



Australian Sustainable Development Institute

NEWSLETTER

Mapping a better future



Bobtail Lizard *Tiliqua rugosa*

Welcome from the Executive Director

Welcome to the third edition of ASDI's newsletter for 2013.

Earlier this week, ASDI had the pleasure of hosting a lecture by Jay Harman. The topic was on biomimicry and it was absolutely fascinating.

Biomimicry is a relatively new discipline that studies nature's best ideas and then imitates these designs and processes to solve human problems.

The central theme is that nature has already solved many of the problems we are now grappling with. Animals, plants, and microbes have 'been there, done that'. They have found what works and what is sustainable, on Earth.

Jay asks questions such as, "How can the colours of a butterfly's wing reduce the world's lighting energy bill by 80 per cent?" and "Why does the bumblebee have better aerodynamics than a 747?"

A particularly interesting study that Jay mentioned was in respect to hippopotamus sweat! It turns out that hippo sweat provides a highly effective, four-in-one sunblock and as well as being a highly effective sunblock, hippo sweat is also antiseptic, insect repelling and antifungal.

Researchers at Kyoto Pharmaceutical University and the University of Trieste, as well as the University of California, have studied the chemicals secreted by hippos. They found two pigments that absorb light across the ultraviolet-visible range, and with structures that ensure the material spreads over the entire skin without the need for being rubbed on by hand.

Highlights in this issue

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Can you imagine the possibilities of being able to reverse engineer the properties of hippo sweat to develop a highly effective, non-toxic sunblock for humans?

You can find out more about Jay and biomimicry here: thesharkspaintbrush.com

Mike Burbridge
Executive Director

CONTACT:

Mike Burbridge, Executive Director
Australian Sustainable Development Institute
Curtin University
Street address:
Kent Street, Bentley, WA 6102
Postal address:
GPO Box U1987, Perth, WA 6845
Tel: +61 8 9266 1792
Fax: +61 8 9266 3793
Email:
mike.burbridge@curtin.edu.au
Web: www.asdi.org.au

OLDEST CHOLESTEROL FOUND

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World's oldest known cholesterol found in the Western Kimberley

Curtin University researchers have found sterols, including cholesterol, coexisting with their fossilised counterparts (geomolecules) in a 380-million-year-old crab-like fossil from the Western Kimberley – a discovery previously assumed unfeasible.

occurrence of sterols by 250 million years, is a consequence of early microbial encapsulation preventing full decomposition in the Devonian seas,” Ms Melendez said.

Ms Melendez said the coexistence of more than 70 steroids in one sample confirmed a proposed scheme for the transformation of biomolecules into

This research has been funded by the Australian Research Council under a second QEII Discovery project grant awarded to Professor Grice. Professor Grice has also recently been awarded a Discovery Outstanding Research Award to continue this research. .

A copy of the paper is available at <http://www.nature.com/srep/index.html>



The research, recently published in *Nature Scientific Reports*, demonstrates sterols can be preserved for longer through an exceptional preservation process, providing the oldest and most extensive molecular relics of the Devonian age.

PhD student Ines Melendez of the WA Organic and Isotope Geochemistry Centre (WA-OIGC) at Curtin led the study alongside her primary advisor, Professor Kliti Grice, Director of WA-OIGC, and visiting Professor Lorenz Schwark from Christian Albrechts University, Kiel, Germany.

“The exceptional preservation of the crab-like fossil, which has extended the

geomolecules (the fossilised version), reported in *Science* and *Nature* in 1982.

“However, we now know this was a microbially induced process rather than thermally driven one as previously assumed,” Ms Melendez said.

Professor Grice said their research demonstrates concretions within rocks were able to preserve biomolecules and geomolecules at remarkable levels.

“This opens up a novel window of opportunity to study such components in very ancient samples and improves our understanding of microbial evolution and past environmental conditions,” Professor Grice said.

Contact:
Ines Melendez, PhD student,
Department of Chemistry, Curtin University
Mobile: 0416 490 043. Email: Ines.Melendez@curtin.edu.au;

Professor Kliti Grice, Department of Chemistry, Curtin University
Email: K.Grice@curtin.edu.au

CLIMATE ADAPTABLE GRAIN

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Climate-adaptable grain could be key to human health

Farmers typically do not consider coloured sorghum grain ideal for feeding to pigs but the grain could be the answer to battling obesity and other chronic diseases in humans, Curtin University researchers have found.



Dr Stuart Johnson from Curtin's School of Public Health and the International Institute of Agri-Food Security is heading up a team running field and glasshouse trials on coloured sorghum grain varieties.

Together with Dr Sarita Bennett, Dr Sue Low and Dr Roger Mandel from Curtin's Department of Environment and Agriculture, he is investigating the potential role of the unusually high level of antioxidants in black sorghum for the production of health-protective human food and supplements, as well as its potential to be grown in the Australian agricultural industry.

Black sorghum bran can have higher

levels of antioxidants than blueberries, however, somewhat ironically, this grain is not considered that suitable for pig and poultry feed because of its slow digestibility of starch and hence reduced energy available for production.

"We are nicknaming this project 'The Reverse Pig Paradigm' as, although

farmers want their pigs to gain weight as quickly as possible by feeding a low antioxidant white-grained sorghum variety, we are looking at ways to do the opposite in humans with the high antioxidant dark sorghum varieties," Dr Johnson said.

"Black sorghum has potential to develop foods with a higher antioxidant concentration than foods currently on the market. It also has potential for development of foods with a low glycemic index and high appetite suppression properties – a perfect combination for protection against development of obesity and related chronic diseases such as type 2 diabetes and cardiovascular disease.

"Also, as rainfall patterns continue to change and higher temperatures are being recorded, the resilient sorghum may be well-suited to food grain production. Unlike wheat that will die-off when drought-stressed, sorghum will go dormant, and come alive again with the next rain."

A small 100-gram sample of black sorghum donated by the Department of Agriculture, Fisheries and Forestry Queensland was all the team had to start off the growing program, but this year they managed to produce 20 kilograms of the seed on site at Curtin's Bentley campus, enough to perform rigorous research studies.

Dr Johnson said he was not only looking at black sorghum grain but other coloured varieties, aiming to design food products such as baked goods, breakfast cereals, pasta and snack foods that were both tasty and could deliver long-term health benefits.

"The problem with sorghum is the difficulty to process as there is no gluten in it, so this limits the type of food products that can be produced," Dr Johnson said.

"We have to think of novel ways to add texture to the products to make them more acceptable to consumers, like with a popcorn or puffing-type process."

The Curtin-led project is the first to involve large human clinical trials on coloured sorghum to substantiate health-related physiological benefits from eating them.

About Sorghum:

Sorghum is a summer-growing cereal crop native to Africa, and is the fifth most important cereal crop grown in the world, produced in large quantities in the USA, China, India and Africa. It is also a major crop in S.E Queensland and northern NSW. Sorghum grows in harsh environments where other crops do not grow well.

Contact:

Dr Stuart Johnson, School of Public Health, Curtin University
Tel: 08 9266 9486, Email: S.Johnson@curtin.edu.au

SUSTAINABLE TRANSPORT

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Professor Peter Newman, Director of the Curtin University Sustainability Policy Institute was riding high on sustainable transport in India this month on the way to the next stage of a Curtin research project.

CUSP has a team working on an AusAID project in India about 'Sustainable Transport and Deliberative Democracy'.

through deliberative democracy. Professor Janette Hartz-Karp runs this part of the project and has been using new technology that enabled the Bangalore Workshop to produce a consensus report at the end of one day's deliberation.

"I was delighted to find that Indian responses were just as enthusiastic to

nightmare. However the local council and a national politician announced after the Pune workshop that the detailed designs developed by the students and enhanced through the deliberative process, will be implemented".

"It has been a remarkably successful trip," Professor Newman said. "The hard work at developing partnerships and delivering a real project through a deliberative process has shown what can be done through a shared vision for change."

The team involved in these projects are Professor Peter Newman, Professor Janette Hartz-Karp, Dr Annie Matan, James McIntosh and Jan Scheurer from CUSP and Associate Professor Reena Tiwari from Urban and Regional Planning.

Contact:
Professor Peter Newman
Curtin University Sustainability Policy Institute
<http://sustainability.curtin.edu.au/>



It is based on two cities: Bangalore and Pune.

The Bangalore project is about how to develop an Indian model for funding a new rail line using value capture, a financing technique in which CUSP has particular expertise. This project is a partnership with the Indian Institute of Science (Centre for Infrastructure Sustainable Transport and Urban Planning, CiSTUP) and the State Government of Karnataka (Directorate of Urban Land Transport, DULT). The other project is in Pune and is about how to manage streets so that non-car users have greater priority. This is in partnership with the BN College of Architecture, Pune Municipal Corporation and two NGO's Parisar and the Centre for Environmental Education.

The project has three PhD students who are supported by scholarships from Curtin, AusAID and PATREC.

A major part of the innovation in the project is the way that full stakeholder approaches to the issues are taken

the new deliberative approach as in Australia", Professor Hartz-Karp said.

"The most absorbing part of the project," according to Professor Newman "is that in Bangalore the State Government has announced a commitment to building the new rail line and is seeking assistance from CUSP and CiSTUP to deliver it. This is not just a research project, it is a really important piece of infrastructure that needs our research in order to be delivered," he said.

An MOU between Curtin (CUSP), Karnataka State Government and IISc (CiSTUP) was announced by the Minister for Planning on October 9th at the deliberation workshop.

In Pune the project involves the development of a model area called Dattawadi to demonstrate how to enhance walking and cycling, as well as manage cars, motor bikes and parking.

"This is a tall order in any city," Professor Newman said, "but especially in a place where traffic has become a bit of a

GLOBAL WARMING & MASS EXTINCTIONS

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Researchers have discovered two of Earth's ancient mass extinctions wiped out life on the planet in a similar way to one another, providing a solid grounding on how mass extinctions happen.



St Audrie's Bay, United Kingdom, Credit: Felipe Opazo, Plymouth University

The Curtin University-led research, recently published in *Geology*, was able to demonstrate the cascade of events during the fourth largest extinction, at the end of the Triassic period 200 million years ago, were remarkably similar to those of the largest extinction that occurred at the end of the Permian 250 million years ago.

The research suggests perhaps all global warming-related mass extinctions show similar patterns of change.

From rock samples collected by colleagues in Plymouth University, lead scientists Professor Kliti Grice, Director of the WA Organic and Isotope Geochemistry Centre (WA-OIGC) program and Dr Caroline Jaraula and Dr Pierre Le Metayer, Research Fellows of the WA-OIGC program from Curtin, discovered and examined molecular fossils of land plants, algae and green sulfur bacteria (known as Chlorobi).

Alongside their international research team, they were able to determine the oceanic and atmospheric conditions that

caused the end-Triassic extinction 200 million years ago.

“Back then, the world's continents were being pulled apart to create what is now the Atlantic Ocean. This event was

accompanied by frequent, massive volcanic eruptions that injected great quantities of CO₂ into atmosphere, estimated at four times higher than today's levels based on plant physiology,” Professor Grice said.

“The high CO₂ levels triggered global warming; leading to a cascade of atmospheric and oceanic changes that were very similar to those that we found had caused the largest mass extinction, which happened 50 million years prior to this one.

“Of the five mass extinctions to have ever occurred in the past 600 million years, four were associated with global warming. Our research suggests if two of these had similar processes operating, perhaps all other global warming-related extinctions do too, helping us understand more about Earth's history.”

Dr Jaraula said the research team looked at stable carbon isotopes of molecular fossils of plant waxes, algae and chlorobi before, during and after the extinction period.

Professor Richard Twitchett of Plymouth University said the next step was to compare the results to changes in the fossil record of marine animals, to help understand how future marine extinctions are likely to occur.

“Our study has provided a glimpse of how extinctions happen and their rates of change. While ocean circulation and aspects of the carbon cycle will always be different, the general patterns of change can still be compared,” Professor Michael Böttcher, of the Leibniz Institute for Baltic Sea Research, Germany, said.

Professor Grice and her research colleagues previously determined the conditions of the largest extinction occurring at the end of the Permian, 250 million years ago in a report published in *Science* in 2005.

The recently published research in *Geology* was carried out in conjunction with Plymouth University and Leibniz Institute for Baltic Sea Research, Germany.

The research has been funded by the Australian Research Council under a QEII Discovery Fellowship awarded to Professor Grice and Professor Twitchett. Professor Grice has also recently been awarded a Discovery Outstanding Research Award to continue this research and investigate the recovery of the largest extinction events and their association with oil and gas resources on a global scale.

The paper, Elevated pCO₂ leading to Late Triassic extinction, persistent photic zone euxinia, and rising sea levels, is available at <http://geology.gsapubs.org/content/early/2013/07/10/G34183.1.abstract>

Contact:

Professor Kliti Grice, Department of Chemistry, Curtin University
Tel: 08 9266 2474; Email: K.Grice@curtin.edu.au
Dr Caroline Jaraula, Department of Chemistry, Curtin University
Tel: 08 9266 3819; Email: C.Jaraula@curtin.edu.au

OPINION: WA EMISSIONS SKYROCKET

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This article first appeared in The Conversation on the 28 October 2013 (<http://theconversation.com/federals-faff-with-carbon-western-australian-emissions-skyrocket-19266>)

The ability of a country to make its mind up says a lot about how prepared it is for the future, its resilience and its competitive standing.



How a country goes about reducing its carbon is very revealing. [Germany](#) always seem to have a clear resolve. [Korea's](#) low carbon growth plans are underway. Even [China](#) has got itself disciplined. [India, and Canada](#) seem to fuff.

In Australia, we have perfected the art of the fuff.

Australia's indecisiveness comes from the change-over of federal governments and their differing carbon legislation. While the carbon price was firmly in place, state governments abdicated their role in reducing emissions. Now the price is likely on the way out, that abdication is reaping a carbon harvest.

Much of the explosion in Australian emissions is coming from LNG. When *burned*, gas emits around half the carbon dioxide of coal. But *producing* LNG uses large volumes of energy. LNG production in the Pilbara is set to more than double by 2017.

Current production sits at [16.3 Million tonnes per annum](#) (Mtpa) of LNG. This will increase by 24.5Mtpa once the [Wheatstone](#) and [Gorgon](#) projects come online in 2017, and these will emit around [16Mtpa](#) of carbon dioxide, even with sequestration. LNG production is growing rapidly with a further 40Mtpa of expansions in the pipeline.

And if that energy comes from a fossilised source, by extension it produces large volumes of carbon dioxide. Further, natural gas contains varying amounts of carbon dioxide, which needs to be removed before making LNG. Around 4% is fairly typical.

The Pilbara in Western Australia is [responsible for](#) around 85% of Australia's LNG and 80% of crude oil and concentrate. Some of the gas projects in the Pilbara contain a great deal more than usual carbon dioxide, with Gorgon containing [14 per cent](#), which will sequester some but not all of this from the atmosphere.

In Western Australia, carbon emissions currently stand at around [76Mtpa](#). With the raft of new LNG and other industrial projects currently under construction, WA's emissions will [double](#) by around 2020.

To put that into context, WA's 2000 carbon emissions levels were 65Mtpa. It's a phenomenal increase.

In 2000, Australia emitted 565Mtpa of carbon dioxide equivalents. In 1990, when the Kyoto Protocol was created, it was nearly the same at 550Mtpa and currently sits at [556.4Mtpa](#).

Australia has unconditionally [committed](#) that by 2020 it will reduce its carbon emissions 5%, based on 2000 levels, equating to 28Mtpa. This would mean it should emit no more than 537Mtpa. Depending on what the rest of the world does, Australia has committed to further reductions of between 15 and 25%. According to Professor Ross Garnaut from the University of Melbourne, this [could](#) happen, requiring reductions down to between 423 and 480Mtpa.

Gas projects are currently subject to the Clean Energy Act, the so called "carbon tax". Under the current federal legislation, thanks to the [Jobs & Competitiveness Program](#), gas producers were granted a substantial carbon cost exemption of [66%, declining at 1.3% per annum](#).

West Australia had required Chevron to sequester the carbon from some of its Wheatstone emissions, but in January 2013, Chevron successfully lobbied to have that restriction [lifted](#). They argued that their carbon is "captured" under the federal carbon price. This was despite [the EPA's own independent expert advice](#) stating their case was "poor".

Using the same rationale, Shell got its greenhouse gas conditions removed from the WA environmental approval process for their Prelude floating LNG operation, again because the [project was covered](#) under the federal scheme. It's a similar story for greenhouse gas control conditions on the Browse LNG project that were recommended by the WA EPA and supported by the Appeals Committee.

And it's unclear whether the relinquished state-based controls are now being factored into the federal baselines and growth projections.

Another looming issue is the potential for fugitive carbon emissions from Western Australia's shale gas industry.

Continued overleaf...

There is a draft [methodology](#) for measuring [fugitive emissions for coal seam gas](#) in Australia, but no methodology has been produced for the shale industry, which is the latest fossil-fuel frontier.

In the US, regulators and industry have resorted to using “factor” estimates; these assume best practice for construction, operation and completion of shale projects. Further research using ambient monitoring has shown that actual emissions are a [great deal](#) higher. Given the dramatic expansion in LNG, and the uncertainty around shale emissions, the carbon budget doesn't seem to add up. Australia's carbon emissions quota is presently long on promises, long on lip service and short on accountability.

This is adding to a declining rank of Australia's [competitiveness](#), which - according to the World Economic Forum - fell behind New Zealand's as of 2013. Australia's competitiveness is only in the top brackets for food and pharmaceutical exports, financial markets, macroeconomic situation and the capacity to innovate.

Australia lags across a broad range of metrics, including bureaucratic red tape where we stand 128th out of 148 countries. Tidying up our carbon legislation could do wonders to reduce this.

Without a credible accounting and reduction plan, Australia's ability to play with the top table of countries like Germany, Denmark, Finland, the UK, Korea and Switzerland will be stymied. These countries see that their efficiency and competitiveness is linked to low carbon growth. If all Australia can muster is lip service, we'll be relegated to the carbon banana republic status, with the likes of India, Nigeria and Canada.

The Coalition claims that the current scheme is an expensive way to reduce carbon emissions. Their alternative - Direct Action - seeks to achieve reductions using a reverse auction, a kind of competitive grant, to buy abatement for their Emissions Reduction Fund. The Emissions Reductions Fund's [Terms of Reference](#) published last week offer no detail about how this might work. Meanwhile, the Coalition government told industry they [didn't need to pay](#) their third year's fixed price carbon payment, removing what little was left of the LNG producers' incentives to reduce their carbon emissions.

Apart from the carbon tax rebates being offered by the federal government, it is difficult to know what Direct Action will do to address Western Australia's burgeoning carbon profile. If it is allowed to grow unfettered, what burden will that place on the other Australian states and territories? Will they have to reduce their emissions by a great deal more than 5% to make up for Western Australia's dramatic carbon growth?

To be equitable, Direct Action needs to ensure the LNG industry sequesters much of its carbon and improves its efficiency. This will ensure a fair go for other industries and the rest of Australia. Germany is capable of being honest about its accountancy in money and carbon terms – the fact is the two are related.

Perhaps it's no coincidence that the richest country in the western world is also the one that's most honest about its carbon issues. When we learn to solve Australia's carbon problem, we won't just be helping the globe, we'll also be helping ourselves.

Jemma Green is a Senior Research Fellow at the Curtin Sustainability Policy Institute (CUSP)

Contact:
jemma.green@curtin.edu.au

About CUSP

Curtin University Sustainability Policy (CUSP) Institute was established in January 2008, headed by Professor Peter Newman. The idea of “sustainability” in a wide range of human endeavour is a relatively new concept, but is rapidly becoming a key issue in public policy theory and practice.

<http://sustainability.curtin.edu.au/>

Curtin scores two Green Gown finalists

Two Curtin University initiatives have been announced as finalists in the 2013 Green Gown Awards Australasia, recognising sustainability best practice in tertiary education institutions.

Both Curtin finalists – John Curtin Weekend and Supported Wage Workers in Motion (SWIM) – are in the social responsibility category.

John Curtin Weekend, run by Curtin Volunteers! since 1999, started last weekend and runs until October 12 and will this year support 47 (mostly rural) communities and feature 600 student volunteers.

The volunteers who take part in environmental and community activities as part of John Curtin Weekend, get a strong sense of engagement and broaden their perspectives on life.

SWIM, a project run by Curtin Human Resources, offers long-term, ongoing work opportunities to people with an intellectual disability and learning spectrum.

The SWIM initiative has already assisted 16 people, who may otherwise have not been able to find work, secure employment at Curtin.

SWIM is part of the voluntary outcome, related to provision of employment opportunities for people with disabilities, which Curtin has added to its mandatory Disability Access and Inclusion Plan.

The winners of the seven categories of the 2013 Green Gown Awards Australasia will be announced at a ceremony in Sydney on September 26.

Curtin is the only Western Australian university among the finalists. The Green Gown Awards started in the UK in 2004 and the Australasian version is conducted by Australasian Campuses Towards Sustainability (ACTS). "Towards Sustainability (ACTS) employers," Professor Downie said.

Contact:
Simon White, Media Consultant, Curtin University
Tel: 08 9266 1931; Mobile: 0401 103 683; Email: simon.white@curtin.edu.au
Web: <http://curtin.edu.au>; Twitter: @CurtinPR

Millennium Kids

Millennium Kids (MK) is a Not for Profit Organisation based in Western Australia with outreach programs and partnerships in Java, South Africa and Malaysia.

The organisation is run by young people and was established in 1996 in response to their demand to have a say about their environment and their world. Not wanting to just talk about things Millennium Kids is about **advocacy and action.**

Who are Millennium Kids?

They are a group of young people aged 10 – 25 years who are committed to **improving our environment through constructive action.** The programs are directed by the Youth Board and are supported by United Nations Declaration Agenda 21 Chapter 25 "national governments should pay more attention to the opinions and concerns of young people regarding the environment."

What does Millennium Kids do?

MK's aim is to develop local, regional and international partnerships which empower young people to explore, **identify and address environmental issues** through information exchange, membership networks and on the ground action and development of youth leadership issues.

How we MK it?

Millennium Kids Inc **consults with young people** using the MK Ten Step Inquiry Methodology to find out what young people like about their community, what they don't like about their community and what they want to change. Through the process **young people identify issues and concerns and look at the challenges and opportunities to solve these problems.** The ten step, multi stakeholder process allows young people to research the issue, consult with stakeholders, learn new skills and develop a plan to address their concerns. Most importantly, **young people get to put their plans into action and evaluate their own programs.** The process can be school or community based. The MK Ten Step Inquiry Methodology can be used as a consultation step with Australian Sustainable Schools Initiative – the **youth voice process.**

To find out more email info@millenniumkids.com.au

Lakhnu Rural Community Development Project

The Lakhnu Rural Community Development Project is being conducted by School of Built Environment at Curtin, in association with the Indian non-government organisation India Rural Education and Development Inc. (IREAD).



As part of the long-term, community-based program, students and academics are working with villagers in Lakhnu to assist with the development of village housing, the conservation of an abandoned school building, and broader issues of education, employment and infrastructure. Associate Professor Reena Tiwari, Professor John Stephens, Associate Professor Dianne Smith, Jake Schapper and Priya Metcalfe are leading the project and providing expertise in the areas of planning, heritage, architecture/interior architecture and community engagement processes.

Contact:
Associate Professor Dr Reena Tiwari
Department of Architecture and Urban Planning
Curtin University
r.tiwari@curtin.edu.au
Tel | +61 8 9266 4730
Fax | +61 8 9266 2711

EVENTS & BOARD MEMBERSHIP

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Upcoming ASDI Events

Supporting material (iLectures, notes, etc) for the majority of the following events can be found at www.asdi.org.au

19 November 2013 10am—11:00am

Biomimicry: the next big thing
Council Chamber
Building 100, Level 3
RSVP to K.pilgrim-byrne@curtin.edu.au

19 February 2014

Global Warming and Mass
Extinctions
Professor Kliti Grice

Affiliated Events

25th-28th March 2014

Indian Ocean Futures

Call for Abstracts:
<http://www.iofc2014.com/>

ASDI External Board

Mr Keith Spence (Chair)

Keith was most recently Executive Vice President Enterprise Capability for Woodside and was responsible for ensuring the business operated with the best people, technology and processes. He was also responsible for building a skilled and technologically advanced workforce through targeted recruiting and enhanced training and played a key role in representing Woodside's interests to the government and the public. In addition, he was responsible for Woodside's Western Australian gas supply interests.

Mr Barry Carbon, FTSE, AM

Mr Carbon's experience includes: Chief Executive of the Ministry for the Environment, New Zealand; Director General-Queensland Department of Environment and Heritage; Director General-Queensland Environment Protection Agency, including Parks and Wildlife; Executive Director, EPA, Commonwealth of Australia; The Supervising Scientist, Alligator Rivers Region; Chairman and Commonwealth Representative, National Environment Protection Council Committee and served on the Environment Protection Authority of Western Australia as Chairman from 1985 – 86 and as Chairman and Chief Executive from 1986-93.

Ms Michelle Andrews

Michelle Andrews has recently commenced as the Deputy Director General, Strategic Policy at the Department of Mines and Petroleum (DMP). Prior to the position she was the Executive Director of State Initiatives at the Department of State Development (DSD).

She has also contributed to the State Government's approval process reforms, including establishing the new Office of the Environmental Protection Authority (EPA).

She has been involved in environmental approvals for major development projects, including the Gorgon project, Chevron's Wheatstone project and the Oakajee Port and Rail project.

ASDI Internal Board

Professor Graeme Wright,
Deputy Vice-Chancellor, Research and Development

Professor Andris Stelbovics,
Pro Vice-Chancellor, Science and Engineering

Professor Majella Franzmann,
Pro Vice-Chancellor, Humanities

Professor Grant O'Neill
Dean, Accreditation, Strategy and Change
Curtin Business School

Executive Director, ASDI

Mr Mike Burbridge
Research & Development
Room 111
Level 1
Building 100
Kent Street
Bentley WA 6102
08 9266 4243

To get in touch:
mike.burbridge@curtin.edu.au

AFFILIATED INSTITUTES AND CENTRES

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Asia-Australia-Pacific Institute

Professor Graham Seal
Tel: +61 8 9266 3234
Email: g.seal@curtin.edu.au
research.humanities.curtin.edu.au/
centres/aapi/

Centre for Excellence Science Seafood and Health

Professor Alexandra McManus
Tel: +61 8 9266 2115
Email: a.mcmanus@curtin.edu.au
cessh.curtin.edu.au

Centre for Marine Science and Technology

Dr Christine Erbe
Tel: +61 8 9266 7543
Email: c.erbe@curtin.edu.au
cmst.curtin.edu.au

Materials Research

Professor Arie van Reissen
Tel: +61 8 9266 7090
Email: a.vanreissen@curtin.edu.au
cmr.curtin.edu.au

Centre for Sport and Recreation Research

Professor Marian Tye
Tel: +61 8 9266 4844
Email: m.tye@curtin.edu.au
research.humanities.curtin.edu.au/
centres

Fuels and Energy Technology Institute

Professor Chun-Zhu Li
Tel: +61 8 9266 1133
Email: chun-zhu.li@curtin.edu.au
energy.curtin.edu.au

Biodiversity and Climate

Grant Wardell-Johnson
Tel: +61 8 9266 3702
Email: g.wardell-
johnson@curtin.edu.au

Department of Agriculture and En- vironment

A/Professor Mark Gibberd
Tel: +61 8 9266 7907
Email: m.gibberd@curtin.edu.au
muresk.curtin.edu.au

Curtin University Sustainability Policy (CUSP) Institute

Professor Peter Newman
Tel: +61 8 9266 9032
Email: p.newman@curtin.edu.au
sustainability.curtin.edu.au

Curtin Water Quality Research Centre

Associate Professor Jeffrey Charrois
Tel: +61 8 9266 7267
Email: j.charrois@curtin.edu.au
cwqrc.curtin.edu.au

Housing and Urban Research In- stitute of Western Australia

Dr Steven Rowley
Tel: +61 8 9266 7721
Email: ste-
ven.rowley@cbs.curtin.edu.au
huriwa.edu.au

International Institute for Agri- Food Security

Professor Janet Bomman
Tel: +61 8 9266 4575
Email: janet.bornman@curtin.edu.au
[http://business.curtin.edu.au/
research/centres_institutions/iaafs/
about_iaafs.cfm](http://business.curtin.edu.au/research/centres_institutions/iaafs/about_iaafs.cfm)

John Curtin Institute of Public Policy

Professor John Phillimore
Tel: +61 8 9266 2849
Email:
j.phillimore@curtin.edu.au
jcipp.curtin.edu.au

Sustainable Engineering Group

A/Professor Michele Rosano
Tel: +61 8 9266 4240
Email:
m.Rosano@curtin.edu.au
cleanerproduc-
tion.curtin.edu.au

WA Organic and Isotope Geochemistry Centre

Professor Kliti Grice
Tel: +61 8 9266 2474
Email: k.grice@curtin.edu.au
chemistry.curtin.edu.au/
research/
wa-oigc.cfm