UWA Centre for Energy



Professor Dongke Zhang (left) and Professor Zhou.

Professor Zhou (second from left) makes a point in his meeting with the Academy's President, Professor Robin Batterham (right) and International Chair Professor Michael Manton.



and also unveiled a plaque to inaugurate the Chinese Cultural Experience Centre at The Confucius Institute at UWA.

Professor Zhou attended an informal dinner at Professor Zhang's home in Perth.

Professor Zhou was formerly President of Huazhong University of Science and

Technology (HUST), where Professor Zhang studied in 1987-88.

"Professor Zhou was one of the youngest professors in the engineering college at HUST, full of energy and new ideas and, in the eyes of postgraduate students like myself, an inspiring model for us," Professor Zhang said.

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



Superior solutions through global connections.

Membranes play a vital role in nature and society with extensive applications in biology, medicine, industry and our daily life. Nanoscience and nanotechnology are recognised as key strategies to improve conventional membrane separation technologies and the development of new ones. This is primarily through the exploration of new materials and separation processes.

At UniSA's Ian Wark Research Institute, Associate Professor Dusan Losic is leading an international collaborative research project in biomolecule separation with Nanjing University of Aeronautics and Astronautics, China.

The project entails an experimental study of a new principle for molecular separation. This has the potential to develop a new separation technology for a range of applications, ranging from bio-analytic separation and chemical processing, to industrial desalination and water purification.

With a new design of membranes and microchip separation devices, there is also the potential to separate and identify different biomolecules accurately and efficiently from a complex biological sample. This is of critical importance for applications such as proteomics and cancer diagnostics.

This outstanding research project has emerged through the Australia/China NanoNetwork, a recently established partnership involving the Australian Technology Network of Universities (ATN) and the China based International Strategic Technology Alliance (ISTA).

This collaboration between the ATN and ISTA networks will also investigate ways that nanoscience can provide great advances in key priority areas such as the environment, health and energy. It's another example of how UniSA continues to expand its reputation as a significant research institution, with outstanding collaborative achievements.

For more information about research at UniSA visit unisa.edu.au/research



"This international collaborative research will help the development of a new generation of separation technologies and devices for diverse applications."

Associate Professor
Dusan Losic, Ian Wark
Research Institute,
UniSA.



Ian Wark
Research Institute

SCIENCE AND TECHNOLOGY KEY TO ECONOMIC DEVELOPMENT

Although still in its “middle stage” of industrialisation and at an “historical key point”, China recognised that science and technology constituted a “primary productive force” for economic development. Professor Zhou Ji told an ATSE audience in Sydney during his Australian visit.

Professor Zhou said the traditional ways of development – constrained by population, resources and environment – could not last any longer and there was an urgent need to change the pattern of economic development at a quicker pace.

“The Chinese Government is now formulating the 12th Five-Year Development Plan, directing the scientific development over the next five years between 2011 and 2015,” he said.

The plan stressed the mission of the Chinese engineering, science and technology community was to support development and lead the future – and included three major tasks:

- upgrade and optimise industrial structure

- developing and nurturing emerging industries and creating new economic growth points through industrial technologies, such as energy saving, environment protection, information, bio-engineering, high-end manufacturing, new energies and new materials;

- promote sustainable economic and social development – by changing the previous pattern of high-input, high-consumption economic development to a “novel path of industrialisation, with high scientific and technological elements, good economic effectiveness, low resource consumption, low environmental pollution and full utilisation of human resources”; and
- improve people’s livelihoods – particularly with eco-friendly agricultural technologies delivering high yields, quality and efficiency and health technologies to improve standards of living.

The Chinese Academy of Engineering sought further collaboration with ATSE, Professor Zhou said, and suggested:

- joint strategic research programs to address common engineering problems;
- joint academic activities, including “frontiers of engineering” symposia and discussions on key issues and problems in engineering sciences and technologies; and
- joint engineering personnel exchange, with particular focus on young engineering talent.



CCS feasibility study agreed

Australia and China have agreed to cooperate on a feasibility study towards a commercial-scale carbon capture and storage (CCS) project in China, following the groundbreaking collaboration between CSIRO and the China Huaneng Group on the Gaobeidian post-combustion capture project, the first carbon capture demonstration project in China.

Australia has allocated \$20 million from the National Low Emissions Coal Initiative to support work under the Australia China Joint Coordination Group on Clean Coal Technology (JCG). The Australian Government will make up to \$12 million of this available for the joint feasibility study with China.

The study will look at site selection, capture technology, storage, finance and timelines. The study will complement existing areas of cooperation between Australia and

China on CCS, including Geoscience Australia’s China–Australia Geological Storage project and work under the JCG.

Six research projects totalling \$3.2 million have also been funded by the Australian Government under the JCG to enhance collaboration between Australian and Chinese research institutions.

The Australian Minister for Resources and Energy, Martin Ferguson, welcomed the exchange of documents in Beijing between representatives of the Chinese and Australian governments agreeing their cooperation on the study.

“When coupled with underground storage of carbon dioxide, post-combustion capture offers the potential for near-zero emissions from coal-fired power stations,” Minister Ferguson said. “Currently around 80 per cent

of Australia’s electricity generation comes from coal-fired power stations and in the next decade up to 1000 new Chinese coal-fired power stations will be brought online.

“Both Australia and China are investing in renewable technologies to deliver a lower emission energy mix for the future, but during this transition period the reliance on fossil fuels for power generation will continue.

“The commercial-scale deployment of CCS is not without its challenges. With this study, Australia and China are addressing these issues head on through close cooperation for the mutual benefit of both our countries.

“Joint studies like this one with China, which has membership of the Global CCS Institute through the Chinese Government as well as the Huaneng Group, will help to accelerate the global deployment of CCS.”

Science cooperation holds the key to a brighter future

Remarkable achievements have been made in our science cooperation in the past three decades and more, making China the third-largest science partner for Australia.



By Chen Yuming

China and Australia have enjoyed time-honoured friendship. Since the establishment of diplomatic relations in 1972, bilateral ties have made considerable progress, bringing real benefits to the two peoples and contributing significantly to peace, stability and prosperity in the Asia-Pacific region.

Remarkable achievements have also been made in our science cooperation in the past three decades and more, making China the third-largest science partner for Australia. Such cooperation has contributed to the scientific advancement of our respective countries, spurred progress in cultural and education sectors, promoted bilateral trade and, more importantly, instilled new vitality into the in-depth development of our overall relations.

Both China and Australia place great importance on science research and science cooperation with other

countries. As early as 1963, Professor Chris Christiansen, an academician of the Australian Academy of Sciences, visited the Chinese Academy of Sciences. He not only assisted with China's research on the astronomical telescope during the visit, but also promoted cultural exchanges and friendship between the two countries and peoples. The then Chinese Premier, Zhou Enlai, met with him in recognition of his contribution. Forty-six years on, Chinese scientists and technicians came to Australia and built, in cooperation with their Australian colleagues in Western Australia, six antennas, each 12 metres in diameter, for the ASKAP radio telescope.

It is fair to say that a solid basis has been built for China-Australia science cooperation. We have instituted the mechanism of China-Australia Joint Science and Technology Commission to provide effective coordination and

Max Lu wins CAS Award for International Cooperation

Professor Max Lu FTSE was one of three international academics honoured with the Chinese Academy of Sciences (CAS) Award for International Cooperation in Science and Technology for 2010 at the CAS annual conference, held 25 to 27 January, in Beijing. He shared the award with Professor Aikichi Iwamoto (Japan) and Professor Stephen Porter (USA).

Established in 2007, the CAS Award for

International Cooperation in Science and Technology honors eminent international experts with outstanding contributions to China's global cooperation in science and technology. It aims to encourage more efforts in this respect that will lead to the enhancement of CAS innovation capacity and the improvement of its research performance, education and training, management and

reputations among the international community.

Professor Lu is Deputy Vice-Chancellor and Chair Professor of Nanotechnology at the University of Queensland. He is a world-renowned scholar in nanoporous materials, adsorption and catalysis.

In 2002, he was elected as

the youngest academician of the Australian Academy of Technological Sciences and Engineering (ATSE), and was appointed as a Federation Fellow of the Australian Research Council in 2003 and 2008. He served on the working group of experts for the Prime Minister's Science, Engineering and Innovation Council (PMSEIC) from 2003-05, and is a former ATSE Board member.

He has won numerous honors and awards, including being selected twice for the Top 100 Most Influential Engineers in Australia. He also serves as the editor of the *Journal of Colloids and Interface Science* and is on the editorial boards of 12 other international journals.

Professor Lu has established long-term fruitful cooperative ties with several institutes of the Chinese Academy of Sciences (CAS). In particular, he has cooperated closely with



guidance to our cooperation, and the China–Australia Special Fund to supply the necessary funding. To date, the Fund has supported more than 130 science cooperation projects between China and Australia, including the five joint research centres for stem cells science, light alloy, phonemics, wireless communications and functional molecular materials respectively.

The youth are our future. Under the initiative of the political leaders of our two countries, the China–Australia Young Scientists Exchange Scheme has been launched. So far, more than 50 prominent young scientists from both sides have participated in the program, a contributing factor to our growing cooperation on science research.

Cooperation between our academies of sciences and engineering is part and parcel of our science cooperation. Under their auspices, a high-level symposium on science and technology has convened once a year since 2004, and enabled our scientists to have in-depth and fruitful discussions on a wide range of issues, such as water resources and biology, plant biology, nanomedicine, fossil and renewable energy, sustainable land use and the environment, remote sensing technology and disaster prevention and reduction, sustainable use of ocean resources, wetland ecology, sustainable agriculture and food security.

The Australian Academy of Technological Sciences and Engineering, the most important academic institution in applied science in Australia, has developed extensive cooperation with China and made valuable contribution to China–Australia cooperation on science and technology.

We value such cooperation and will work to augment it in both depth and width.

The year 2010 marked the 30th anniversary of the signing of the Sino–Australian science and technology agreement. To commemorate the event, the two sides co-organised an Australia–China Science Week at the Australian National Pavilion at the Shanghai World Expo. Workshops on science and technology were held and a number of cooperation agreements signed during the Week, making it a new starting point for our cooperation in this field.

Looking ahead, I sincerely hope that scientists from China and Australia will broaden cooperation and work more closely on technological innovation so that we can be better placed to meet the challenges of mankind and bring more benefits of science and technology to our peoples and people around the world. As the Ambassador of China to Australia, I stand ready to exert my utmost to this end. ◀

HIS EXCELLENCY MR CHEN YUMING, Ambassador Extraordinary and Plenipotentiary of The People's Republic of China since October 2010, was formerly (2005–10) Director-General, Department of Foreign Affairs Management, Ministry of Foreign Affairs (MFA) and earlier (1998–02) Deputy Director-General, Policy Research Office, MFA. He was Ambassador Extraordinary and Plenipotentiary of the People's Republic of China to the Republic of Lithuania (2002–05) and Counselor, Permanent Mission of the People's Republic of China to the United Nations (1996–98) and served earlier in his career in Romania and in senior roles in the MFA in China. Mr Chen was born in Guangdong in 1956 and is a university graduate.

the Institute of Metal Research (IMR) and the Dalian Institute of Chemical Physics in the field of clean energy materials and has completed a number of joint international projects, which significantly promoted the development of materials for photocatalysis, energy storage, and green catalysis. He has shown devotion to training young CAS researchers in these areas, and has visited IMR 19 times and co-supervised 10 graduates for PhD and Master's degrees.

He has also actively facilitated cooperation between ATSE and CAS. In 2005, he submitted a report entitled *New Energy Materials Progress and Outlook* to CAS, which was beneficial in guiding the development of new energy materials. Representing the Australian Academy of Sciences and ATSE, he attended the 4th CAS Forum, and provided much helpful advice on collaborations on clean energy materials.

UWA Confucius Institute appoints new director

Associate Professor Philip Kirchlechner, a marketing and business development consultant with strong industry links to China, has been appointed director of the University of Western Australia's Confucius Institute.

Professor Kirchlechner has 20 years' experience in marketing and business development in the iron ore/steel industry, having worked for Voest-Alpine (VAI), JP Morgan, Fortescue Metals Group (FMG) and Rio Tinto Iron Ore. He has consulted to mining companies and banks. As head of marketing at FMG he was instrumental in building relationships with key decisionmakers in the Asian steel industry. At Rio Tinto, he was based in Shanghai and in charge of iron ore sales and marketing activities to Chinese steel producers.

As a student in Beijing during the early 1980s and working in Shanghai from 1986–93 and 1996–01, Professor Kirchlechner's

experience in China spanned paramount leader Deng Xiaoping's early opening up and reform period, to his successors' more intense reform push from the mid-1990s, and the rapid economic growth and transformation to a market economy in the new millennium.

He lived in China for 16 years and is fluent in Mandarin, Chinese, German and Dutch. He has a MSc from MIT, a BA from Reed College, and a diploma in Chinese language from the Beijing Languages Institute.

UWA Vice-Chancellor Professor Alan Robson AM FTSE welcomed Professor Kirchlechner's appointment and acknowledged the contribution of the institute's inaugural director, Professor Gary Sigley. The Confucius Institute aims to promote Chinese language teaching and learning, and cultural awareness, and strengthen WA–China links across business, government and the community.

When **science is in the headlines** the Australian Science Media Centre is there to help scientists have their voices heard.

The centre aims to better inform public debate on the major issues of the day by improving links between journalists and scientists.

Independent and not-for-profit, we have a growing database of over 2500 experts and 650 registered journalists. To find out more about us, visit our website.

www.aussmc.org

ausSMC
australian science media centre

Foundation sponsors



RESMED



Government of South Australia



News Limited



Gold Sponsors are the Australian Academy of Science, ATSE, Cisco Systems Inc., CSL Ltd, IBM Australia, Shell Australia Ltd and the University of Adelaide. Supporters include AMTA, Flinders University, Johnson Winter & Slattery, Microsoft Pty Ltd, O'Loughlins Lawyers and the Powerhouse Museum.

The Australia-China science and research partnership

Regular high-level visits between the two countries demonstrate the strength and importance of the bilateral relationship.



By Geoff Raby

2010 was a milestone year for the Australia–China science and technology relationship, marking the 30th anniversary of the signing of a treaty-level cooperation agreement on science and technology between the two countries.

Over the past three decades, the bilateral science and research relationship has grown dramatically, reflecting the overall growth of the Australia–China relationship. Looking ahead, I believe the partnership between the two countries is provided with unprecedented strategic opportunities, especially in areas of common interest such as climate change, clean energy and biotechnology, to name just a few.

Looking back over the past 30 years, the Australian and Chinese science and research communities have together produced significant outcomes across a broad range of disciplines, from using lasers to treat eye and skin diseases to developing solar energy technology, from tracking pre-dynastic trade routes in China to exploiting new coal reserves with zero emissions, all of which have brought substantial mutual benefit to both countries.

The number of joint scientific publications with Australian and Chinese authors rose from 114 in 1996 to 2295 in 2009, making China Australia's third-largest research collaboration partner after the US and the UK. This 20-fold increase is by far the most rapid of any of our top 10 partner countries.

The governments of Australia and China highly value bilateral science and research cooperation. Over the past 10 years, R&D collaboration has been supported by a bilateral government funding program. Of particular note, the Australia–China Special Fund for Scientific and Technological Cooperation, which was launched in 2001, has so far supported more than 130 joint research projects in common priority areas, such as agriculture, biotechnology, ICT, environment, climate change, mining, energy and advanced materials, leading to the establishment of five joint research centres in water, phenomics, stem cells, wireless communications and functional molecular materials. In

addition, the Australia–China Young Scientist Exchange Program and annual academies symposia have become very successful fora for scientists in both countries to develop closer relationships.

Regular high-level visits between the two countries demonstrate the strength and importance of the bilateral relationship.

In June 2010, Chinese Vice-President Xi Jinping visited Australia and launched the Australia–China Joint Research Centre in Functional Molecular Materials at the Australian National University.

In August 2010, a senior delegation of Australian scientists and officials, including Chief Scientist Professor Penny Sackett, visited China to celebrate the 30th anniversary of bilateral science cooperation at Shanghai World Expo.

In November, the President of the Chinese Academy of Sciences (CAS), Professor Lu Yongxiang, had a very successful visit to Australia. CAS has developed extensive linkages with Australia's leading science and research institutions, and has been the top international partner for Australian researchers over the past four years. Also in November, the President of the Chinese Academy of Engineering, Professor Zhou Ji, visited Australia to explore opportunities for cooperation on engineering science and clean energy.

Looking to the future, both Australia and China face a number of common challenges, including climate change, energy security, environment protection, ageing populations and growing health care obligations, and both governments have made science and innovation a key pillar of

► [MORE ON PAGE 18](#)

The number of joint scientific publications with Australian and Chinese authors rose from 114 in 1996 to 2295 in 2009, making China Australia's third-largest research collaboration partner after the US and the UK.

Can Australia save the world?

Suntech is the world's largest producer of solar panels, having supplied more than 13,000,000 panels to thousands of customers in more than 80 countries.



By Zhengrong Shi

All nations have brands. Australia is perhaps best known for its natural assets – a wealth of marsupials, beautiful beaches and reefs, oceans of coal, and, of course, abundant sunlight. But maybe the world has overlooked one of our country's most important environmental assets: solar technology. As renewable energy industries continue to expand at a remarkable pace, advanced solar technology developed in Australia has emerged at the forefront in driving the world's green revolution.

Let's rewind to 1999. I had finished my PhD in electrical engineering at the University of New South Wales (UNSW), quit my job flipping burgers at Maisy's Cafe in Neutral Bay, and taken a research position with Pacific Solar (now CSG Solar), a solar thin-film development company. Professor Martin Green, my mentor to this day, and Professor Stuart Wenham, now Suntech's Chief Technology Officer, had just won the Australia Prize for their groundbreaking work in pushing the theoretical limits of solar cell technology. It's a bright summer morning, and the pair is sitting with Alexandra de Blas of ABC Radio, considering the possibility – indeed, the eventuality – of a global solar industry.

"I guess we both have the long-term vision of believing that photovoltaics can solve many of the world's problems in terms of electricity generation in a clean, low-cost, envi-

ronmentally friendly fashion, and that's certainly a long-term goal that we both have, to see photovoltaics used in that way, probably on everybody's rooftops," explained Professor Wenham. "It's not a question of whether photovoltaics will have a major impact, but rather when they will have a major impact."

"Stuart, how long do you think it will be before we see photovoltaic cells on most of the rooftops in Australia?" asked Alexandra de Blas.

"I think you'll be looking at a scenario where photovoltaics will need to directly compete with conventional generating sources head-on, and that could well happen in the next 10 to 20 years. So I wouldn't be surprised if within 20 years you have a scenario where a very significant number of houses will have photovoltaics on their rooftops, powering most of their electricity requirements."

Back then these shrewd predictions were dismissed by many as wildly optimistic. The average levelised price of solar electricity at the time was somewhere in the range of \$0.75 per kWh, roughly five or ten times higher than grid electricity prices. The key challenge, as Professor Green described, was to make solar cells commercially viable by reducing processing costs without significantly sacrificing performance.

"I think the most exciting bit of the work has been seeing the technologies actually making their way onto the marketplace ... that's probably the most exciting feeling you get when you see the results of research actually out there in use," remarked Professor Green, in the same interview. "The most important area I think has been to reduce the cost of the photovoltaics, and that's where a lot of our effort has gone into, finding successively improved generations of cells that reduce the cost without sacrificing cell performance."

Inspired by Professor Green, I started Suntech with that goal in September 2001. At the time, progressive governments in Australia, Germany, Japan, California, and China, were willing and working to facilitate R&D as well as the utilisation of renewable energy technologies. As a species, we were just beginning to appreciate the magnitude of our im-

Professor Martin Green FAA FTSE, Executive Research Director, and Scientia Professor Stuart Wenham FTSE, Director, ARC Photovoltaics Centre of Excellence, UNSW, are world leaders in solar technology, having won the 1999 Australia Prize jointly for their work. Professor Green was named 2010 winner of the CSIRO Eureka Prize for Leadership in Science, 2008 NSW Scientist of the Year and has won a string of national and international prizes for his work over nearly 20 years. Winner of a 2008 ATSE Clunies Ross Award, the 2009 William R. Cherry Award and named 2010 NSW Professional Engineer of the Year, Professor Wenham is one of Australia's most successful inventors of solar cell technology and has been involved in the successful commercialisation of solar technologies worldwide.

pacts on our planet's fragile environment. We were also starting to take carbon supply and security concerns more seriously. Everyone agreed that solar technology could only offer a viable, mainstream solution if we could dramatically bring down the price of solar electricity to parity with fossil fuels.

With US\$6 million in capital invested by several companies and the government in Wuxi, China, it took a year to put together our first 10MW solar panel manufacturing line. Looking for good ways to reduce capital costs, I purchased both new and second-hand PV equipment. As we expanded capacity, I even helped a Japan-based company design its first PV equipment product offerings in exchange for a discount on their products. Our 10MW facility came online in 2002, nearly tripling China's existing solar panel production capacity. But that milestone was only the start of a much more important journey.

The first commercial Suntech solar cells had a conversion efficiency of about 14 per cent – little more than half of the world record 25 per cent efficiency that Professor Green and Professor Wenham were able to achieve in the laboratory with their Passivated Emitter Rear Locally Diffused (PERL) technology. We knew we could do better. The challenge was to simultaneously enhance solar cell quality while lowering processing costs. Since 2002, our R&D teams have steadily introduced new designs and processing techniques that have improved our best cell conversion efficiencies to 15 per cent in 2004, 16.5 per cent in 2006, and 17.8 per cent in 2008. Along with these gradual technology improvements, our business and brand grew rapidly. We were able to roughly double production capacity each year, helping to achieve greater economies of scale and further reduce costs. In 2005, Suntech became the first private, China-based company to list on the New York Stock Exchange. Soon after, we extended operations to Japan, Europe, the US, and around the world.

A major technology breakthrough came in 2009 when Suntech's global R&D team introduced our Pluto solar cell technology. Pluto technology effectively commercialises much of the original PERL cell architecture developed by Professors Green and Wenham, achieving high power performance at a relatively low price. Suntech's Pluto-powered monocrystalline cells have achieved more than 19 per cent conversion efficiency in commercial production, independently verified by Germany's Fraunhofer Institute. In other words, our Pluto cells achieve about 80 per cent of the laboratory PERL cell performance though – most importantly – at less than 1 per cent of the original production costs.

At the same time, we have worked tirelessly to improve operational efficiency. Between 2006 and 2009, Suntech reduced the energy and water intensity of each megawatt (MW) produced by 34 per cent and 51.6 per cent, respec-

tively. We have developed our own processes and automation equipment, working closely with our Germany-based subsidiary KSL Kuttler, to increase process efficiency and to use thinner silicon wafers. With these developments, our headcount per MW of cell production has fallen from 4.1 persons in 2008 to 2.3 persons in 2010, with further advances anticipated. Most recently, we have begun to vertically integrate into silicon wafer manufacturing capacity, which we anticipate will bring our solar panel production costs down below one dollar per watt within the next few years.

Today, Suntech is the world's largest producer of solar panels, having supplied more than 13,000,000 panels to thousands of customers in more than 80 countries. Most importantly, we have driven down the levelised cost of solar electricity by more than 50 per cent since 2001, to now as low as \$0.15 per kWh in some regions without government subsidies. Our 380 R&D professionals are working across China, Japan, the US, Germany and, of course, Australia to make solar technology more competitive against fossil fuels. Suntech invests several million dollars each year in partnerships with leading Australian solar research



Zhengrong Shi

organisations, such as UNSW and Swinburne University of Technology. These advanced research initiatives are essential for making solar electricity affordable for millions of people in Australia and around the world.

Based on our current progress, we are targeting to reach retail grid parity in 50 per cent of world markets by 2015, meaning that in most of the world it will cost less to produce clean and quiet solar electricity than to buy electricity from the grid, without even considering the hidden costs of carbon. We have already reached that threshold in regions with high electricity prices and plenty of sunlight, such as Italy and Hawaii. Advanced solar technology, largely pioneered in Australia, now offers an increasingly competitive alternative to carbon-based electricity generation. From thousands of 50W installations for basic lighting in Bangladesh; to the Sydney Theatre Company's 384,000W Pluto installation on top of The Wharf in Sydney; to multi-megawatt solar power plants in Europe and the US; anyone today can look up and harness nature's cleanest and most abundant energy resource.

Suntech would not exist had I not been fortunate enough to meet and study under Professor Green in Sydney. In fact, our CEO, CTO, and COO are all UNSW graduates and Australian citizens. And it's not just Suntech.

Roughly half of the CEOs or CTOs at the world's top dozen solar companies studied physics or engineering in Australia. There is no doubt that advanced solar technology developed in Australia continues to make prominent contributions to solving our planet's energy and environmental crisis.

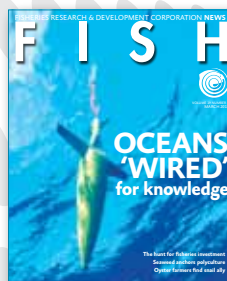
The UK figured out how to use coal, and the US harnessed the power of the atom – both of these revolutionary advances brought economic and social challenges and opportunities. They also fundamentally changed the way we think about and use energy.

We stand today on the cusp of another such revolution. Perhaps Australia and China will be remembered for rediscovering nature's original source of energy and life.

DR ZHENGRONG SHI FTSE is the founder, Chairman and CEO of **Suntech Power**. Prior to founding the company in 2001, he was a research director and executive director of Pacific Solar Pty Ltd, an Australian PV company engaged in the commercialisation of next-generation thin film technology, from 1995 to 2001. From 1992–95, he was a senior research scientist and the leader of the Thin Film Solar Cells Research Group in the Centre of Excellence for Photovoltaic Engineering at UNSW, where he obtained his PhD in electrical engineering in 1992. Dr Shi is the inventor of 15 patents in PV technologies.

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

CSIRO and China

Collaboration with China has included agricultural sciences, astronomy, preventative health, climate change, remote sensing and zoology.



By Megan Clark

Dr Laura Wendling, a research scientist working in CSIRO Land and Water, recently returned from China full of excitement after a visit to Lake Poyang, the country's largest freshwater lake, in Jiangxi province. Dr Wendling's China experience had given her a renewed sense of the strength of China's science research and the opportunities for collaborative research.

But Dr Wendling's experience is not new – in fact she follows in the footsteps of many CSIRO scientists who have worked with Chinese colleagues over the years.

CSIRO's relationship with China first began with a delegation visit from Beijing's Academia Sinica, now the Chinese Academy of Sciences (CAS), in 1975. This relationship with China has since been built over 35 years on trust, commitment and friendship between scientists, like Dr Wendling, and their collaborative partners.

Collaboration with China has been in a wide range of science in areas including agricultural sciences, astronomy, preventative health, climate change, remote sensing and zoology. We believe this type of partnership, where we collaborate across broad capability areas, is critical to delivering on our mission.

It is without question that China is a science leader in the Asia and Pacific regions. Over the past decade in particular, China has provided increasing leadership to confront and solve regional issues.

Although Australia and China may differ in many respects, we also have some important common links: our water supply and distribution issues, our heavy reliance on coal to fuel growth and our commitment to understand and confront global issues of importance, such as climate change and food security. These mutual interests have provided the backbone of CSIRO's relationship with China. We also believe that in an era of complex global challenges, international scientific engagement provides a way to establish an environment to build bridges and friendships between countries.

A relationship shaped by mutual respect and complementary expertise collaboration between CSIRO and Chinese scientists has resulted in the development of solutions needed for China to continue its rapid economic transition. Our relationship with China has also provided real benefits to Australia and its science. Over the past 35 years China has helped provide Australia with a strengthened



Signing ceremony at the Chinese Academy of Sciences/CSIRO Joint Steering Committee in 2010.

grain-harvesting system, improved coal-mining practices and improved efficiency in resource management based on water-balance modelling and soil-impact assessments.

Today China is CSIRO's third-largest international collaborator by number of co-authored journal articles. This number has grown by more than 20 per cent a year for the past four years. The number of joint activities has also increased substantially over the past decade.

CSIRO's longest and most enduring partnership in China is that with the Chinese Academy of Sciences (CAS). This partnership was further strengthened last year by the visit to Australia of Professor Lü Yongxiang, President of CAS. During the visit, Professor Lü indicated CAS will move to incorporate a mission-directed science model in the form of eight strategic projects. These eight projects, in the areas of marine science, preventative health and nutrition, ecosystems and ecology, space, climate, sustainable agriculture, ICT networks and future energy, align with CSIRO's National Research Flagships reflecting the similarities in the issues currently facing Australia and China.

Professor Lü spent time at CSIRO Food and Nutritional Sciences with Dr Martin Cole and expressed an interest in further CAS/CSIRO collaboration in the areas of food safety and security. CSIRO is co-funding four joint projects with CAS in climate change and remote sensing, health, agriculture and materials. We look forward to many rewarding collaborations with CAS over the coming years.

Some of our other recent engagements with China include conferences and workshops such as the nanotechnology workshops in Shanghai in 2009 and 2010 in conjunction with the Science and Technology Commission of the Shanghai Municipality. Project collaborations range from a virtual taxonomy laboratory between the Chinese Academy of Sciences Institute of Zoology and the Australian

National Insect Collection through to construction and testing of the first pilot-scale ventilation air methane catalytic turbine in partnership with the Australian Department of Climate Change and Energy Efficiency, Shanghai Jiaotong University and Huainan Coal Mining Group.

And it is not only on joint projects that knowledge exchange happens. In 2010 CSIRO hosted 42 doctoral and postdoctoral students from China under the memorandum of understanding with the Chinese Ministry of Education and China Scholarship Council, as well as other staff exchanges.

The ATSE-administered Australia–China Young Scientist Exchange Program, funded by the Department of Innovation, Industry and Science Research and the Chinese Ministry of Science and Technology, has also provided CSIRO scientists with important connections and enduring friendships with a host of organisations throughout China.

There is no question that the challenges and opportunities for Australia are also the challenges and opportunities for world. It is only through deep relationships such as with our Chinese colleagues, that humankind will begin to find the solutions for a sustainable and prosperous planet. ◀

DR MEGAN CLARK FTSE is the Chief Executive of CSIRO. She is also a member of the Prime Minister's Science, Engineering and Innovation Council, the Automotive Industry Innovation Council and the National Research Innovation Council. She began her career as a mine geologist and subsequently worked in mineral exploration, mine geology, research and development management, venture capital and technical strategy areas with Western Mining Corporation for 15 years. More recently she was Vice President Technology and prior to that Vice President, Health, Safety, Environment, Community and Sustainability with BHP Billiton. Dr Clark served on the Expert Panel for the Review of the National Innovation System.

◀ FROM PAGE 13

economic growth and social development in the coming decade and beyond.

China, as a rapidly emerging player in world science, has stated its determination to strengthen its innovation capability, particularly in seven strategic industries which include: energy saving and environmental protection, information technology, biotechnology, advanced equipment manufacturing, new energy, new materials and clean automobile technologies.

The Chinese Government has said it will encourage more international exchanges and collaboration in these priority

areas. Further details will be outlined in the Chinese Government's 12th Five-Year Economic and Social Development Plan (2011–15), which will provide a blueprint for China's economic growth over the next five years.

Australia's strong R&D capabilities in these priority areas present exciting opportunities for cooperation between China and Australia. I am confident that with the support of both governments and the joint efforts of scientists and researchers in China and Australia, we can look forward to another 30 years of fruitful cooperation. ◀

HIS EXCELLENCY DR GEOFF RABY, Australian Ambassador to the People's Republic of China since 2007, was Deputy Secretary of the Department of Foreign Affairs and Trade (DFAT) 2002–06. He has held a number of senior positions in DFAT, including First Assistant Secretary, International Organisations and Legal Division (2001–02), Ambassador and Permanent Representative to the World Trade Organization, Geneva (1998–01) and First Assistant Secretary, Trade Negotiations Division (1995–98). He was Australia's APEC Ambassador from 2002–04. Dr Raby was head of the Trade Policy Issues Division of the OECD, Paris, 1993–95.

True partners in science and research

China is an important scientific power and both countries benefit from Australia–China research collaboration.



By Mary Finlay

When Chinese Vice-President Xi Jinping visited the Australian Centre on China in the World at the Australian National University in June 2010, his gift to the new centre was a very generous parcel of books.

In November 2010, the visiting presidents of the Chinese Academy of Sciences and Chinese Academy of Engineering were also presented with books by their Australian hosts, including the Minister for Innovation, Industry, Science and Research, Senator Kim Carr.

These gift choices were highly significant. They demonstrate the intellectual partnership that underpins a well-established and highly productive science and research relationship between Australia and China. This relationship stretches back to the initial contacts between our learned academies in the early 1960s, through the signing of the treaty on science and technology cooperation in 1980, to the Partners for a Better Future: Australia-China Science and Technology Week at Shanghai World Expo in August 2010 and the Academy Presidents' visits in November 2010.

In addition to its well-known and rapidly growing economic and industrial strength, China has become a major global power in innovation, science and research.

China is now in the top five countries in all major indicators of science and innovation strength (third on investment in research and development, second in production of scientific publications, fifth in generation of patents), and is rapidly increasing its relative share globally. The Chinese Government is vigorously pursuing policies to build on China's strengths in key areas such as renewable energy, ICT, nanotechnology, biotechnology and space science and technology. The scale and quality of China's research makes it a priority partner for science and research collaboration for all major scientific nations today.

Australia enjoys a long-standing reputation for high-quality science and outstanding innovation, with one of the highest per capita rates of scientific publications in the world, a citation impact above world average, and an im-

pressive history of world-leading inventions and discoveries. This makes us a natural research partner for China, particularly in areas of mutual strength and common priority, such as water, environment, agriculture, energy, health, biotechnology, nanotechnology and astronomy.

We have promoted a cooperative science relationship with significant bilateral investment in joint research over many years, giving rise to many exciting breakthroughs. The strength of our science and research relationship is shown by the fact that publications with Australian and Chinese co-authors rose from 114 in 1996 (our 12th most important partner) to 2295 in 2009 (our 3rd partner behind the US and the UK). Australia ranks sixth among China's research partners – higher than our general publications rank of 12th in the world – as China recognises the advantages of collaboration with our quality research institutes.

Professor Lu Yongxiang, President, Chinese Academy of Sciences and Senator Kim Carr, Minister for Innovation, Industry, Science and Research, celebrate the 30th anniversary of the Australia-China science cooperation treaty at the Shine Dome, Australian Academy of Science.

PHOTO: IRENE DOWDY, AUSTRALIAN ACADEMY OF SCIENCE



International Science Linkages (ISL)

With its Chinese counterparts, the Department of Innovation, Industry, Science and Research has supported more than 130 joint research projects, seven Academies Symposia, eight intensive exchanges of leading mid-career researchers and numerous other activities designed to enhance research relationships and address mutual research priorities. These international linkages have advanced our collective knowledge and improved our industries. Some headline collaborations funded under ISL include:

- phenomics research – nearly a dozen leading research institutes in Australia and China are collaborating to identify and characterise alterations in the genome code of mice that lead to increased susceptibility or resistance to infectious diseases (particularly avian influenza), to provide a foundation for further study in human immunogenetics and vaccine development;
- water resources research – a network led by Australia and China has, among many other achievements, developed a water and fertiliser management decision-support system that has created more than \$400 million in economic benefits and realised huge environmental benefits to both countries;
- wireless communications – long-term cooperation between our research communities is focusing on future

wireless communications technologies, including novel antenna designs and scalable *ad hoc* wireless networks;

- environmentally friendly products and processes – joint projects have discovered a timber and soil fumigant for quarantine which replaces an ozone-depleting substance with an ozone-friendly one, a more effective method for removing lead pollution from waste water and a more efficient biological control agent for protecting crops from fungal agents; and
- medical research – joint projects have led to advances in areas such as mapping brain connections and function for studying multiple sclerosis, innovative new therapeutic substances for degenerative conditions, and clinical trials of potential treatments for diabetes and pre-diabetes conditions.

Partners for a Better Future

In August 2010 we celebrated 30 years of formal collaboration under the science treaty at Partners for a Better Future: Australia-China Science and Technology Week at the Shanghai World Expo.

Eminent researchers from leading institutes exchanged information on research and discoveries of mutual interest and explored future opportunities for cooperation. It was clear that in terms of science, technology and research, Australia and China have become important partners, and cooperation looks set to continue expanding and delivering improved economic, social and environmental outcomes for both countries.

As China's development continues to power ahead, its government is placing increasing emphasis on innovation and science to solve problems and drive sustainable growth. The Australian Government is also promoting major development and renewal of the Australian science sector, through initiatives such as Super Science and Excellence in Research for Australia, which will keep us at the forefront of the science world.

As two leading nations in the world of science and research, the partnership between Australia and China will be important regionally and globally.

Already Australia and China have cooperated to capture carbon dioxide emissions from operating power stations, process satellite data swiftly enough to guide disaster recovery efforts, and develop the world's most efficient solar cells.

Together we can be an integral part of finding solutions to the major global challenges of health and wellbeing, climate change, food and resource security and environmental sustainability. ◀

MS MARY FINLAY is General Manager, International Science and EIF Branch, Department of Innovation, Industry, Science and Research.

Clean energy from toxic waste

A team of Australian and Chinese scientists has pioneered a new way to make clean energy from land heavily contaminated with toxic waste.

Researchers from Australia's CRC for Contamination Assessment and Remediation of the Environment (CRC CARE) and its offshore partners, HLM Asia Group and Shaoguan University, have delivered proof of concept for a new system for cleaning up badly polluted land that produces greenhouse-friendly energy for homes and industry at the same time.

China has a number of sites so contaminated by heavy metals from past industrial or mineral processing that the usual solution is to fence them off and abandon them. It has been estimated that up to one-tenth of Chinese farm land is affected by industrial pollution, which can reach consumers via the food chain.

The Australia-China team has demonstrated that a fast-growing plant called giant napier grass can be used to cleanse affected soils of contaminants, then be converted to ethanol for transport fuel or steam for electricity production. Biomass harvested from an experimental plantation at Shaoguan University, in Guangdong Province, is already being used to generate electricity for 100 households.

"This is a genuine win-win solution," says CRC CARE managing director Professor Ravi Naidu. "We use special plants to extract the toxins from the soil and then we convert the plants to safe, clean energy."

"By continually planting and harvesting these crops, you can lower the level of toxicity in the soil and make the land fit for human uses again, including housing."

Stronger collaborations hold a key to prosperity

Working with China is an important strategy if we are to have global influence and realise our scientific and educational ideology and have a greater global impact.



By Dongke Zhang

In November 2010, I was invited by the Chinese Academy of Engineering (CAE) to present a plenary lecture at China Energy Forum held in Beijing. In the lecture, I explained my new concept of the four imperatives of energy and articulated their implications in China's sustainable energy development. The four imperatives are Power Density, Energy Density, Cost, and Scale.

I explained that what people really want is not energy but power! It is the power that enables us to do things. In this concept:

- Power Density is the amount of power generated per unit of area of land occupied by the whole process of using a given primary energy source, from extraction, through conversion, to final waste disposal, in the units of W (energy/time);
- Energy Density is the amount of energy per unit of mass or volume of an energy source or carrier in the units of MJ/kg or MJ/m^3 ;
- Cost includes both Capex and/or Opex; and
- Scale is simply the (large or small) capacity of a power generation or energy conversion installation.

These four tables summarise the relevant data and, by ex-

amining various energy options, it is not difficult to deduce the following three recommendations to the refining of China's sustainable energy policy – the CN2N Policy (Coal & Natural Gas to Nuclear), the RECT Policy (Resources and Energy Collaboration and Trade) and the DEAR Policy (Distributed Energy for Agriculture and Remote Regions).

The CN2N Policy makes sense considering that China's economy has sustained a record rate of growth for more than a decade with little sign of slowing down, a large population of 1.3 billion, and a high rate of urbanisation at 150,000 people each day. Large, highly efficient and clean power generation utilities, based on China's vast coal and imported natural gas and nuclear resources for a clean energy future, is beyond argument the most important and foremost element in China sustainable energy policy.

China's large population base and rapid economic growth demand the supply of raw materials, both mineral resources and energy, at a rate that could not be matched by domestic production – therefore, the RECT Policy recommendation. Importing liquefied natural gas (LNG) and high-quality coal as well as uranium from Australia is good for both China and Australia's economies. China should

Table 1 Power density of common fuels

ENERGY SOURCES	POWER DENSITY
Nuclear	~57 $W m^{-2}$
Coal	21–49 $W m^{-2}$
Crude oil	~27 $W m^{-2}$
Natural gas	~53 $W m^{-2}$
Solar PV	~6.7 $W m^{-2}$
Wind turbines	~1.2 $W m^{-2}$
Hydroelectricity	~0.02 $W m^{-2}$
Geothermal	~0.01 $W m^{-2}$
Biomass-fired power plant	~0.4 $W m^{-2}$
Corn ethanol	~0.05 $W m^{-2}$
Algae (ex energy for processing)	~1 $W m^{-2}$

Table 2 Energy density of common materials

MATERIALS	$MJ kg^{-1}$	$MJ m^{-3}$
Natural uranium (99.3% U-238, 0.7% U-235)	86,000,000	
Coal	32	42,000
Crude oil	42	37,000
Natural gas	54	38
Petrol	47	36,000
Diesel	45	37,000
Dry wood or sawmill scrap	12.5	10,000
Ethanol	28	22,000
Biodiesel	38	34,000

Table 3 Cost of kW sent out

ENERGY SOURCES	COST (A¢/kWh)
Nuclear	6 ~ 8
Coal	2 ~ 4
Crude oil	~
Natural gas	5 ~ 7
Solar PV	> ~ 40
Wind turbines	5 ~ 10
Hydroelectricity	4 ~ 15
Geothermal	> ~ 18
Biomass-fired power plant	> ~ 25

Table 4 Scale – Efficiency – Cost – Environmental Impact

ENERGY SOURCES	
Nuclear	50 MW to > 1 GW
Coal	250 – 1 GW
Natural gas	50 MW to 500 MW
Solar PV	~ kW
Wind turbines	0.1 – 10 MW
Hydroelectricity	10 – 1000 MW
Geothermal	100 - > 500 MW
Biomass-fired power plant	10 – 100 MW

continue to encourage, and Australia should welcome, the investments in resources and energy in Australia by Chinese public and private sectors.

China still has a significant proportion of the population in the agricultural sector and in remote regions where energy supply and distribution are rather problematic and very expensive, like Australia's remote communities (although for very different reasons). Renewable energy, such as wind, solar and bioenergy, is mostly 'distributed' in nature and advanced, innovative renewable energy technologies can serve to narrow the gaps between China's urban and rural communities and thus enhance the social wellbeing and stability. Renewable energy technology development and deployment in China are an area where Australia can greatly assist.

For me as an energy researcher, collaboration with the Chinese Academy of Sciences (CAS), China's top universities, industry and governments presents an opportunity to affect global influence in the areas of clean energy and sustainable development while exploring visionary ideas that have not yet been picked up by industry and Governments in Australia.

It is my strong belief that if we are to have global influence and realise our scientific and educational ideology and have a greater global impact, then working with China is an important strategy.

My collaborations with CAS institutes and Tsinghua University have led to several major research and development projects, with Chinese industry contributing almost \$2 million, an additional \$1 million funded by China's Natural Science Foundation and the Chinese Ministry of Science and Technology and CAS, and more than \$1 million funding from the ARC. These grants have enabled me to develop research programs and implement research outcomes in areas of clean coal, coal bed methane, natural gas, synthetic natural gas and oil, bioenergy and process energy efficiency.

The collaborations have resulted in completion of four PhD and two Masters graduates under my joint supervi-

sion at CAS and more than 30 joint publications in the past eight years. In addition, I have supervised more than 10 Chinese PhD students and some 20 Chinese visiting scholars in my research laboratories in Australia. To recognise and reward outstanding performance and encourage interested and enable young people to choose energy science and research as their career, I have also set up a Dongke Zhang Scholarship at Qingdao Institute of Bioenergy and Bioprocess Technology of Chinese Academy of Sciences.

Coal-rich, oil-lean and high-carbon-emission China is embracing new technology and new ideas for fuel sustainability. The University of Western Australia recently signed a Memoranda of Understanding with CAS affiliated Graduate University, and formed the Australia–China Joint Centre for Biomass Utilisation Technology.

Stronger collaborations in science, technology and research training in energy and resources certainly hold a key to the long-term prosperity of both countries. I think the most benefit we can impart is in research and student training.

China has a generation of very good engineers and we now need a generation of academics who understand the importance of collaboration with China and can supply the appropriate training to Chinese students, along with our energy and resources exports to China. ◀

WINTHROP PROFESSOR DONGKE ZHANG FTSE is the Foundation Professor of Chemical Engineering and Director of Centre for Energy at the University of Western Australia. Professor Zhang is an international authority in combustion science and technology, energy conversion and utilisation, and heterogeneous and homogeneous reaction systems. His research interests spread over combustion science and fuel technology; applied catalysis; coal and biomass; natural gas; bioenergy and slurry fuels. Professor Zhang has successfully raised and managed funding for research, valued more than \$36 million over his 17-year academic career, from the Commonwealth and state governments, and Australian and overseas governments and industries.

Promoting science exchange through grants

The Australia–China Council now supports science and technology-related activities, alongside education, culture and the arts and economic and trade projects.



By Mark Wainwright

mark.wainwright@unsw.edu.au

The Australia–China Council was established by the Australian Government in 1978 for the purpose of promoting understanding and fostering ‘people-to-people’ relations between Australia and China.

The Council’s budget is distributed largely through an annual grant round for areas where there is believed to be a strategic need and in line with Australian Government foreign affairs and trade policy with China. Projects are funded in Australia, China, Hong Kong, Macau and Taiwan.

In recent years the Australia–China Council has expanded its priority areas for funding as the relationship has expanded and matured. The Council now supports science and technology-related activities, alongside education, culture and the arts and economic and trade projects. A significant portion of the Council’s budget is spent on our Australian Studies in China program.

Since the introduction of science as a key theme in 2008, funding for projects in 2010–11 represented 17 per cent of the total annual budget. Individual projects have highlighted Australian expertise in China in niche areas such as parenting and peri-natal services, heritage and sustainability of historic buildings, architecture, pharmaceutical and natural medicine, sustainable coastal zone development, climate change and health system reform among others.

Projects such as the Next Step Initiative: Making collaboration happen, managed by the Australian Academy of Science and the Australian Academy of Technological Sciences and Engineering in collaboration with the Chinese Academy of Science, aimed to progress key science and technology issues that benefit both economies by bringing together researchers from China and Australia to discuss ideas. Doing so raised the profile of Australian and Chinese science and technology in important areas of mutual importance such as the impacts of climate change on the urban environment, clean energy and spatial information.

As a result of the project, participants reported they expected to increase:

- collaborative research between the Australian host

institutes and Chinese researchers’ institutes over the medium to long term;

- PhD student exchanges between Australia and China;
- ongoing information exchange and reciprocal visits between both countries;
- the number of joint papers and review articles; and
- the number of planning workshops in China to identify and continue collaborative research.

The 2009–10 year also saw high profile visits to Taiwan by Dr Karl Kruszelnicki, Professor Jennifer Graves, Professor Richard Shine and Dr John Church FTSE to promote science education.

Another highlight was the People and Plants project managed by Wik Projects Ltd to promote links between indigenous Wik Waya people from the western Cape York and people in the city of Nanjing and the province of Jiangsu through the examination of traditional Chinese medicinal plants. The Wik Waya delegates to Nanjing gained an appreciation of how medicinal plants can be cultivated, used to improve health outcomes, and provide a source of income. During the visit a Memorandum of Understanding and Confidentiality agreement was signed between China Pharmaceutical University, Nanjing, the University of South Australia and the Wik People (Wik Projects Ltd).

For more information on the Australia–China Council and the annual grant funding round which opened February 2011, please visit the website (www.dfat.gov.au/acc). ◀

EMERITUS PROFESSOR MARK WAINWRIGHT AM FTSE, Chairperson of the ACC, is currently an Honorary Visiting Professor at the University of NSW, following his retirement from the position of Vice-Chancellor and President of UNSW from April 2004 to June 2006. He was Deputy Vice-Chancellor (Research and International) from January 2001 and prior to that Dean of the Faculty of Engineering from June 1991. He holds a number of positions in the research and higher education sectors and is a Director of Engineering Aid Australia and a Member of the QUT Council, Australian eResearch Infrastructure Council, Smart Services CRC Board and Astronomy Australia Ltd Board.

SHANGHAI EXPO A REAL SHOWCASE FOR ATSE

Australia–China Science and Technology Week in August 2010 – part of the 2010 Shanghai World Expo – was extremely productive, with ATSE playing a strong role in an event that provided a focus to review cooperative arrangements and the key elements of vital international collaboration and science and technology linkage programs between China and Australia.

The Science and Technology Week celebrated 30 years of Science and Technology Partnership between China and Australia. The Australian Government and the Chinese Ministry of Science and Technology (MOST) hosted a high-level reception at the Australian Pavilion to mark 30 years of bi-lateral partnership.

Australian and Chinese participants agreed that the events, interactions and outcomes were outstanding. The personal interface and understanding developed between high-level delegates from both sides illustrated the value of international collaboration and science and technology linkage programs.

The principal events included:

- the launch of a major report of considerable bi-lateral interest;
- the conduct of three major International Workshops; and
- the signing of four bilateral MoUs.

CLIMATE CHANGE REPORT

The Chief Scientist for Australia, Professor Penny Sackett, launched the ATSE Report *Climate Change and the Urban Environment*, which enjoyed good news media pick-up in Australia.

IMPACTS OF CLIMATE CHANGE OF FUTURE URBAN SOCIETIES

This two-day workshop, convened by Professor Michael Manton FTSE and Professor Yang Xin, sponsored by the Department of Innovation, Industry, Science and Research and the Shanghai Association for Science and Technology, linked more than 20 Chinese and Australian experts in architecture, town planning, water management, human health and climate science to explore the issues and impacts of climate change on urban environments.

NANOTECHNOLOGY BENEFITING SOCIETY

This two-day workshop, convened by Professor Max Lu FTSE and Dr Calum Drummond FTSE, the Science and Technology Commission of Shanghai Municipality and the Shanghai Nanopromotion Centre, linked 14 top scientists from both countries to discuss nanomedicine, nanomaterials for clean energy, nanotechnology for quantum computers and computational molecular tools in a stimulating and meaningful atmosphere.

BIOTECHNOLOGY IMPROVING FOOD PRODUCTION, FOOD QUALITY & HUMAN HEALTH

This two-day workshop, convened by Dr Jim Peacock AC FRS FAA FTSE and Professor John Shine AO FAA and the Chinese Academy of Sciences, featured high-quality presentations from nine Chinese and Australian speakers covering biotechnology in food production and nutrition and also in medical science, particularly in the area of non-infectious disease.

FOUR MoUs SIGNED

Four bilateral MoUs between Australian and Chinese agencies were signed:

- China–Australia Automotive Research Alliance (participants – CSIRO, China Automotive Engineering Research Institute, Tongji University Shanghai, CRC for Advanced Automotive Technology);
- CSIRO MoU with Eastern China University of Science and Technology;
- Australian National Measurement Institute and Chinese National Institute of Metrology; and
- Australia–China Joint Venture on Nanoscience and Nanotechnology (participants – CSIRO, University of Queensland, Shanghai Municipal Government's Science and Technology Commission).



Professor Max Lu at the podium in Shanghai.



Dr Calum Drummond (left) and Professor Max Lu (right) celebrate the MoU signing with Min Guoquan, Director of Shanghai Nanotechnology Promotion Centre.

SOLID FOUNDATION FOR FUTURE COLLABORATION

Thirty years of scientific cooperation between Australia and China was celebrated in November 2010 by a visit from the President of the Chinese Academy of Sciences, Professor Yongxiang Lu.

Professor Lu's schedule of engagements included the Australia-China workshop on Agriculture and Food Security Relating to Health in South Australia. This was the seventh in a series of bilateral workshops organised by Chinese Academy of Sciences, the Australian Academy of Science and Australian Academy of Technological Sciences and Engineering (ATSE) with funding from the Chinese Academy and the Australian Government's International Science Linkages program.

Since their commencement in 2004, a wide range of topics has been considered, including sustainable global ecosystems, remote sensing technologies and coastal and deltaic systems under climate change.

Professor Lu was the guest of honour at a public lecture and celebration dinner at the Australian Academy of Science in Canberra, co-hosted by the President of the Academy of Science, Professor Suzanne Cory AC FAA and Senator Kim Carr, Minister for Industry, Innovation, Science and Research. Other eminent guests included the newly appointed Chinese Ambassador to Australia, Mr Chen Yuming, ATSE President Professor Robin Batterham AO FREng FAA FTSE, several senior representatives from the Chinese Academy who accompanied Professor Lu during his visit, and Australian researchers who have established relationships with Chinese counterparts during the last three decades.

Professor Lu's lecture, entitled 'Science and technology for a green, smart and sustainable future', highlighted China's appreciation of the valuable contribution that science and



(From left) Professor Suzanne Cory, Senator Kim Carr, Professor Lu Yongxiang and Professor Robin Batterham.

technology can make in addressing the global challenges of a changing world.

"The contribution of science and technology progress to [China's] economic growth has reached 40 per cent. China is second only to the USA in terms of the total number of scientists and engineers," he said.

In discussing the Chinese Academy of Science's next 10-year plan, Professor Lu identified significant opportunity for future cooperation that would build upon and expand the foundation that has been built since the signing of the Memorandum of Understanding for Cooperation between the two countries in 1980.

"We should place science and technology cooperation as of strategic importance so as to address common challenges for a brighter future!" Professor Lu said.

During his Canberra visit, Professor Lu also attended the award ceremony for the

Prime Minister's Prizes for Science as the Prime Minister's guest at Parliament House and met with Foreign Minister Kevin Rudd. He also signed memoranda of understanding with the Universities of Adelaide and Sydney and visited the CSIRO's Division of Food and Nutritional Sciences.

Letters to the Editor

ATSE *Focus* welcomes letters from readers in response to articles. Please keep letters brief to enhance publication prospects. Longer letters may be run as contributed articles. Please address to editor@atse.org.au

ATSE FELLOWS STRONG

The Academy has had a strong influence on the development of the Federation of Chinese Scholars Australia (FOCSA), with ATSE Fellows serving in many roles in support of its work to drive Australia-China cooperation.

Professor Min Gu FTSE, from Monash University, is the current FOCSA President. He was preceded by Professor Max Lu FTSE, who was the inaugural President (2004–06) and remains Honorary President. Professor Lu was succeeded by Professor Aibing Yu FTSE.

Professor Liangchi Zhang FTSE serves on the Council of FOCSA and Professor Yu chairs the FOCSA Advisory Board, which includes several Fellows – ATSE President Professor Robin Batterham AO FREng FAA FTSE, Emeritus Professor Malcolm Chaikin AO OBE FTSE, Dr Megan Clark FTSE, Professor Dagan Feng FTSE, Professor Shi Xue Dou FTSE, Professor Ian Frazer FAA FTSE, Professor Y W Mai FAA FTSE, Dr Jim Peacock AC FRS FAA FTSE, Dr Zhengrong Shi FTSE and Emeritus Professor Mark Wainwright FTSE.

FOCSA is a united body of Chinese professional associations across Australia. It is a non-government, non-religious, non-profit organisation established in 2004 to represent Chinese scholars in Australia.

FOCSA has more than 1300 members, most of whom hold a senior academic position

or a management position. The research and academic areas of FOCSA members is very broad, spanning most disciplines in science, engineering and technology. FOCSA consists of 13 Chinese professional associations across all states except Tasmania. It is aimed at making greater contributions by Chinese scholars to Australian society and promoting the exchange and cooperation in science, technology, education and culture between Australia and China.

The Federation organises national and international events including conferences, workshops and exhibitions. A joint biennial symposium between Chinese and Australian scholars and professionals in science, technology and education and the proposed Annual Australian Chinese Scholars Congress will be the regular FOCSA events.

It organised the Third Australia–China Joint Symposium on Science, Technology and Education in Melbourne in October 2010. Its aims were to further the bilateral understanding of some highly important issues concerning both countries; facilitate more fruitful collaboration and cooperation in all disciplines of science, technology and education between Australia and China, by providing a forum for exchange of ideas and networking among representatives from governments, academia,

industrial and research organisations; and report on and review the latest developments and progress in the areas of interest through the invited keynote addresses and selected presentations. It focused on some of the strategic topics of interest to both countries, such as technology commercialisation, clean coal technology, renewable energy, climate change response and mitigation, and future education.

The Federation is governed by the Council, with the Executive Committee as its standing governing body. The Executive Committee conducts its governance through the Secretariat and Professional Committees. The Council is comprised of representatives of group memberships for a two-year term of office. FOCSA holds a yearly Council Annual General Meeting. The Council nominates distinguished individuals in science, technology, education, enterprise and management as its advisers.

Thirteen Fellows are members of FOCSA and are briefly profiled below.



Professor Xiao Dong CHEN FTSE is attached to the Department of Chemical Engineering at Monash, and is the Chair

of Biotechnology and Food Engineering. He is also the Associate Dean International of the Australia-China Consortium on Engineering Education and Research (ACCEER).

His current areas of study are wide and varied, and include: drying technologies for food and biological materials, ink-jet spray drying technology and freeze concentration technology, powder agglomeration technology, falling film evaporation technology and crystallisation processes.

Professor Chen is engaged in the development of a gastrointestinal tract model. He is investigating new bioreactor design and operations, and is studying protein gel dissolution theories. The work conducted by Professor Dong Chen's group has already had a significant



ATSE Fellows at dinner at the Melbourne Aquarium during the third FOCSA Symposium in 2010.

SUPPORTERS OF FOCSA

impact in the fields of food and biotechnology, by contributing to the manufacture of high quality products, and in applications in waste treatment and desalination. This includes the commercialisation of several patents.

Professor Dong Chen has established collaborations with several venture capitalists, production companies and funding agencies to assist him and his group in their research. He also maintains strong links with the University of Auckland and China Agricultural University in Beijing. Professor Dong Chen is also exploring spontaneous combustion, fire hazards, fluid mechanics and baking and solar refrigeration.

He is the recipient of significant awards such as Excellence in Drying Research (2007), Fonterra Award (2006), the Royal Society of New Zealand's E R Cooper Medal (2002) and Shedden Uhde Medal (1999). He is also a Fellow of Royal Society of New Zealand and Fellow of the Institution of Chemical Engineers (UK).



Professor Yi-Bing CHENG FTSE is a

Professor in Materials Engineering at Monash University. He completed his undergraduate (1978)

and Masters (1983) studies at Wuhan University of Technology, China, and a PhD at University of Newcastle-upon-Tyne, UK, in 1989.

He joined Monash in 1991 after three years of postdoctoral research in the UK as a Lecturer, then Senior Lecturer, Reader and Professor.

He specialises in inorganic materials and composites. His research interests cover the areas of ceramic processing, microstructure development, phase characterisation, and materials for energy related applications. His recent work on dye-sensitised solar cells has been focused on the development of nanoporous working and counter electrodes and flexible solar cell devices, which has received significant grants from the Australian government and industries. His work has

received a number of awards in Australia and overseas. He has published more than 300 research papers and is an inventor of 15 patents.

As Associate Dean, International of Faculty of Engineering at Monash between 2004 and 2006, Professor Cheng took a leading role in the development of several major international collaboration programs, especially with China. The Australia-China Consortium on Engineering Education and Research (ACCEER) is a major initiative, through which Monash has formed a partnership with Central South University, Wuhan University of Technology, Rio Tinto and Aluminum Corporation of China Ltd.

Dr Cheng has developed strong research collaborations with Chinese researchers since 1993. He received a number of joint research grants from the Chinese National Nature Science Foundation and was a recipient of the Outstanding Overseas Chinese Scholars Award of the Chinese Academy of Sciences in 2001.

He has jointly published more than 70 research papers with Chinese researchers. He currently holds an adjunct professor position under the Thousand Talents Program at Huazhong University of Science and Technology in Wuhan, where he is Director of the Michael Gratzel Center for Mesoscopic Solar Cells.



Professor Shi Xue DOU FTSE is an Australian

Professorial Fellow and Director of the Institute for Superconducting and Electronic Materials (ISEM)

at the University of Wollongong.

Professor Dou was born in Heilong Jiang Province, graduated from Jilin University (1963), obtained his PhD (1984) from Dalhousie University, Canada, and returned to Northeastern University, as a foundation chairman of Department of Chemistry, Shenyang, in 1985. He came to Australia in 1986 as a visiting professor at the University of New South Wales (UNSW), then held a MM Chair of Superconductivity in 1989.

He was awarded a DSc (1998) from UNSW and moved to the University of Wollongong where he established ISEM in 1994.

Professor Dou has published more than 500 refereed journal papers and his publications have attracted more than 9700 citations with h index of 42. He has supervised or co-supervised 55 PhD graduates.

He was awarded two consecutive Australian Professorial Fellowships by the Australian Research Council in 2002 and 2007. The Australian Government awarded him the Centenary Medal for his achievements in materials science and engineering in 2003. He received the Vice-Chancellor's Excellent Senior Researcher Award in 2008.

Professor Dou has established a strong international collaborative network consisting of more than 50 institutions, including 15 from China. He is an honorary and adjunct professor at 10 universities and member or associate editor-in-chief of seven journals.



Professor (David) Dagan FENG FTSE

is Professor, School of Information Technologies and Associate Dean –

International IT, Faculty of Science, University of Sydney. He received his ME in Electrical Engineering and Computing Science (EECS) from Shanghai JiaoTong University (1982), and MSc in Biocybernetics (1985) and PhD in Computer Science (1988) from the University of California, Los Angeles.

After briefly working as Assistant Professor at the University of California, Riverside, he joined the University of Sydney at the end of 1988, as Lecturer, Senior Lecturer, Reader, Professor and Head of Department of Computer Science/School of Information Technologies. He is currently Associate Dean of the Faculty of Science at the University of Sydney; Honorary Research Consultant, Royal Prince Alfred Hospital, the largest hospital in Australia;

Chair, Professor of Information Technology, Hong Kong Polytechnic University; Adviser of the European 3D-AH Project, involving nine countries; Advisory Professor, Chief Scientist, Chief Scientific Adviser and Chair of International Advisory Committee, Med-X Research Institute, Shanghai JiaoTong University; Guest Professor, Northwestern Polytechnic University, Northeastern University, Beijing University of Posts and Telecommunications, Xiamen University and Tsinghua University.

His research area is Biomedical and Multimedia Information Technology (BMIT). He is the Founder and Director of the BMIT Research Group. He has published more than 500 research papers, pioneered several new research directions, made a number of landmark contributions in his field with significant scientific impact and social benefit, and received the Crump Prize for Excellence in Medical Engineering.

Many of his research results have been translated into solutions to real-life problems and have made major improvements to the quality of life worldwide. He is a Fellow of ACS, HKIE, IEE and IEEE, and Special Area Editor of IEEE Transactions on Information Technology in Biomedicine. He has served as Chair of IFAC-TC-BIOMED.



Professor Min GU FAA FTSE is an elected Fellow of both the Australian Academy of Technological Sciences and Engineering

and the Australian Academy of Science. He is also an elected Fellow of the Institute of Physics (UK), the Australian Institute of Physics, the Optical Society of America and the International Society for Optical Engineering. He is currently President of FOCSA.

He is a Laureate Fellow of the Australian Research Council and Special Adviser to the Vice-Chancellor (Pro Vice-Chancellor-International Research Collaboration) at Swinburne University of Technology, a University Distinguished Professor in Optoelectronics and Director of the Centre of Micro-Photonics. His research interests span nanophotonics and biophotonics, with internationally renowned expertise in three-dimensional optical imaging theory.

Professor Gu is a sole author of two standard reference books, *Principles of Three-Dimensional Imaging in Confocal Microscopes* (World Scientific, 1996) and *Advanced Optical Imaging Theory* (Springer-Verlag, 2000). He is also the first author of the book published by Cambridge University Press (*Femtosecond Biophotonics: Core Techniques and Applications*, 2010). He has more than 800 publications (including over 320 papers in internationally refereed journals). He is a member of the editorial boards of 15 top international journals. He was President and Vice-President of the International Commission for Optics.

Professor Gu received his BSc (1981) from Shanghai JiaoTong University and his PhD

(1988) and MSc (1984) in Optics from the Chinese Academy of Sciences. He was awarded the Chang Jiang Chair Professorship (2007) and the Thousand Talents Award (2009), both from the Ministry for Education, China, and the Einstein Professorship (2010) from the Chinese Academy of Science (2010). He is an Advisory/Honorary/Guest/Visiting professor in many top-tier Chinese universities.



Professor Max LU FTSE, a Chinese-born Australian, entered Northeastern University at the age of 16 to be trained as metallurgist

and subsequently did a Master's degree in engineering before taking up an Australian government scholarship to pursue his PhD in Chemical Engineering at the University of Queensland (UQ).

Professor Lu is currently Deputy Vice-Chancellor (Research) at UQ, following a stellar research career as Federation Fellow (awarded twice) and Director of ARC Centre of Excellence for Functional Nanomaterials since 2003. He has held positions of Senior Lecturer, Reader and Chair Professor of Nanotechnology at UQ and been known for his work in nanoparticles and nanoporous materials for clean energy applications. He has published more than 420 papers in high-impact journals. He is recognised as one of the 250 top authors in the world in the field of material science. He is also co-inventor of more than 20 patents some of which are being commercialised.

Professor Lu has received numerous awards including the Orica Award, RK Murphy Medal, Le Fevre Prize, ExxonMobil Award, and Top 100 Most Influential Engineers in Australia (2004, 2010). He is Fellow of ATSE since 2002 and Institution of Chemical Engineers. He has served in numerous governmental advisory committees, ARC College of Experts, and on many boards including the Board of ATSE, and is a director of the Australian Synchrotron and National Centre for Desalination, among others.

Professor Lu has been a driving force for Australia-China cooperation in science and technology. He has helped ATSE and many colleagues to develop productive links with China and personally held numerous honorary

The 13 member associations of FOCSA are:

- Canberra Society of Chinese Scholars;
- Society of Chinese-Australian Academics (NSW);
- Australian Chinese Engineers Association (NSW);
- Aus-Sino Science and Technology (NSW);
- Australian Chinese Finance Organisation (NSW);
- The Northern Territory Chinese Professional Association;
- Queensland Chinese Association of Scientists and Engineers Inc;
- South Australia Chinese Professionals Association;
- Australia Chinese Association for Biomedical Sciences (Victoria);
- The Australian Chinese Engineering and Technology Experts Network (Victoria);
- Australian Chinese ICT Professional eSociety (Victoria);
- Association of Chinese PhD Students and Young Scholars (Victoria); and
- Western Australia Chinese Scientists Association.

and advisory roles in the Chinese Academy of Sciences and top universities. He was the only Chinese Australian to make the list of the top 50 most influential Chinese in the world, compiled by *Phoenix Weekly* magazine in 2006. He recently shared the CAS Award for International Cooperation with two scientists from the US and Japan.



Professor Yiu-Wing MAI
AM FRS FAA FTSE

holds a University Chair at the University of Sydney and was an inaugural Australian

Federation Fellow. He is a world authority on advanced materials and fracture mechanics having made significant contributions to the development of asbestos-free cements in Australia and international testing protocols and standards on essential fracture work and crack-tip opening displacement measurements. He is a highly cited researcher in Materials Science with an h-index of 48. In 2001, he was awarded the Centenary Medal for service to Australian society and science in materials engineering. In 2010, he was made a Member of the Order of Australia for service to engineering, particularly in the fields of advanced composite materials and fracture research.

Professor Mai was born in Hong Kong and received his primary, secondary and tertiary education there before doing postdoctoral research at the University of Michigan and Imperial College. He came to Australia in 1976 and held various academic positions as Founding Director of the Graduate School of Engineering, Associate Dean and Pro-Dean of Engineering. He was also a past president of the Society of Chinese Australian Academics, which was established more than 35 years ago in NSW.

Professor Mai has maintained strong ties with China. He has graduated 16 PhDs and two MERs, advised seven ARC-supported postdoctoral, research and professorial fellows, and hosted more than 50 visiting academics, all from China. He is currently honorary professor of Harbin Institute of Technology, Harbin Engineering University, Huazhong University of Science and Technology, South China University of Technology, Beijing Chemical University of Technology, Nanjing University of Aeronautics

and Astronautics, and the Institute of Technical Physics and Chemistry, CAS. He has active ongoing collaborative research projects with several of these universities.



Dr Albert Wai-Hing MAU
FTSE, CSIRO

Fellow and Chief Research Scientist, CSIRO Molecular Science, was born in China

and has spent some 35 years with CSIRO following his tertiary education in the US at Baylor University (Texas), where he gained his BSc, and the University of Michigan where he gained his MSc (applied mathematics) and PhD (physical chemistry).

A former head of Molecular Science, he was involved in two iconic Australian research projects: the development of Australia's pioneering polymer banknotes (along with Foundation Fellow Professor David Solomon AM FRS FAA FTSE) and development of Australia's world-first influenza drug, Relenza.

In 1999 he was awarded the Australian Department of Foreign Affairs and Trade's inaugural medal for contribution to science and technology in recognition of his work in developing collaborations between Australia and China. He is a Fellow of the Royal Australian Chemical Society, Member of the Photobiological Society of America and Optical Society of America, Adjunct Professor, University of Queensland, Visiting Professor, University of Wollongong, and Honorary Professor, Chinese Academy of Sciences and University of Science and Technology of China.



Professor Linfa WANG
FTSE

is a CSIRO Science Leader at the Australian Animal Health Laboratory (AAHL) and is

an internationally known authority in emerging zoonotic viruses, specialising in novel viruses of bat origin.

He has served as a member of the World Health Organization SARS Scientific Research Advisory Committee and played a key role in the identification of bats as the natural host of SARS-like viruses. His research group also played an important role in the discovery

and molecular analysis of Hendra and Nipah viruses and in the development of vaccines and diagnoses for these deadly viruses.

Professor Wang has more than 200 scientific publications and serves on six editorial boards for publications in the areas of virology, biotechnology and immunotechnology.

Born in Shanghai, Professor Wang obtained his BSc (1982) from East China Normal University, Shanghai, his PhD (1986) from the University of California, Davis, and came to Australia in 1989.

He has strong links with several Chinese universities and institutes, and is an adjunct professor at the East China Normal University and an honorary professor at the Wuhan Institute of Virology, Chinese Academy of Sciences.



Professor Lin YE
FTSE

is a world-leading researcher in areas of smart materials and structures, and composites science

and technology. His work in these areas has received worldwide recognition. He received the Friedrich Wilhelm Bessel Research Award in 2004 from the Alexander von Humboldt Foundation for his outstanding and influential achievements in the technological development of advanced composites.

Professor Ye has more than 400 scientific publications and serves on the editorial boards of six international journals in the areas of advanced composites, smart materials and nanocomposites.

He was born in Jiangxi, and obtained his BEng in 1982 from Harbin Engineering University and his PhD in 1987 from Beijing University of Aeronautics and Astronautics. He joined the University of Sydney as a Lecturer in 1992, and became a full Professor in 2002 at the School of Aerospace, Mechanical and Mechatronic Engineering. He was the Head of School from January 2004 to December 2007.

Professor Ye has very strong research collaboration and professional links with many Chinese universities and institutes, and he is a visiting or an adjunct professor at Shanghai Jiaotong University, Xi'an Jiaotong University, Harbin Institute of Technology, Harbin Engineering University, Tongji University, Sichuan University and Chinese Academy of Sciences.



Professor Aibing YU

FTSE has specialised in process metallurgy, obtaining a BEng (1982) and Masters (1985) from China's

Northeastern University, then his PhD (1990) from the University of Wollongong (UoW), and DSc in 2007 from the University of New South Wales (UNSW). Since 1992, he has been with the UNSW School of Materials Science and Engineering. Currently he is Scientia Professor and ARC Federation Fellow, directing a world-class research facility, SIMPAS (Simulation and Modelling of Particulate Systems).

Professor Yu is a world-leading scientist in particle/powder technology and process engineering, which is closely related to the mineral/metallurgical/chemical/material industries. He has made many significant contributions and is recognised as an authority in particle packing, particulate and multiphase processing, and simulation and modelling. He has authored more than 550 publications and delivered invited plenary/keynote presentations at many international conferences. He edits and/or is on the editorial board of more than 10 learned journals including *Industrial & Engineering Chemistry Research*, *Powder Technology*, *Granular Matter*, *Particulology*, and *ISIJ International*.

He is a recipient of a number of prestigious awards/fellowships including a CSIRO Postdoctoral, ARC Queen Elizabeth II, Australian Professorial and Federation fellowships, Josef Kapitan Award from the Iron and Steel Society (ISS), the Ian Wark Medal, ExxonMobile Award from the Australian and New Zealand Federation of Chemical Engineers, and NSW Scientist of Year 2010 in engineering, mathematics and computer science category.

Professor Yu has a strong professional link with the scientific and technological community in China. He holds honorary/adjunct professorships with a number of universities and CAS institutes in China, and is a current science and technology adviser to the government. Being a former president, he is now chair of the Governing Board of FOCSA.



Winthrop Professor Dongke ZHANG FTSE

studied at Southeast University, Nanjing, and Huazhong University

of Science and Technology, Wuhan, before obtaining his PhD in Chemical Engineering from the University of Newcastle, NSW. He is currently the Foundation Professor of Chemical Engineering and Director of Centre for Energy at the University of Western Australia.

Professor Zhang is an international authority in combustion science and technology, energy conversion and utilisation, and heterogeneous and homogeneous reaction systems. His research interests spread over combustion science and fuel technology; applied catalysis; coal and biomass; natural gas; bioenergy and slurry fuels. Professor Zhang has successfully raised and managed funding for research, valued more than \$36 million over his 17-year academic career, from the Commonwealth and state governments, and Australian and overseas governments and industries. He has authored and co-authored more than 400 technical publications.

He won the Combustion Institute's David Warren Fellowship in 1996, was awarded the Shedden Uhde Medal by Engineers Australia and Institution of Chemical Engineers in 2000, the Young Investigator Award by the Combustion Institute at the Asia-Pacific Conference on Combustion (ASPACC) in 2001 and the John A Brodie Medal of Engineers Australia in 2008.

With love, passion and commitment to both Australia and China, Professor Zhang is a promoter, an activist and a practitioner of science and technology linkages between Australia and China and holds concurrent research professor positions with Institute of Bioenergy and Bioprocessing Technology of Chinese Academy of Sciences, Honorary Professor of South China University of Technology, and adjunct professorship with Beijing University and Taiyuan University of Science and Technology in China. He was appointed inaugural Honorary Director of Centre for Applied Energy Technology at Qingdao Institute of Bioenergy and Bioprocessing Technology, Strategic Adviser of ENN Ltd and awarded the One Thousand Talents fellowship of China in 2010.



Professor Liangchi ZHANG FTSE

is Scientia Professor, Professor of Mechanical Engineering, Australian Professorial

Fellow, and Head of Precision and Nano Processing Technology Group at the University of New South Wales (UNSW). He is also Honorary Professor at the University of Sydney.

Prior to joining UNSW he worked at the University of Cambridge (UK), National Mechanical Engineering Laboratory (MITI, Japan) and University of Sydney. He has been Director of the Graduate School of Engineering and Associate Dean of Engineering at the University of Sydney, President of Ausinan Society of Science and Technology and Vice-President of FOCSA.

Professor Zhang is internationally renowned for both his fundamental research and technological development at the forefront of multi-scale mechanics, and precision and nanomanufacturing, partly reflected by the more than 20 awards/honours he has received.

Professor Zhang's publication citation is at the top globally in his discipline. His world-first investigation on the ballistic resistance of carbon nanotubes has attracted more than 7000 downloads and has been extensively reported by the media worldwide. The application of his technologies has led to considerable economic benefits, about \$20 million a year. He is the inventor of six patented technologies, and has published four books, edited 15 books and authored 16 book chapters and about 400 papers. Professor Zhang is editor, honorary editor, advisory editor, senior editor, associate editor and editorial board member of many international journals.

Professor Zhang was born in Huangyan, Zhejiang. He obtained his BSc (1982) and MEng (1985) from Zhejiang University, PhD (1988) from Peking University and his higher doctorate degree DEng (2005) from the University of Sydney. He started his work in Australia in 1992.

Professor Zhang has professional links with many Chinese institutions including Peking University, Tsinghua University, Zhejiang University and the Chinese Academy of Sciences.

ATSE INTERNATIONAL STRATEGY GROUP

The Academy's International Strategy Group consists of eight ATSE Fellows and the Chief Executive Officer.



Professor Michael Manton FTSE, Professor, School of Mathematical Sciences, Monash University; Director of ATSE (Chair)



Professor Simon Foote FTSE, Director Menzies Research Institute, University of Tasmania



Dr Susan Pond AM FTSE, Consultant; Director of Commercialisation Australia; Director of ATSE



Professor Erol Harvey FTSE, CEO MiniFAB (Aust) Pty Ltd



Professor Mike Miller AO FTSE, Chair Mnet Corp Ltd; Board Member Australia Korea Foundation; Director of ATSE



Dr Graeme Woodrow FTSE, Director – Health Technologies, CSIRO



Professor Dongke Zhang FTSE, Winthrop Professor of Chemical Engineering, University of Western Australia



Professor Kaye Basford FTSE, Professor of Biometry and Head of School of Land and Food Sciences, University of Queensland; ATSE Queensland Division Secretary



Professor John O'Callaghan FTSE, Principal, Lakeview Consulting



Dr Margaret Hartley, ATSE CEO

THE INTERNATIONAL STRATEGY GROUP IS SUPPORTED BY ACADEMY KEY STAFF.



Ms Elizabeth Meier, Executive Manager, International Program



Ms Anne Houston, Project Officer, International Program



Ms Joanne Trinchera, Administrative Officer, International Program



Ms Susan Moldrich, Program Coordinator, International and Projects

Five ATSE Fellows honoured

The Academy congratulates its five Fellows honoured in the 2011 Australia Day Honours list.

The list is headed by Professor Anthony John McMichael AO FTSE of the National Centre for Population Health and Epidemiology at the Australian National University, Canberra. Professor McMichael was honoured for distinguished service to population health, particularly in the area of environmental impact, as an academic and author and through leadership roles with international organisations.



Rob Lewis

John Simmons

Mr Michael Anthony Rayner AM FTSE, Partner in Cox Rayner Architects, Brisbane, was honoured for services to architecture, particularly through leadership roles in the planning and design of the built environment, and to the community of Queensland. Mr Rayner received national publicity in January for his design of a new style of 'Queenslander' home to better handle flooding.

Emeritus Professor John Montague Simmons AM FTSE, of the School of Engineering, University of Queensland, was honoured for his service to engineering and education, particularly through innovative approaches to curriculum reform and the development of the international student

market. Professor Simmons is a Vice President and Board Director of ATSE, has responsibility for membership matters and is a former Queensland Division Chair.

Emeritus Professor Kenneth Vincent Jubb OAM FTSE, of the University of Melbourne's Faculty of Veterinary Science at Werribee, was honoured for his service to veterinary science and pathology.

Professor Robert Keer Lewis PSM FTSE, former head of the South Australian Research and Development Institute, was honoured for his outstanding public service in the area of primary industries R&D. Professor Lewis is a former ATSE SA Division Chair.

John Burgess brings history and art to ATSE

John Burgess FTSE brought a new look to the Boardroom at the ATSE Office in Melbourne when he presented a painting of Cape le Grand, near Esperance, Western Australia, to the Academy recently.

The painting, which was inspired when John and his wife Gai visited the region three years ago, depicts the grandeur of the southern coast with a strong dash of botany. John's talent for landscape painting is evident, with his depiction of the south coast banksia shrubs in the foreground lending real authenticity to the scene.

John's painting also recalls the early exploration by Matthew Flinders in 1802, and John recalled Flinders' views of the area in his presentation remarks to an audience of Board and Victorian Division Fellows and ATSE staff. These notes are recorded on a presentation plaque that accompanies the painting, which brings a new note of contemporary presentation of historic science and technology to the ATSE Boardroom.

The plaque records Commander Flinders' comments in the ship's log of *HMS Investigator*, on 10 January 1802, anchored at what he called Lucky Bay.



John Burgess with the painting he presented to the Academy.

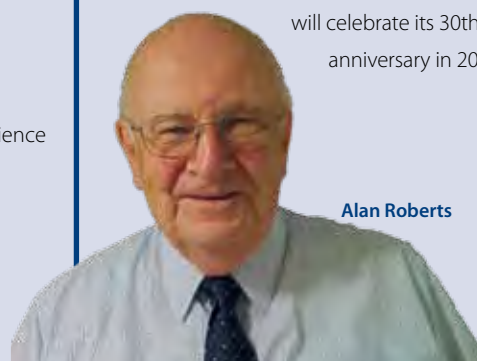
"The vegetation indeed consisted of an abundant variety of plants, and yielded a plentiful harvest to our botanists, but to the herdsman and humble cultivator it promised nothing: not a blade of grass fit for cattle to eat or a square yard of soil that could be expected to return the grain sown upon it, attracted the eye in its glance over these arid plains," Flinders wrote.

Alan Roberts wins top EA Award

Emeritus Professor Alan Roberts FTSE, one of the world's most respected researchers in bulk solids handling, has been awarded the Peter Nicol Russell Memorial Medal for 2010 – Engineers Australia's highest individual award.

Professor Roberts (80) has worked in the field for nearly 50 years and was dean of Newcastle University's engineering faculty for 20 years.

A Fellow since 1989, he was the founding chair of EA's National Committee for Bulk Materials Handling and instigated the international conference series Bulk Materials Storage, Handling and Transportation, which will celebrate its 30th anniversary in 2013.



Alan Roberts



Milton Hearn

Milton Hearn wins Green Chemistry Award

Professor Milton Hearn FTSE, Professor of Chemistry and Director of the Centre for Green Chemistry, Monash University, has been awarded the Royal Australian Chemical Institute's 2010 Green Chemistry Challenge Award. He has also been elected a Fellow of the Royal Society of Victoria.

Professor Hearn was recognised for his outstanding contributions to postgraduate education and training in green chemistry. He has authored 535 scientific publications and several books, and is a named inventor on more than 20 patents related to developments in chemistry and biotechnology.

The Centre for Green Chemistry celebrated 10 years of operations in 2009. This Centre received funding as an ARC Centre of Excellence for the period 2000–08 and established itself as the major centre for research and postgraduate research student education for green chemistry in Australia. More than 100 PhD students have been trained through the centre, with 33 graduate students supported by the centre in 2009.

Professor Hearn has played a major role in the recent establishment of Green Chemical Futures – a major, \$80 million-plus initiative of Monash University – scaled to deliver high-impact undergraduate education, graduate and vocational training and research

outcomes to support and enhance Australia's chemical and allied industries.

This initiative builds upon the work of the Centre for Green Chemistry, which has led to numerous collaborative engagements with the chemical, pharmaceutical, biotechnology and scientific instrument industries in Australia and overseas.

• *Green chemistry involves a reduction in, or elimination of, the use or generation of hazardous materials, including feedstock, reagents, solvents, products and byproducts, from a chemical process. Green chemistry encompasses all aspects and types of chemical processes, including synthesis, catalysis, analysis, monitoring, separations and reaction conditions that reduce impacts on human health and the environment relative to the current state of the art.*

John Bennett: a pioneer of computer science

Emeritus Professor John Bennett AO FTSE died in Sydney in December 2010, aged 89. Professor Bennett, a Fellow since 1981, was a pioneer of computer science in Australia and former professor of computer science at Sydney University for 25 years until 1986.

He held BE degrees in Civil Engineering and Mechanical and Electrical Engineering, a BSc and a Cambridge PhD. He was also Foundation President of the Australian Computer Society and became an ACS life member in 1977.

Armed with a Civil Engineering degree he saw war service as an RAAF Flying Officer on radar and airfield construction then worked in the power industry in Brisbane post-war while he gained two further bachelor degrees.

He was at Cambridge from 1947–50 and then spent five years in the UK as a computer specialist with Ferranti. He was senior numerical analyst at the Basser Computing Laboratory



John Bennett

at Sydney University from 1956–61, when he became Professor of Physics (Electronic Computing).

He won numerous awards for his work and served as an expert adviser on a number of topics in the 1970s and 1980s. He was a member of a government committee on privacy and computerisation of legal data. He was editor of *Computing in Australia: the development of a profession* (an ACS history of Australian computing).

Professor Bennett served as Secretary (1984–86) and Chair (1989–90) of the NSW Division of ATSE and on Council (1984–87).

ACS President Anthony Wong praised the significant contributions Professor Bennett made to the ACS and the development of Australia's ICT profession.

"We have lost one of our nation's greatest ICT icons, however John Bennett's pioneering efforts have given Australia's ICT professionals and industry countless opportunities and advantages," Wong said.

"John's talents and knowledge base were recognised by his appointment as Australia's first Professor of Computer Science and his work performing the world's first structural engineering calculations on an electronic computer.

"Through establishing the ACS, John Bennett created an environment whereby Australian IT professionals could work together to perform to the best of their ability. By doing this, he significantly advanced the professional excellence of Australia's ICT industry which dramatically increased our nation's presence on an international level. Today, the Australian Computer Society represents more than 17,000 ICT professionals and is well recognised around the world"

ACS CEO Bruce Lakin said "John was a thought leader and one of our nation's greatest ICT scholars. His dedication and passion was instrumental in the progression of the Australian Computer Society to every state in Australia. He was well respected, not only as a great colleague at the ACS but also he was admired by the industry as a true ICT professional and a gentleman. He will be greatly missed,"

STELR Mentor Workshop

The Mentor Program, which is an integral part of the STELR Project, moved ahead a further step when the STELR mentors met at the ATSE offices in December for a one-day forum looking at the STELR program in 2010 and planning for 2011.

The mentors' roles were to visit schools and support and encourage school staff in the implementation of the STELR program.

The role included training staff not confident in the physical sciences and providing a way of sharing best practice between schools, as well as giving STELR important feedback about strengths and weaknesses.

Their reports indicate STELR is an out-and-out success in terms of the equipment, curriculum materials and the training provided to teachers. All 183 schools involved indicated they would continue with STELR.

Mentors visited more than 90 per cent of STELR schools, in which more than 24,000 students joined in the 2010 STELR program based on renewable energy themes. On average, schools devoted 30 periods to STELR, mainly at year 9 and 10 levels.

The consensus was that the mentors really enjoyed their roles and thought the program was top quality and very well regarded. They are all keen to work with STELR in 2011.

New CSIRO role for Calum Drummond

Dr Calum Drummond FTSE has been appointed as the new Group Executive for Manufacturing, Materials and Minerals (MMM), following Dr Steve Morton's retirement.

CSIRO CEO Dr Megan Clark FTSE said Dr Drummond would bring a national and global reputation for science excellence, impact and leadership to the Executive Team.

Dr Drummond joined CSIRO as a Postdoctoral Fellow in 1987 and worked on projects with more than 30 companies and industry support agencies to develop products and improve processes. He was



STELR's mentors hard at work in a session led by Dr Terry McClafferty, one of the STELR evaluators. Terry presented a synopsis of the evaluation he and Professor Leonie Rennie had gathered on all aspects of STELR, including what teachers thought of the mentors.

appointed Chief of CSIRO Industrial Physics in 2006 and subsequently of CSIRO Materials Science and Engineering in 2007.

Earlier, Dr Drummond was seconded from CSIRO to be Vice President Research at CAP-XX Pty Ltd, a Sydney-based company that designs and manufactures advanced super-capacitors (energy storage devices enabling the development of next-generation portable electronic devices). He was responsible for all research and intellectual property matters and some manufacturing operational activities. In April 2006, CAP-XX listed on the London stock exchange at \$110 million.

Dr Drummond has a Bachelor of Science with First Class Honours in both Chemistry and Science Education, and a Doctorate in Physical Chemistry from the University of Melbourne. He holds an ARC Federation Fellowship hosted by CSIRO.

David Cohen wins national award

Dr David Cohen FTSE, ANSTO's Senior Principal Research Scientist, is working on research to help identify the sources of fine particle pollution across Asia. Air pollution is a major problem in this region, mostly due to a



David Cohen

high concentration of cars, industries and wind-blown soils from desert areas. Globally, more people are dying from air pollution related diseases than in road-related deaths.

This is just one of many research projects Dr Cohen has been leading over the past three decades. A Fellow since 2009, with a career spanning more than 35 years in research, the Australian Nuclear Association has awarded Dr Cohen its 2010 Annual

Award for his outstanding contributions to research and applications of accelerator science and technology.

Accelerator science involves the use of instruments that accelerate electrically charged particles to extremely high speeds to create a high energy reaction. It is an integral part of research at ANSTO and underpins the development of new materials and processes in nanotechnology, environmental science and medicine. Particular applications in these fields can include cancer therapy, medical diagnostics, improving air and water quality and DNA analysis.

Dr Cohen has been instrumental in steering research in the field of accelerator science within the organisation, but says he wouldn't be where he is today without the help of some significant people.

"Research, by necessity, is a team effort and I'd like to acknowledge colleagues at AINSE and ANSTO for their support over many years," he said. "In particular, Bill Palmer, former Executive Officer of AINSE and John Boldeman*, former Chief of Physics Division at ANSTO, for their mentoring roles and guidance in my career."

** Dr John Boldeman FTSE, 2010 ATSE Clunies Ross Lifetime Contribution Awardee.*

Ian Young

Professor Ian Young, incoming Vice-Chancellor of the Australian National University in March, has been appointed to the Advisory Council of the Australian Research Council. He is one of six new members of the Advisory Council. Professor John Ralston retired from the Advisory Council after serving three years.



Tony Gregson takes seed to Svalbard



Tony Gregson

An Australian farmer has left the floods and heat of Victoria's Wimmera district, donned special protective clothing and gone through a variety of quarantine and other safety checks at a remote frozen location in Norway to make the historical first deposit of crop seeds from Australia in the Arctic 'doomsday' seed vault.

The Australian on the seed vault mission to Svalbard, Norway, in February was ATSE Fellow Dr Tony Gregson AM FTSE, Director of the Crawford Fund, member of the ATSE Board Audit Investment and Remuneration Committee and Chair of the CRC for Molecular Plant Breeding and Plant Health Australia. He is immediate past-Chairman of Bioversity International and former board member of CIMMYT, the international maize and wheat research institute in Mexico, which was responsible for breeding semi-dwarf wheat varieties that proved so productive in Australia's harsh conditions.

"Like the seeds on their way to Svalbard, Australian farming has gone a long way – considering all our food crops are exotic to this country. We have depended almost completely on other countries for seeds to feed us and make us a major force in global agriculture," said Dr Gregson, who was joined in Svalbard by Professor Edwina Cornish FTSE, Deputy Vice-Chancellor (Research) at Monash University and Mr James Choi, the Australian Ambassador to Norway.

"Like me, many Australian farmers have been dealing with extremes in weather, which are harsh reminders of the need to research and have access to crops that can adapt to changing conditions and new pests and diseases," Dr Gregson said.

While Australia has only just organised its first shipment, it played an important role in the

vault's establishment. Through AusAID and the Grains Research and Development Corporation, Australia was one of the first countries to support the Global Crop Diversity Trust, which operates the seed vault in partnership with the Norwegian Government and the Nordic Genetic Resource Centre in Sweden.

"We have gained so much from other countries and generous public research bodies that have freely provided us with their seeds, and it's time we reciprocated. It's satisfying to see Australia start to improve arrangements so that our germplasm is safe and more freely available to the global scientific and agricultural communities," said Dr Gregson, a grain grower from the Wimmera region who has extensive national and international experience in biodiversity conservation for food security and is passionate about plant genetic resource conservation.

"I hope that this first small shipment of Australian germplasm will be followed by others so that more of Australia's crops are safe. Australia also needs to move towards secure funding and better management of its own collections, and to living up to its international treaty obligations, to share its seeds globally and help feed the world," he said.

The mission of the Crawford Fund, an ATSE subsidiary, is to increase Australia's engagement in international agricultural research, development and education for the benefit of developing countries and Australia.

"Just like the rest of the world's seed collections, ours are vulnerable to a wide range of threats such as natural catastrophes and, perhaps surprisingly in a relatively wealthy country like Australia, lack of adequate funding. For want of a Federal/State agreement, Australia has seen a number of its collections de-funded."

Dr Gregson suggests a range of other activities to boost the Australian contribution to global food security and help shape the future of our own rural industries and the communities they support including:

- commitments to 50:50 governments/industry funding for Australia's seedbanks, which are currently facing underfunding and closure;
- appointment of a national coordinator of our genebanks, who can serve in organisational, management and advocacy roles; and
- establishment of a national database and authority for Australia's implementation of the International Treaty on Plant Genetic Resources for Food and Agriculture, the cornerstone of global germplasm exchange.

"I would also like to see Australia commit to further collection of our native and unique genetic resources such as wild relatives of sorghum, rice and soybean that will help in the development of new crops in the face of climate change. Australia also has globally significant forest tree species and our micro-organism, plant pathogen and insect pest collections are all essential to Australia's status as a vibrant global food producer."

As the Global Seed Vault nears its third anniversary, it is well on its way to ensuring that one day all humanity's existing food crop varieties are safely protected in a frozen environment from any threat to agricultural production, natural or manmade.

(From left) Bob Redden, Curator of the Australian Temperate Field Crops Collection; Peter Walsh, Victorian Minister for Agriculture and Food Security; Hugh Delahunty, Member for Lowan and Victorian Minister for Sport; and Tony Gregson.



Planets align for Max Lay

ATSE Fellow Dr Max Lay AM FTSE, one of Australia's noted transport engineers, wonders if there was special alignment of the planets for him recently.

Over 26 days in November he experienced a chain of important events in his life. He stood down as a Director of ConnectEast, a role he had held since the Company began in 2004.



Max Lay



Strange Ways by Max Lay is available from EA books in Sydney for \$50 and can be ordered online at www.eabooks.com.au/epages/eab.sf

ConnectEast, now trading profitably and paying distributions from operating cash flows and surplus reserves, "is by far the safest main road in Australia and is now carrying more traffic than any of the interstate private toll roads," Dr Lay says. "So I leave this beautiful road on a high note. In addition, the Board has asked me to continue as Chairman of its Health, Safety and Environment Committee."

The Intelligent Transport Society of Australia (ITSA), which Dr Lay helped to found, awarded him its first Individual Excellence Award for "Eminent Service to the Australian ITS Industry". The ITS also announced that future Individual Excellence Awards would be called the Dr Max Lay Award.

It was also announced that a company he helped start, Intelematics, was now the successful major supplier of traffic information (Suna Traffic) to all the major road navigation devices used in Australia.

Engineers Australia has published his new new book, *Strange Ways*. The back cover notes say "Max Lay diverts us down many a

whimsical detour in his quest to define 'the way'. The perfect companion in any traffic jam, *Strange Ways* is a comical atlas of the weird and wonderful happenings on our roads throughout history."

The RACV announced that it would place Dr Lay's name in its Golden Book – the first such entry since 2004. The Golden Book began in 1932 and is "dedicated to those individuals who have rendered distinguished services in the interests of motoring". There are currently 27 names in the Golden Book, including William Calder, pioneering Victorian road engineer; distinguished civil engineer General Sir John Monash, later head of the State Electricity Commission of Victoria and Vice Chancellor of the University of Melbourne; Formula One legend Sir Jack Brabham; and former Victorian Premier Sir Rupert (Dick) Hamer. Dr Lay is a former RACV President.

To round out the month Dr Lay gave a key paper on 'An operational history of traffic congestion' at the Institute of Historical Research at the University of London.

"It was nice to be recognised by experts in a discipline that had been a hobby area for me," Dr Lay says. "In writing the paper I also realised that there was a much better way of measuring and costing traffic congestion than that currently used." What a month!

Soil scientist honoured in America

Professor Rob Fitzpatrick FTSE has been elected a Fellow of the Soil Science Society of America (SSSA) for his lifetime achievements and sustained meritorious contributions to soil science. Fellow is the highest recognition bestowed by the SSSA on its members.

His career has focused on the interface of

Professor Fitzpatrick (left) receives his award from Dr Nicholas Comerford, SSSA President.



pedology, biogeochemistry, mineralogy and forensic science as applied to soil-landscape processes, including development of advanced techniques to characterise, assess and map soils. He is a Chief Research Scientist at CSIRO and Professorial Fellow at Flinders University and The University of Adelaide.

Professor Fitzpatrick was a plenary speaker at the 2010 SSSA Symposium on Applying Soil Chemistry to Solve Soil Problems, speaking on 'The Role of Pedotechnology in Solving Forensic and Drought Induced Soil Problems'. He also gave a keynote address on 'Guidelines for Criminal and Environmental Soil Forensic Investigations' at the 3rd International Conference on Criminal and Environmental Soil Forensics, also held in California.

He was also a plenary speaker at the 16th International Forensic Science Symposium (IIFSS) at INTERPOL headquarters in Lyon, France, in October 2010. His presentation was 'Forensic soil science support for environmental crime investigations' in the thematic session on environmental crime.

He also presented the keynote address, 'Demands on Soil Classification and Soil Survey Strategies', at the International Conference on Soil Classification and Reclamation of Degraded Lands in Arid Environments (ICSC2010) in Abu Dhabi in May 2010.

Two WA Fellows join Technology Council

WA Commerce and Science and Innovation Minister Bill Marmion announced the establishment of the new Western Australian Technology and Industry Advisory Council (TIAC), which will "play a critical advisory role in determining the strategic direction for industry, science and innovation in the State". Professor Lyn Beazley AO FTSE and Professor Beverley Ronalds FTSE, Group Executive for CSIRO Energy Group, have been appointed to the Council.

"TIAC will provide advice to the State Government and deliver recommendations that support the development and growth of our key sectors," Mr Marmion said.

He also confirmed that Professor Beazley had been re-appointed as Western Australia's Chief Scientist for 2011.



Lyn Beazley

David Trimm: a gentle giant in the world of catalysis

David Trimm was born in England in April 1937 to Kathleen Alice (née Green) and Wilfred Lawrence Trimm. He attended Collyers School in Horsham, Sussex, and then completed a BSc in Chemistry with 1st Class Honours and a PhD in Free Radical Oxidation

at the University of Exeter.

He then went on to do postdoctoral research at Imperial College London and at the University of Chicago before returning to Imperial College in 1963 as an

David Trimm

Assistant Lecturer in the Department of Chemical Technology. This was the start of an outstanding career as an academic. In 1976 David was appointed to the Chair of Petrochemistry at the University of Trondheim, Norway, and in 1979 he was appointed to the Chair of Chemical Technology at the University of NSW, Sydney.

David's career at UNSW was truly outstanding. He provided great leadership as Head of the School of Chemical Engineering and Industrial Chemistry, which was formed by the merger of the School of Chemical Engineering and the School of Chemical Technology. Through his leadership and mentoring, he developed the school into a leading position, nationally and internationally. In 2001, his outstanding research was recognised by UNSW by his appointment as a Scientia Professor, the university's highest academic appointment.

In a very short time in Australia, David Trimm brought research in heterogeneous catalysis and catalytic processes in this country to international recognition. Despite the demands as head of a new school at UNSW, he immediately built up an outstanding research team and wrote the

definitive text *Design of Catalysts*, published by Elsevier.

One of David's first actions was to invite Noel Cant from Macquarie University to join the Catalysis Group at UNSW as a Visiting Professor. The 1980s and 1990s were a wonderful time for the three of us and we published some excellent research papers with some outstanding PhD students. David attracted a stream of talented postdoctoral research fellows from ETH in Zurich and we had a great time as well as doing good work.

David's international standing in the catalysis community attracted a constant stream of international visitors to the school and they, too, became lifelong friends of David. Many of them made numerous return visits on a sabbatical leave or simply to have a vacation frequently staying at his Watsons Bay home that he and his partner Gabi (Gabriella Furtenbach) loved so much. David was a most popular member of the Watsons Bay community and he spent his happiest times there, despite having travelled so extensively overseas and all around Australia.

Following his 'retirement' from UNSW in 2001, David was appointed to the position of Science Leader – Gas Processing in the CSIRO Division of Petroleum. At the age of 64, when many seek an easy life, he embarked upon a new career at CSIRO and in 2002 he was appointed an ARC Federation Fellow, the ARC's highest award. He held this position until 2008 and was appointed a CSIRO Fellow in 2007.

Until his recent death, he continued to work part-time with CSIRO and continued to make major contributions to leadership of gas-for-liquids research in collaboration with Chevron. During his time at CSIRO, he continued to be recognised by numerous national and international awards

including the Award of Excellence for conversion of natural gas and, only five days before his passing, the CSIRO Medal. He was made a Member of the Order of Australia for his outstanding contributions to catalysis research and higher education.

Emeritus Professor David Trimm AM FTSE died last October, aged 73, while holidaying on the Great Barrier Reef with Gabi and friends from Watsons Bay. It was a life cut too short for a giant of a man, both physically and personally. He is sadly missed by all of us who knew him and worked with him. He was a great friend and a great Australian. He is survived by Gabi and his nieces Sarah Thirkell and Elizabeth Nicholson and his brother-in-law Paul Tingley.

– Emeritus Professor Mark Wainwright AM FTSE

Award for Paul Zimmet

The United Arab Emirates (UAE) has honoured a host of international research scientists, including Professor Paul Zimmet AO FTSE, Director Emeritus of the Baker IDI Heart and Diabetes Institute, Melbourne.

Professor Najib Al Khaja, Secretary-General of the Shaik Hamdan Awards, said the Award focused on diabetes, obesity and endocrinology as statistics showed that in the coming decades there would be a significant number of people suffering from diabetes in all countries, particularly in Gulf region.

Professor Zimmet was awarded the Grand Hamdan International Award for his classic observations in the 1970s that helped foresee the current epidemic of type 2 diabetes.

Shaikh Hamdan Bin Rashid Al Maktoum, Deputy Ruler of Dubai and Finance Minister, presents the award to Profesor Paul Zimmet.



Michael Tobar's clock to be tested in space

The world's most precise clock – developed at the University of Western Australia (UWA) by Winthrop Professor Michael Tobar FTSE and his colleagues – will be subject to testing in space as a result of recent Australian Research Council (ARC) funding.



Michael Tobar

Among the 10 UWA projects to win funding is the work being undertaken by Professor Tobar – 2010 WA Scientist of the Year – and his colleagues on the world's most

precise timepiece, which is testing the very fundamentals that underpin physics.

The \$1.2 million project will provide a unique opportunity for Australian membership of a high-profile space mission involving atomic clocks on board the International Space Station and in the world's best frequency and time laboratories.

Professor Tobar, a Fellow since 2008, is a world-leading scientist researching the invention, creation and applications of precise time, frequency and phase measurement techniques. His work has resulted in the most pure oscillators and exact measurement systems so far manufactured, with use in radar, telecommunications, fundamental physics and defence applications.

Awards flow for David Abramson

Professor David Abramson FTSE, Science Director of the Monash e-Research Centre (MeRC), has been awarded the John Hughes Distinguished Service Award for 2011 for his contributions to high-performance computing and various national committees,



David Abramson

which have been significant in leading the development of IT in Australia.

Professor Abramson, admitted to ATSE last year, was also named in December as a 2010 Fellow of the US-based Association for Computing Machinery (ACM) – one of 41 of its members worldwide acknowledged for their contributions to computing and computer science who have provided fundamental knowledge to the field and generated multiple innovations in industry, commerce, entertainment and education.

The 2010 ACM Fellows, from the world's leading universities, corporations, and research labs, were judged to have accomplishments that are driving the innovations necessary to sustain competitiveness in the digital age. ACM will formally recognise the 2010 Fellows at its annual Awards Banquet on 4 June in San Jose, California.

John de Laeter Award announced

Professor Igor Bray has been named the inaugural winner of the John de Laeter Award for Research Leadership, named after Professor John de Laeter AO FTSE, who died recently.

Professor de Laeter, a Fellow for more than 25 years, was regarded as a visionary and elder statesmen of science in Western Australia, and was a former Deputy Vice-Chancellor of Curtin University. He was the driving force behind the

establishment of many science institutions, including Perth's Scitech, Perth's Technology Park and the Gravity Discovery Centre at Gingin, east of Perth.

Professor Bray is the head of Curtin's Department of Imaging and Applied Physics, in the Faculty of Science and Engineering. He has received numerous awards, including the Pawsey Medal in 1998, awarded by the Australian Academy of Science for Outstanding research in physics.

Greenfield succeeds Robson at Go8

Professor Paul Greenfield AO FTSE, Vice-Chancellor of the University of Queensland, is the new Chair of the Group of Eight (Go8) universities, succeeding Professor Alan Robson AM FTSE, Vice-Chancellor of the University of Western Australia, who completed his term in December 2010.

Professor Greenfield has been a member of the Go8 board since January 2008. He has worked at UQ since 1975, starting as a lecturer in chemical engineering and eventually becoming Senior Deputy Vice-Chancellor (2002–07) and Vice-Chancellor in 2008.

In announcing the change, Go8 acknowledged Professor Robson's commitment as Chair over the past three years. "Professor Robson's responsiveness and ability to turn around decisions in a timely way have been very impressive, particularly given the time differences and travel required from his home base in Perth."



Paul Greenfield

2011

ATSE CLUNIES ROSS 2011 AWARDS DINNER

Rewarding leadership in technology

your invitation to

A CELEBRATION OF EXCELLENCE

The **ATSE** Clunies Ross Awards recognise Australia's pre-eminent scientists, innovators and technologists who have bridged the gap between research and the marketplace.

The 2011 Awards Dinner will be a unique opportunity to celebrate excellence in science, engineering and technology and network with leaders in industry, government and academia.

THURSDAY 19 MAY 2011

CONVENTION & EXHIBITION CENTRE, BRISBANE



To register your interest in attending the
2011 ATSE Clunies Ross Awards Dinner,
please contact Johanna Gasser:
T (03) 9864 0908 **F** (03) 9864 0930
E events@atse.org.au

RSVP: 28 April 2011

ATSE Clunies Ross
is proudly supported by:

PLATINUM

THE UNIVERSITY OF QUEENSLAND



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

GOLD
CSIRO



2012 ATSE CLUNIES ROSS AWARDS

CALL FOR NOMINATIONS

For more information about the nomination process or to download a nomination form visit www.cluniesross.org.au Entries close 29 July 2011



UQ CONFUCIUS INSTITUTE

Australia's first science and technology focused Confucius Institute has opened at The University of Queensland

The UQ Confucius Institute was established through a partnership with Chinese science and technology institution, Tianjin University, and the Office of Chinese Language Council International (Hanban) in China. The Chinese, Australian and Queensland Governments have also provided support for its formation.

The key aims of the UQ Confucius Institute will be to:

- Facilitate academic and student exchange between UQ and Chinese universities and research institutions;
- Support and initiate teaching and research programs in Chinese studies at UQ and in the broader community;

- Promote science and technology collaboration between Australia and China;
- Host forums and guest lectures by science and technology scholars, and experts in Chinese studies and Australia-China relationships; and
- Encourage bilateral high-level government and corporate visits.

The institute has a unique focus on intermeshing language and culture with science, engineering and technology. A range of new courses, cultural programs and public lectures will be made available through the institute, for more information visit www.uq.edu.au/confucius.