

# R&D NOW

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The Magazine of the Office of Research and Development

## Highway to health

Researchers get the data linkage breakthrough

## Mass spectrometry

40 years on and still going strong

# Pole Position

Australia lines up for SKA



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# Curtin's Research Strengths

Curtin is renowned for practical research that solves real-world problems. Curtin's four areas of research strength that serve to focus our research endeavours are:

## Resources and energy >

Curtin supports Australia's key industry sector with high-impact research and development in areas such as mining, engineering and chemistry. To this end, the Resources and Chemistry Precinct – a major initiative – will open at Curtin's Bentley Campus in November 2009.

## ICT and emerging technologies >

Curtin's ICT research continues to grow at the Institute for Multi-sensor Processing and Content Analysis, the Digital Ecosystems and Business Intelligence Institute, and the Department of Spatial Sciences which undertakes world-class research in geodesy, GIScience and remote sensing. ICT also underpins Curtin's work in emerging technologies, such as research in nanotechnology at the Western Australian Nanochemistry Research Institute.

## Health >

Curtin is the most comprehensive provider of health sciences research in Western Australia. Our expertise in population health, ageing, chronic disease, Indigenous health and mental health was recently boosted by the establishment of the Curtin Health Innovation Research Institute which aims to produce new models of health care that address the changing needs of Australian communities.

## Sustainable development >

Curtin recently launched the Australian Sustainable Development Institute (ASDI). The institute combines scientific research, engineering and social science in its focus on three key challenges for sustainable development: energy, water and coastal zone management. ASDI brings together the expertise of 16 research centres to tackle issues linked with climate change, diminishing resources and population growth.

# R&D Overview

“ This edition of *R&D Now* showcases a number of research programs that illustrate Curtin's outstanding research leadership and our strong engagement with industry. ”

The first half of 2009 has been very successful for Curtin's research endeavours. Our researchers continue to excel internationally, with several notable achievements.

Professor Peter Howat, Director of the Centre for Behavioural Research in Cancer Control, has been awarded a Fellowship in the American Academy of Health Behavior. He is only the second Australian resident to become a fellow of the academy. Professor Howat has authored more than 280 publications, including more than 120 refereed journal articles, and has been the principal or co-investigator on 92 research grants.

I congratulate Dr Helen Armstrong, from the School of Information Systems, who was awarded the prestigious Western Australian IT Achiever of the Year Award at the 18<sup>th</sup> WA Information Technology and Telecommunications Awards held recently. The award recognises an individual's outstanding contribution to the IT&T industry in WA, and Dr Armstrong is the first woman to have won the award.

The Curtin Institute of Radio Astronomy, launched in December 2008, will play a major role in the \$20 million International Centre for Radio Astronomy Research, an initiative of the Western Australian Government to support Australia's bid for the international Square Kilometre Array project. Curtin is also the lead organisation in a State Centre of Excellence for radio astronomy, under the leadership of Premier's Fellow Professor Steven Tingay and Professor Peter Hall, Chair of Radio Astronomy Engineering.

The Faculty of Health Sciences has won several prestigious grants from the National Health and Medical Research Council. Associate Professor Tony Butler, from the National Drug Research Institute at Curtin's Shenton Park Campus, was awarded \$2.3 million to develop capacity in Indigenous offender health research, building a team of

Indigenous researchers and creating an Australia-wide network for sharing knowledge in this field. Professor Jan Piek, from the School of Psychology, was awarded \$2.4 million to build critical mass of Indigenous and non-Indigenous researchers, to develop a sustainable, culturally appropriate mental health policy and service model.

Curtin's commitment to high-quality research continues to attract high-calibre recruits. Professor Chun-Zhu Li joined the School of Chemical and Petroleum Engineering this year as Professor Clean Coal Technologies, and he leads the Curtin Centre for Advanced Energy Science and Engineering. Professor Mark Buntine has been appointed the new Head of Chemistry as the department prepares to move into the \$116 million Resources and Chemistry Precinct later this year. Professor Peter Teunissen, winner of a prestigious Australian Research Council Federation Fellowship, joins the Department of Spatial Sciences from Delft University of Technology in the Netherlands. Dr Marian Tye joins Curtin as Director of the Centre for Sport and Recreation Research, a centre formed through collaboration between Curtin and the State Department of Sport and Recreation. A senior academic, Dr Tye's research areas include entrepreneurship, business synergies and physical education, and she has lectured in sport, health, recreation, physical education, arts and business.

This edition of *R&D Now* showcases a number of research programs that illustrate Curtin's outstanding research leadership and our strong engagement with industry. We look forward to a productive year ahead as we continue our leadership in excellent and innovative research.

**Professor Linda Kristjanson**  
Deputy Vice-Chancellor  
Research and Development

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# LABS ADD POLISH TO PRECINCT

Advanced laboratories are being outfitted for research teams as they prepare to move to the \$116 million Resources and Chemistry Precinct later this year.

Anticipation is growing among research teams which will soon have access to laboratories unlike any they've previously used in Western Australia.

"We'll double our lab space and have an entire new H<sub>2</sub>S environment for sour service," said Professor Rolf Gubner, who leads the Western Australian Corrosion Research Group.

"We have very strong relationships with industry partners, and the precinct provides us with another level of capability for research and consultancy."

Gubner's team is one of several within Curtin's Department of Chemistry that will relocate to the precinct. Professor Mark Buntine, Curtin's newly appointed Head of Department of Chemistry, is enthusiastic about the future of all research teams within the University's strong chemistry program. The precinct's advanced research laboratories will no doubt boost Buntine's own research output in laser chemistry and spectroscopy and computational chemistry.

"The Chemistry Department is also working to increase our involvement in chemical synthesis relevant to the biomedical and biomolecular sciences," Buntine said.

"Furthermore, the precinct's advanced teaching laboratories, together with the presence of ChemCentre at the state-of-the-art facility, will attract quality students to the enabling sciences."

The precinct's main building will also house the Nanochemistry Research Institute, the WA Organic and Isotope Geochemistry Centre, led by Professor Kliti Grice, and the Curtin Water Quality Research Centre, led by Associate Professor Anna Heitz.

ChemCentre – the WA Government's flagship chemical science facility – will relocate from the Perth CBD (where it has been based since the 1950s) to the precinct. Those working in areas such as minerals resources and hydrometallurgy will also be able to collaborate easily with other world-renowned research groups and industry partners, all within walking distance.

# Was the clock set wrong?

Research using the most sophisticated instrument available for isotopic analysis of micrometer-sized samples may have made redundant a decade-long scientific dilemma about the discrepancy between the rise of atmospheric oxygen and the existence of the Earth's first photosynthesisers.

In 2008, Professor Birger Rasmussen and three other geochemists were working to develop new techniques for analysing the carbon isotopic signatures in organic matter, to gain information about ancient biological processes and early life. Their research has led to an Australian Research Council (ARC) Discovery Project. More importantly, their remarkable results were published last year in the prestigious science journal *Nature*.

The team – comprising Dr Ian Fletcher, Rasmussen's colleague at Curtin's Department of Applied Geology, Dr Matt Kilburn, from The University of Western Australia (UWA) and Dr Jochen Brocks, from the Australian National University – showed that long-standing biomarker evidence for the existence of cyanobacteria (photosynthesising bacteria) and eukaryotes (organisms with cells containing a nucleus) 2.7 billion years ago is flawed.

Establishing when cyanobacteria proliferated is significant because from that point on oxygen was being released (as a byproduct of photosynthesis) into the Earth's atmosphere. The availability of oxygen enabled the evolution of early complex life – organisms that used aerobic respiration to acquire energy – and on to the rapid biodiversification of life on Earth.

"Our research has shown that the oldest, unequivocal fossil evidence for cyanobacteria is 500 million years younger than has been widely accepted. Geochemical evidence, however, indicates cyanobacteria existed before 2.3 billion years ago; this is the time of the Earth's first major oxidation event," Rasmussen explained.

The shale sampled by Rasmussen's team contained biomarkers known as hopanes and steranes, which are characteristic of cyanobacteria and eukaryotes, respectively. In 1999, a research team (which included Brocks) extracted these biomarkers using solvents, and concluded they were derived from organisms deposited in the shale 2.7 billion years ago.

"However," said Rasmussen, "we can see that organic matter in these rocks has been subjected to levels of heating that would have destroyed any indigenous biomarkers long ago."

"We also found the ratios of carbon isotopes (<sup>13</sup>C/<sup>12</sup>C) in the biomarkers, which should have been similar to the indigenous organic matter, to be vastly different from both the matrix pyrobitumen and the co-occurring kerogen in the sediment.

"The biomarkers couldn't be the same age as their host rock – they must be younger contaminants."

The new research was possible due to the development of an instrument that provides ultra-high resolution isotopic mapping. As part of the John de Laeter Centre, the Cameca NanoSIMS-50 ion microprobe (housed at UWA) can measure the isotopic composition of particles as small as a few micrometers in situ within a sample.

[geology.curtin.edu.au/local/research.html](http://geology.curtin.edu.au/local/research.html)

## Professor Chun-Zhu Li

Director  
Curtin Centre for  
Advanced Energy Science  
and Engineering  
Faculty of Science  
and Engineering



Professor Chun-Zhu Li took up the position as Director of the new Curtin Centre for Advanced Energy Science and Engineering earlier this year. An authority in the area of energy science and engineering, his work on coal, particularly brown coal or lignite, has covered a wide spectrum of topics, including the pyrolysis, gasification, liquefaction and combustion of coal, as well as coal structure and properties. His expertise also includes biomass utilisation, natural gas conversion and the production of diesel from waste plastics.

Under Li's leadership, the Curtin Centre for Advanced Energy Science and Engineering is developing novel technologies for fossil fuels and renewable energy sources. In partnership with Spitfire Oil Pty Ltd, the centre is working to develop a technology for converting low-grade lignite in Western Australia into liquid fuels and chemicals. Importantly, the novel technology will have a smaller carbon footprint than conventional coal-to-liquid technologies.

The centre is also investigating the utilisation of mallee biomass grown in WA. Most notably, Li is leading a major international collaborative project supported by the Asia-Pacific Partnership on Clean Development and Climate, which involves researchers in Australia, China, Japan and Korea. The project aims to develop a novel biomass gasification technology for distributed power generation.

Li's team is also working on the production of liquid transport biofuels from the pyrolysis and bio-refinery of mallee biomass; a project which is supported by Australian federal funding agencies. The hydrolysis of mallee biomass to produce sugars is another novel technology of biomass utilisation the centre is developing – a project led by the centre's Deputy Director, Associate Professor Hongwei Wu. Li also has keen research interests in the area of catalysis, which will contribute to the endeavour of converting WA's abundant natural gas into liquid fuels and valuable chemicals.

Li has established productive international alliances, especially with researchers in Japan, China, Korea and the US.

Since receiving his PhD in chemical engineering from Imperial College London in 1993, he has authored or co-authored more than 200 papers in international journals and conference proceedings. He serves on the editorial and/or advisory boards of seven international journals, including *Process Safety and Environmental Protection*, *Fuel* and *Energy & Fuels*.

## Professor Rolf Gubner

Director  
Western Australian  
Corrosion Research Group  
Professor of Corrosion  
Chemistry  
Faculty of Science and  
Engineering



Late in 2008, Curtin appointed Dr Rolf Gubner as the inaugural Professor of Corrosion Chemistry and as Director of the Western Australian Corrosion Research Group (WACRG), based within Curtin's Department of Chemistry. The position is jointly funded by Woodside Energy Limited and Chevron Australia, and demonstrates the commitment by Curtin and its industry partners to the advancement of corrosion science.

Gubner brings to the role comprehensive experience in large projects in corrosion control and mitigation. His research (most recently at the Swedish Corrosion and Metals Research Institute AB) includes, for example, projects in corrosion prevention of infrastructure such as subsea and offshore equipment, bridges and water mains.

Gubner also brings to Curtin a commitment to both research and education that will reduce the high cost of corrosion to Australia. To this end, his vision is for the WACRG to be a "corrosion knowledge centre" that is active in teaching and training as well as research and consulting.

His current research focus includes microbially induced corrosion (MIC) of seawater injection wells in oil and gas plants. This expertise is being applied to WACRG research into MIC of common steel alloys used in the construction of subsea equipment (a collaboration with CSIRO, and supported by the Western Australian Energy Research Alliance and Chevron).

Gubner is also focused on the assessment and development of corrosion inhibitors for the offshore environment. The WACRG is working to address industry's long-standing problem with top-of-the-line corrosion, with new techniques for delivering corrosion inhibitors to susceptible areas of wet gas carbon steel pipelines.

Gubner joined Curtin, impressed that the University is "one of the few that is increasing its support of natural sciences – demonstrated, for example, by the new Resources and Chemistry Precinct". Already he has increased Curtin's corrosion research and consultancy capabilities, and appointed four new research staff.

Gubner obtained his PhD in chemistry in 1998 at the University of Portsmouth, in the United Kingdom. In 2003, he was awarded International Scientist of the year by the International Biographical Centre (Cambridge, UK).

He is the current Vice-President of the European Federation of Corrosion and a member of the editorial board for the high-impact journals *Corrosion Science and Technology* and *Materials and Corrosion*.

## Diversity on the board

The ratio of men to women at board director level is about 10:1 for firms listed in the ASX200. Many firms could be strategically addressing the imbalance now that research from Curtin's Graduate School of Business has shown they may be better equipped to address sustainability if women serve on the board.

A recent study by the Graduate School of Business's (GSB) Dr Jeremy Galbreath focused on whether a link existed between boards that had women serving as directors and corporate sustainability – economic, environmental and social.

Galbreath's investigation was compelled by a trend that has called for firms to move beyond narrow financial self-interest to respond to stakeholder demands for environmental quality and social responsiveness.

"Recent corporate scandals and concern over large bonuses for management have encouraged public scrutiny on organisational conduct," Galbreath said.

"Corporate sustainability means that firms will perform in challenging economic climates, and respect the interests of multiple stakeholders and respond to their requirements."

While previous research had established a positive link between women directors and solid financial performance, Galbreath realised that management researchers and practitioners would benefit from research that investigated whether female directors and sustainable performance were linked.

To ascertain the economic performance of firms listed in the ASX, in 2007 he collected and analysed data from secondary databases, and then studied the environmental and social dimensions of the sampled firms using content analysis of annual reports. The results showed a positive association between women directors and economic and social performance.

"There are several reasons for this. Firstly, male board members tend to have had a continuous background in business enterprise – they're accustomed to reacting solely from an economic viewpoint," Galbreath said.

"They may also be more apt than women to behave unethically, for example, by subverting shareholder funds for personal gain through large bonuses and other executive perks.

"Female board members, on the other hand, often come from 'social' organisational roles – for example, not-for-profit organisations or charities. Research suggests that women encourage business integrity and are more inclined to ensure codes of ethics are in place and enforced, which can protect against misuse of shareholder funds."

Diversity in the organisational backgrounds of board members is also likely to encourage wider discussion about the firm's corporate behaviour and critical debate about board responsibilities and processes.

"Having more women on boards helps ensure that economic activities are balanced against environmental and social requirements. This may be due to the greater 'relational' capabilities of women, who work to see that all stakeholder requirements and concerns are addressed – not just those that are economic in nature," Galbreath said.

"Female directors help channel communication between a firm and its stakeholders. This provides a good avenue for facilitating corporate sustainability."

[cbs.curtin.edu.au/business/research](http://cbs.curtin.edu.au/business/research)

## PERSONAL SPACE

"They're not just about wars, they're about people and memory," said Associate Professor John Stephens, discussing the community significance of war memorials.

A possible reason for Stephens' conclusion might be the trend for war memorials to be designed as landscapes for people to inhabit – enter, traverse and reflect.

"War memorials have been moving towards abstract designs, and away from traditional designs that are tied to cemetery architecture," Stephens said.

"Spaces like the new Mandurah War Memorial are intended to be interactive as well as contemplative, while incorporating symbolic elements of wartime narratives."

After noticing a resurgence of war commemoration in WA and elsewhere, Stephens decided to investigate the reasons for the renewed public interest in memorials. He began a research project in 2006, with an assumption that war memorials are primarily about war.

"We found just the opposite. War memorials are important to all sorts of people for all sorts of reasons, but the glorification of war is not one of them," he said.

"For example, many younger people are interested in memorials because they're re-evaluating the Anzac story on a personal level. Anzac Day commemorates a distant event, but endures as an important part of Australian mythology.

"It reflects a contemporary curiosity about notions of identity. There has been a recent episodic surge of interest in memorials, generated by the end of the Cold War and evidenced by the 'Australia remembers' campaign of 1995. More recently, the threat of terrorism has probably helped to buoy this trend. Such events encourage spurts of collective memory activity in the population."

The project, Remembering the Wars: Community significance of Western Australian war memorials, is being undertaken by a team at Curtin's School of Built Environment in partnership with the Returned and Services League (RSL), and supported by the Australian Research Council.

The work has involved studying the history, design and significance of 40 war memorials in WA, and interviewing members of RSL branches around the state. The team has also been exploring the RSL's state headquarters archives in Perth.

"We were astonished at the amount of resource material on war commemoration. There are piled boxes of records and photographs in basements waiting to be discovered," Stephens said.

The team's research findings to date were published last year

in the book *The Importance and Care of Western Australian War Memorials* – a community resource book which considers the connections between community meaning and memorial design, and the importance of war memorials as instruments of citizenship and cultural values.

"The RSL was not only interested in us being able to develop the public's understanding of war commemoration, but also, on the practical side, it was important to promote strategies for the interpretation and conservation of memorials as community architecture," Stephens said.

[humanities.curtin.edu.au/schools/BE](http://humanities.curtin.edu.au/schools/BE)



# ALL THE WAY TO SKA

The International Year of Astronomy 2009 is an ideal time to commend the Curtin Institute of Radio Astronomy for the pace of its progress and achievements in major international projects.

The December 2008 launch of the Curtin Institute of Radio Astronomy (CIRA) was a highlight for the University. Combining physics and engineering in the field of radio astronomy, CIRA

became the first cross-disciplinary research centre of its kind at an Australian university, and demonstrated Curtin's determination to position radio astronomy as a science and technology strength for Western Australia.

CIRA is jointly led by Premier's Research Fellow Professor Steven Tingay (astrophysics and technical astronomy research) and Professor Peter Hall (engineering research and industry collaboration), who is the only Chair in Radio Astronomy Engineering in Australia.

Tingay and Hall have been capacity-building Curtin's expertise in radio astronomy since joining the University last year. CIRA will soon have about 25 researchers focusing on the development of pathfinder technologies for the proposed international \$2 billion Square Kilometre Array (SKA) project.

Eagerly awaited by astrophysicists everywhere, the SKA will enable an unprecedented amount of new knowledge about the evolution of the Universe. It will offer information about 'dark energy', gravitational physics and cosmic magnetism, for example, and reveal countless more wonders of the cosmos.

The apparatus will consist of thousands of individual antennas positioned across a 3,000-kilometre continental area. By 2012, the international SKA Science and Engineering Committee, and government agencies around the world, will have decided whether to build the SKA in southern Africa or in Western Australia's radio-quiet Murchison area.

The SKA will require vast amounts of resources and numerous breakthrough technologies, and is therefore triggering pathfinder projects across the world. Australia and southern Africa are now intensely developing and promoting their SKA capabilities and readiness.

**AUSTRALIA'S CASE** for hosting the SKA project has been strengthened by the Federal Government's May budget announcement that \$80 million will be allocated to a new Australian National Centre for SKA Science to be established in Perth.

The federal support follows a recent \$20 million investment by the WA Government in the International Centre for Radio Astronomy Research (ICRAR). Hall and Tingay are Deputy Directors of ICRAR, which is an equal joint venture between Curtin and UWA that is focused on technical astronomy, science and engineering aspects of the SKA.

Tingay is Project Manager for the Murchison Widefield Array (MWA) project under development at the Murchison Radio-astronomy Observatory. The project is a major international collaboration between a number of US, Indian and Australian research teams.

"The MWA will be a completely new type of radio telescope. Rather than an array of dishes, the MWA will be a configuration of 'tiles', each consisting of 16 antennas," Tingay said.

"The major advantage of the MWA instrument is that it has no moving parts, so the integrity of the acquired data is unlikely to be compromised."

Tingay's world-renowned expertise in a technique known as Very Long Baseline Interferometry (VLBI) has led to other breakthrough projects in WA.

"VLBI combines and measures radio signals simultaneously from an array of telescopes separated by hundreds to thousands of kilometres," he said.

"We've been developing software correlation techniques for the technology which will require high-speed optical fibres and a cache of supercomputers [to process terabytes of astronomical data].

"These will generate real-time, wide-field images of the radio sky, and reveal more of the Universe's radio phenomena in exquisite detail."

Tingay's ICRAR team, in collaboration with CSIRO, recently demonstrated how astronomical data could be transferred between the radio receivers on one side of Australia and computational facilities on the other. The demonstration used an AARNet transcontinental 10 Gbps connection, and was supported locally by IVEC (WA's advanced-computing facility).

Hall joined Tingay at Curtin in 2008, coming from the position of International Project Engineer for the SKA and bringing unmatched insight into the design of the instrument and the policy development surrounding it. His research is concerned with the development of pivotal engineering technologies required for the SKA, and of decision-making tools for what is an extremely complex science and engineering design environment.

"For example, CIRA will be concerned with the development of next-generation aperture array antennas, which is a natural fit to our present work on the MWA," Hall said.

"At the local level, we're working with Poseidon Scientific Instruments on the design and manufacture of MWA receiver systems and other electronics, with a view to extending the collaboration to new arrays."

Hall also chairs the international Power Investigation Task Force for the SKA.

"The development of an efficient, alternative energy scheme for remote sites is a critical goal," he explained, "and CIRA is working closely with Horizon Power to achieve this."

Hall and Tingay are also applying their complementary skills to the design of software and hardware instruments for the detection of cosmic transients: a new class of astronomy that promises to reveal the time-variable nature of the Universe, giving insight into new astrophysics.

Clearly, CIRA's capabilities for developing infrastructure and new technologies will enable many advances in radio astronomy. The International Year of Astronomy has marked the beginning of a brilliant future.

[astronomy.curtin.edu.au](http://astronomy.curtin.edu.au)

## Highway to Better Health →

Better health outcomes for individuals and communities are the end goals of a major collaboration to establish Australia's Population Health Research Network.

Consisting of nodes distributed throughout Australia, the Population Health Research Network (PHRN) will provide Australian health researchers with high-tech health data linkage facilities and services.

But why is it important to efficiently link health data?

"Because all too often health policy is formed on an ad hoc basis to meet deadlines, without high-quality data to support the policy or expenditure," said Curtin's Professor of Health Services Research, James Semmens.

"Health researchers know that collated health data has been under-utilised. This affects health policy, the provision of health services and individual health outcomes."

The Commonwealth Government has responded to the need and is providing \$20 million for the PHRN, supplemented by a further \$31.7 million from state governments and academic institutions, via the National Collaborative Research Infrastructure Strategy program. Curtin has been provided

with a budget of \$3.6 million over a four-year period to establish and run the network's Centre for Data Linkage (CDL).

The CDL will comprise a secure data linkage facility that links Commonwealth and jurisdictional datasets – and between those datasets and research datasets – using demographic data. The CDL will collate jurisdictional linkages into a national system, and assist with the delivery of linkable data to health researchers.

"The responsibility reflects our success with the WA Record Linkage Project and the Data Linkage Australia Centre of Excellence (WA) over the past 15 years. Security and privacy of data is a priority for the project, which will institute WA's best practice protocols and block requests for identified data," Semmens said.

"It's important to understand the CDL won't hold the datasets, but will link the demographic data that has been separated from the remainder of each dataset to create 'linkage keys'.

"Such complex integration of health data sets is enabled by the technological advancements that have paved the way for this project."

During the next six months, a number of international researchers will arrive in Perth to help establish the CDL and coordinate the essential infrastructure for maximising data linkage. The executive team currently includes Professor Christine O'Keefe, who has been seconded from CSIRO; James Boyd, who has been central to the development of the Scottish Record Linkage Project; and Anna Ferrante, seconded from The University of Western Australia and who has been responsible for the development of the WA Crime Research Database.

"The CDL team will also have a vital research role in the development of better data linkage systems and methods. And a key part of that will be the evaluation and quality assurance of new linkage systems and methods," Semmens said.

"I anticipate that the PHRN will transform the way that taxpayer funds are spent on public health. So, returning to a point I've made before, I don't think we should be asking whether it's ethical to do data linkage; the question is whether it's ethical not to."

[healthsciences.curtin.edu.au/research](http://healthsciences.curtin.edu.au/research)

## Associate Professor Dawn Bessarab

Centre for International Health  
Faculty of Health Sciences



Associate Professor Dawn Bessarab joined Curtin's Centre for International Health in 2008, with a four-year research grant to help develop high-impact research in Indigenous health.

With a career background in Indigenous-specific social work – particularly in family and domestic violence, community development, child protection and justice issues – Bessarab considerably bolsters Curtin's expertise in Indigenous health research. Her past role with the then Western Australian Department for Community Development and the Department of the Attorney General involved promoting and developing Indigenous child protection services and Indigenous policies and services in the justice arena across WA courts.

Bessarab's research approach to Aboriginal health and wellbeing comes from a psycho-social perspective. While working in child protection, she developed a strong interest in the gender roles that exist in contemporary Indigenous society. Her PhD in social work, completed at Curtin in 2007, explored notions of identity and meanings of gender for Aboriginal people living in both urban and regional settings. She intends to soon focus this area of research into how Aboriginal women, in particular, negotiate their domestic relationships.

Bessarab is working on a number of nationally funded research projects in Indigenous health. One of these, Not Just Scholars But Leaders: Learning Circles in Indigenous Health Research, has a 21-member team of investigators who are working to build the capacity of Indigenous researchers to conduct Indigenous-specific population health research that translates into policy and practice. Funded by the National Health and Medical Research Council (NHMRC), the project's themes include Indigenous communities, health services, lifestyle, behaviour and susceptibility to disease, and pathways to resilience and wellbeing.

Bessarab is also working on the Restor(y)ing Aboriginal Parenting Project – another highly collaborative Healthy Start to Life project with the Telethon Institute for Child Health Research, which is also funded by the NHMRC. The aim of the project is to develop and evaluate a culturally relevant parenting program for Aboriginal parents of young children. The end goal is to restore identification with culture, promote parental confidence, knowledge and child rearing skills, and enhance resilience in Aboriginal children.

## Floating Ideas

Eminent naval architect and ship designer Dr Nigel Gee foresees an urgent need for engineers and naval architects able to address emerging demands in a new era of innovation for marine technology.

Dr Nigel Gee arrived from the UK in late 2008 to visit Curtin as the inaugural recipient of the Innovator-in-Residence fellowship, with predictions of a new era in marine innovation, propelled, in part, by "policies that respond to climate change driving greener solutions for marine vessels – lower-power ship designs, lower emissions, bigger ships".

He is known for his groundbreaking pentamaran ship design, and for the design of the world's fastest, large naval vessel for the US Navy (the X-craft) and the fastest passenger-only catamaran in the world. His four-month visit to Curtin was an initiative by the Director of the Centre for Marine Science and Technology (CMST), Dr Kim Klaka.

"Nigel is an internationally renowned designer and engineer, with considerable experience in research and development programs," Klaka said. "We knew his expertise would be valuable in anticipating the needs and expectations for marine technology research.

"Australia has a reputation for marine technology innovation. However, we're anticipating a severe skills shortage in engineers and naval architects that will adversely affect our local marine industries."

The CMST was founded in 1985 as a marine technology research and development facility to advance technical ocean-related skills in Australia. The centre's expertise falls under three broad areas of marine acoustics, hydrodynamics and underwater visualisation technology.

Gee was able to take a six-month break from his consultancy work in the UK and offer CMST researchers and research students a leading naval architect's perspective on how best to advance technological innovation – and promote collaboration – with industry.

He anticipates that population growth, climate change and diminishing reserves of fossil fuels may soon launch a new era of innovation in marine technology. After a comprehensive program of visits to local and interstate marine industries, he provided insights on the long-term research and training needs of both the international and the local marine transport industry that will meet, and go beyond, industry expectations.

Said Klaka: "One of Nigel's key points was that there needs to be a greater synergy between industry and academia so that university-industry collaboration will develop ideas within a rigorous scientific framework able to validate those ideas."

"And, departing from the strictly science perspective, he also noted that the use of industrial designers is a recognition by industry that aesthetics, ergonomics and user-friendliness are aspects of innovative products that are as important as pure functionality."

As a result of Gee's insights, the CMST will begin focusing research on a number of new areas in applied research to ensure Australia's ships are both economically and environmentally sustainable.

[cmst.curtin.edu.au](http://cmst.curtin.edu.au)



# NO PAIN, PLENTY TO GAIN



The judges for the 2008 WA Inventor of the Year Awards recognised the value of an inexpensive tool for identifying people at risk of chronic pain, and awarded the Cold Pain Test Kit top prize in the Early Stage category.

Professor Tony Wright's long-standing research interest in the mechanisms of musculoskeletal pain is leading to an innovation in diagnosis of pain sensitivity.

The Head of Curtin's School of Physiotherapy was aware that some patients present with greater pain and sensitivity than is expected for their disorder. Wright noticed that hyperalgaesic patients (those with an increased sensitivity to pain) were also more sensitive to cold, and he realised that evidence of a correlation between pain and cold sensitivity could lead to a useful diagnostic tool for primary care practitioners.

"Pain that has lasted for months or years is far more challenging to overcome than acute pain," Wright said.

"Patients who have developed a severe chronic pain disorder can struggle to find pain relief even with the strongest of medications. If we can identify these patients early on in their disorder, appropriate pain management strategies can be in place

before the psychological, physical, and even social consequences of chronic pain set in."

Wright and his colleague, Penny Moss, at the School of Physiotherapy, began collaborating with Associate Professor Heather Benson, from the School of Pharmacy. Benson brought expertise in pharmaceutical research and transdermal drug delivery to the project.

Said Wright: "We were using a thermode to investigate the link between a patient's sensitivity to cold and their sensitivity to pain. However, to install a thermode in a diagnostic setting would cost more than \$30,000, so we looked for a cheaper and more practical way of testing for cold-pain sensitivity."

The team developed a test using a naturally occurring compound as a substitute, and then designed a kit containing a topical formulation that delivers a specific concentration of the compound at a controlled rate to the skin. The kit is for use by GPs and pain specialists in the early stages of a patient's treatment.

Interpretative software will enable practitioners to quickly assess the extent the patient is demonstrating cold hyperalgesia, and their risk of developing severe chronic pain, before they then select the appropriate pain medication.

To support the innovation, the US-based Merck pharmaceutical company has provided \$400,000 through their investigator-initiated studies program. The research includes an evaluation of the prototype Cold Pain Test in patients with osteoarthritis, and an assessment of the treatment efficacy of a relevant drug.

Research and development is continuing, with ongoing testing for optimal formulation and delivery methods, and the design of assessment software.

"We're in the process of acquiring a full patent, and will soon be involved in broader market research to gauge the interest of medical practitioners," Wright said.

"We hope the kit will help GPs manage their patients more efficiently, and improve the quality of care they can provide."

# MILESTONES OF MASS SPECTROMETRY

The John de Laeter Centre for mass spectrometry had its beginnings 40 years ago at Curtin. The centre's capabilities are now as revered as the researcher who lends his name to one of Western Australia's most important analytic science facilities.

When Professor John de Laeter joined the Western Australian Institute of Technology (WAIT, now Curtin) in 1967, one of his goals, as Head of the Department of Physics, was to create a hub of expertise in mass spectrometry. Hundreds of Western Australian scientists are grateful for de Laeter's vision, which has led to Perth having the Southern Hemisphere's finest research centre for mass spectrometry.

Now an Emeritus Professor of Physics at Curtin, de Laeter enjoyed an *annus mirabilis* of honours in 2008. He was inducted into both the Western Australian Science Hall of Fame and the Australian Prospectors and Miners Hall of Fame – the latter recognising his extensive contribution to geochronological research in Western Australia. He was also invited by the *Australian Journal of Earth Sciences* to edit the journal's dedicated issue on Australian geochronology.

Although de Laeter is best known for his work in geochronology, he has significant research achievements in atomic weights of elements, nuclear physics and astrophysics. The small facility for mass spectrometry de Laeter established at WAIT developed to become the John de Laeter Centre (JdLC) for mass spectrometry – a joint venture between Curtin, CSIRO, The University of Western Australia (UWA) and the Geological Survey of Western Australia.

Since 2001, the State Government has funded the JdLC as a Centre of Excellence. This has enabled the continued acquisition of high-end instrumentation for analytical techniques relevant to many fields within and outside of Earth science.

Without the JdLC it is unlikely Western Australia would have earned its world-renowned research capabilities in geochronology, isotope geochemistry,

biogeochemistry, geochronology, organic geochemistry, radiogenic isotope studies and thermochronology.

The JdLC's Acting Director, Professor Neal McNaughton, said the State Government was prudent in realising it was critical to maintain and enhance the analytical capabilities of the state, particularly for research that impacts on resources exploration.

"The centre is unique because it serves a range of sciences, and no one institution houses all of the research infrastructure," he said.

"The JdLC and the Centre for Microscopy, Characterisation and Analysis (CMCA) at UWA are the state's two most important analytic facilities for the Earth sciences. It's a credit to the partner institutions how they've collaborated to ensure all Western Australian researchers can access their high-end scientific instruments."

Importantly, as advanced technologies become available and are installed at the JdLC, they trigger research endeavours from groups who aim to fully exploit the latest capabilities by developing and validating new analytical methods and applications (see, for example, 'Was the clock set wrong?' on page 2).

Testament to its calibre, the JdLC has been cited by numerous overseas researchers as the key reason for choosing to advance their research in Perth. With appropriate funding, the centre will continue to acquire instrumentation and attract high-calibre scientists that will enable world-leading research to be undertaken in Western Australia, and thus continue to honour one of our most distinguished scientists.

[jdlcms.org](http://jdlcms.org)

nanoSIMS

ACE

ICP-MS

40Ar/39Ar

SHRIMP II

TIMS

## Professor David Hay

### How did you become interested in twin research?

In 1975, I had a call from a twins' parent group concerned about the lack of research into multiple births. There were questions, for example, regarding why some twins didn't do as well at school as single-born children.

### Why is twin research important?

Twins enable researchers to identify the genetics behind specific forms of behavioural disorders and diseases, and Australia has an outstanding reputation for such work. With one birth in 70 resulting in twins, twins are also very important as a high-risk population for medical and psychosocial problems. Our work has straddled these two issues.

### What are your most important research collaborations?

There are three. Until recently, I was national patron of the Australian Multiple Birth Association, and we worked on issues such as separating twins in school. How many people know that our Curtin website, [twinsandmultiples.org](http://twinsandmultiples.org), is the world's most accessed site on this and related topics?

In the late 1980s, I began working on children of mentally ill parents, who were often invisible. I'm pleased there is now a very active education, intervention and research program to which I and state and interstate colleagues contributed.

Since 1990, I have worked with Professor Florence Levy, a child psychiatrist in Sydney, on what has become a landmark study of ADHD, the Australian Twin ADHD Project. More than 12,000 families with twins have contributed data to this project.

The National Health and Medical Research Council [NHMRC] has funded us since the early 1990s to study the genetic and environmental causes of ADHD. Bad parenting does not cause ADHD – at least 10 specific genes have been identified and, overall, ADHD is one of the most heritable behaviours I have studied. And it rarely occurs by itself – we found common genes underlying ADHD and reading problems, for example.

### Is there a lot more research into ADHD still to do?

Much more – as I've discovered while being involved in the new National ADHD Guidelines. We're currently investigating the common sub-type of ADHD, where people have severe problems with attention, but not hyperactivity. The US National Institute of Mental Health has provided a USD\$2.4 million grant for the project with Washington University.

Along with Curtin colleagues and my former student, Dr Tracy Westerman (2002 NAIDOC Scholar of the Year), we are working on culturally appropriate assessment of ADHD in Indigenous children.

The NHMRC has also funded us to investigate why some children grow out of their ADHD, while for others it's a lifelong problem.

### What is the future for your area, behavioural genetics?

We're more aware of the heritability of mental disorders. Many disorders involve a complex interplay of genes, meaning there'll be genetically determined differences in responses to medication. Some will be appropriate for the brains of some people and not others. So, there'll be many advances in the field of psychopharmacogenetics, particularly in 'designer' treatments and personalised medicine. But there are many psychological issues here, and I've been closely involved in how to counsel people about the implications of their family history of mental illness.

[twinsandmultiples.org](http://twinsandmultiples.org)

# Q+A

## ONE OF A KIND

Professor David Hay is one of very few behavioural geneticists in Australia. His 40-year research career has involved three major strands: genetic and behavioural research on twins, Attention Deficit Hyperactivity Disorder (ADHD), and children of parents with mental illness. Hay has thrice been Curtin's Faculty of Health Sciences Researcher of the Year. He will soon retire from the School of Psychology and from an astonishingly busy academic life.



## Centres + Institutes

### UNIVERSITY RESEARCH INSTITUTES

Centre for Advanced Studies in Australia, Asia and the Pacific  
Curtin Institute of Radio Astronomy  
Curtin University Sustainability Policy Institute  
Digital Ecosystems and Business Intelligence Institute  
Institute for Multi-sensor Processing and Content Analysis  
Institute of Theoretical Physics  
John Curtin Institute for Public Policy  
Nanochemistry Research Institute  
National Drug Research Institute  
The Institute for Geoscience Research  
Western Australian Biomedical Research Institute

### UNIVERSITY RESEARCH CENTRES

Curtin Indigenous Research Centre  
Centre for Behavioural Research in Cancer Control  
Centre for Developmental Health  
Centre for Ecosystem Diversity and Dynamics  
Centre for International Health  
Centre for Labour Market Research  
Centre for Marine Science and Technology  
Centre for Materials Research  
Centre for Population Health Research  
Centre for Research in Applied Economics  
Centre for Research into Disability and Society  
Centre for Research on Ageing  
Communication Economics and Electronic Markets Research Centre  
Curtin Centre for Advanced Energy Science and Engineering  
Curtin Centre for Rock Characterisation  
Curtin Industrial Modelling and Optimisation  
Curtin Water Quality Research Centre  
Isotope Science Research Laboratories  
Psychological Wellbeing Across the Lifespan  
Research Centre for Applied Psychology  
Research Centre for Stronger Communities  
Science and Mathematics Education Centre  
Western Australian Organic Isotope Geochemistry Centre  
Western Australian Centre for Health Promotion Research

### GOVERNMENT-FUNDED INSTITUTES AND CENTRES

Centre for High Definition Geophysics  
Centre for Sport and Recreation Research  
Centre of Excellence in Cleaner Production  
John de Laeter Centre of Mass Spectrometry  
Western Australian Nanochemistry Research Institute  
Western Australian Telecommunications Research Institute

### INDUSTRY RESEARCH CENTRES

Environmental Health Impact Assessment  
WHO Collaborating Centre  
Housing and Urban Research Institute of Western Australia  
Rio Tinto Centre for Materials and Sensing in Mining  
Woodside Research Facility

### MULTI-INSTITUTIONAL RESEARCH CENTRES

Australian Housing and Urban Research Institute  
Australian Centre for Geomechanics  
Australian Institute for Coal Strategies  
Centre for Exploration Targeting  
iVEC – The Hub of Advanced Computing in Western Australia  
Nanoscale Characterisation Centre  
Planning and Transport Research Centre  
WA Energy Research Alliance  
Western Australian Centre for Cancer and Palliative Care  
Western Australian Centre for Urban Design  
Western Australian Marine Science Institute  
Western Australian Satellite Technology and Applications Consortium

### COOPERATIVE RESEARCH CENTRES CORE PARTICIPANT

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Australian Seafood CRC  
CRC for Construction Innovation  
CRC for Greenhouse Gas Technologies  
CRC for Sustainable Resource Processing  
CRC Mining  
CRC for Sustainable Tourism  
Desert Knowledge CRC  
Parker CRC for Integrated Hydrometallurgy Solutions  
Spatial Information CRC

### SUPPORTING PARTICIPANT

CRC for Contamination Assessment and Remediation of the Environment  
CRC for Innovative Grain Food Products  
CRC for Integrated Engineering Asset Management

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