The tingle mosaic
Biodiversity begins at home

Precision tools
Global navigation sharpens up

Our war with corrosion
Applied chemistry for oil and gas

The Kwinana synergy
Commonsense sustainability
Curtin has also taken important steps to develop a comprehensive health research institute at the University. The Curtin Health Innovation Research Institute (CHIRI) will work with community, governments and industry partners in the prevention and management of chronic disease through strategical, collaborative and interdisciplinary research. It is an important step to developing new interdisciplinarity and community-focused health care to reshape our ailing health system and keep people out of hospital. The Centre for Population Health Research was also established under the leadership of Professor James Sommers. Our partnership with Silver Chain has led to the successful implementation of a wounds management clinic on our Bentley Campus.

In the area of sustainability, our existing capacity in the areas of environmental biology, cleaner production, sustainable communities and sustainable tourism has been augmented by the appointment of leading sustainability expert Professor Peter Newman. With this strong foundation, the University will be moving forward to establish a sustainable development institute. The institute will conduct high-level research into sustainable best practice across a broad range of fields. It will also provide advice to business and industry on resource usage and management, as well as investigate and set sustainability guidelines and targets.

R&D Now Research Highlights 2008 showcases a number of activities that illustrate Curtin’s leadership in our key areas of research. The strong, collaborative research relationships established with government and industry are a key component of our success. As we move into 2009, we look forward to developing new partnerships and consolidating existing relationships, which will further strengthen our position as a provider of innovative research.

Professor Jeanette Hackett
Vice-Chancellor

Professor Linda Kristjanson
Deputy Vice-Chancellor
Research and Development
The tingle mosaic of diverse biotic patterns lies in the highest-rainfall area of Western Australia, at the southernmost edge of one of the planet’s oldest landscapes. It exists in one of 30 global biodiversity ‘hotspots’ – the only one in Australia – recognised by ecologists.

Nestled in a small pocket of Australia, the tingle mosaic is home to five species of highly restricted forest eucalypts – unique to a small area near the town of Walpole. All species are dominant members of their biological communities, and indicators of a small-scale, high-rainfall-dependent biota – relics of a past age of rainfall that has dropped off the south-western tip of the continent.

An area of remarkable diversity, it is the focus of research that will provide a biological and evolutionary basis for conservation management and planning. Climate change will have profound implications for biodevity. As such, according to Associate Professor Grant Wardell-Johnson, new approaches will be required for conservation management and planning across Australia.

“At Australian habitats will be affected by climate change, and good conservation practice can no longer depend on reserve acquisition and design,” he said. “Rather, a new approach to biodiversity conservation, based on the local scale of the biota and on the refuges available to the biota, is required.”

Wardell-Johnson research is in the Centre for Ecosystem Diversity and Dynamics (CEDD) at Curtin, and has a long-standing research focus on biodiversity within high-rainfall, Mediterranean-climate regions (MCRs). Worldwide, there are five MCRs (characterised by winter rainfall and dry summers), and it is predicted that climate change will have disproportionate effects, based on reliance on temperature and aridity, for these compared with many other ecosystems.

South-western Australia includes a major, and the most diverse, part of the Australian Mediterranean climate region. Within this area, the high-rainfall region is restricted to the south-west corner.

“The tingle mosaic is extraordinarily rich in landscape patterns, in plant species and in ‘relictual biota’ – animals and plants left over from previous climates and environments – and now far more restricted than in the past,” Wardell-Johnson said.

“The southern edge of this section of Gondwana is highly vulnerable to the impacts of climate change. The biota of the area have been changing because Australia has been drifting north by a few millimetres each year. So the South-West has been becoming drier and warmer. And to test the more dramatic warming associated with climate change and many of the biota restricted to the wettest areas of the South-West will drop off altogether.”

FORTUNATELY, Wardell-Johnson’s research is likely to improve conservation outcomes for the region. He led a research team to the tingle mosaic more than 20 years ago. The hundreds of plots established to record plants and environmental data now form the basis of a much broader program of research – contributing to a major initiative in applied conservation biology, which involves universities and land management agencies worldwide.

Funded by the Australian Research Council (ARC), the International Linkage project is studying Mediterranean ecosystems in four globally significant regions – Western Australia, Chile, South Africa and Greece.

The project will analyse multivariate data collected by the organisations over a 20-year period. It will be the first study to combine four fields of ecological enquiry – biogeography, growth form, phylogeny and environment – across the high-rainfall MCRs. Because the origins and diversification paths of the flora of the individual MCRs are varied, analysing the datasets of each region will enable the researchers to resolve a number of critical questions. These include why different habitats and regions vary in their level of species richness and composition at different scales; why particular taxonomic groups predominates in different habitats in particular regions; and why specific growth forms prevail in different habitats of certain regions.

This project – ‘Biodiversity in high-rainfall Mediterranean-climate ecosystems: integrating fields of ecological enquiry to achieve improved conservation outcomes’ – builds on Wardell-Johnson’s prior and existing ARC-funded projects. It involves researchers from Curtin’s Department of Environmental Biology, Wildlife Department of Environment and Conservation, and researchers from the University of California, Oregon State University, the Universidad Catológca de Chile, and others in South Africa and Greece.

The outcome will be a picture of how local plant species and plant assemblages are linked with particular processes at a range of spatial scales – providing ecologists with a more precise framework for biodiversity conservation.

To far, geographic information systems (GIS) and existing datasets have been used to analyse the climatic characteristics of the high-rainfall areas of the MCRs, which has led to an assessment of the vulnerability of individual regions to changing climatic conditions. The biota of south-western Australia is particularly vulnerable because of the region’s muted topography and its lack of connections to higher latitudes.

“There is no doubt that all high-rainfall MCR forests are threatened. The effects of current land-use practices, climatic change and other factors mean that more effective conservation programs must now be developed,” Wardell-Johnson said.

“The aim is to understand what determines plant diversity and structure at different spatial scales in the high-rainfall MCRs, and to use this to help create a unified theory of global diversity.”

The end-goal of the project is to provide a biological and evolutionary basis for conservation management and planning that will help ecologists understand how the biota responds to climate change.”
The Nanochemistry Research Institute (NRI) has recently added to the instrumentation of its Scanning Probe Microscopy (SPM) Facility, with a state-of-the-art, high-speed Video Atomic Force Microscope (AFM). The microscope brings to leven the number of different scanning probe microscopes housed at the NRI, creating the largest and most advanced facility of its kind in Australia.

The SPM Facility provides nanoscience researchers with powerful tools for very high-resolution, three-dimensional surface examination of an increasing variety of materials. The addition of the Infinitesima VideoAFM means researchers can now investigate their samples with high-speed scanning video atomic force microscopy for gas and liquid imaging at 25 frames per second. “This is a major new research capability for nanoscience.” SPM Facility Manager Dr Thomas Becker said. “Processes that were too fast to monitor thoroughly by normal scanning probe microscopy, provide about one image within 30 seconds—we can gain a far more detailed understanding of.”

“For example, near real-time imaging means we can monitor, at atomic resolution, rapid processes like crystallisation.”

The NRI has long been known for its state-of-the-art Computational Molecular Modelling laboratory, equipped for large-scale computations of solution, bulk and surface structure and energetics. In assembling a second facility, the NRI can provide those working in applied chemistry with a comprehensive instrumentation for both fundamental research and applied research. Teams from the Western Australian Corporation Research Group, Parker Cooperative Research Centre for Integrated Hydrometallurgy Solutions and the Centre for Materia Research are all benefiting from the NRI’s facilities.

“The NRI is fortunate that, due to the research expertise, we’re able to constantly upgrade our facilities through grants and industry funding.” Becker said.

Over the past 12 months, the NRI has further increased its research capabilities with new research staff being appointed within all program areas: Theoretical Chemistry, Crystallisation, Functional Molecules, Minerals Processing, Solid State Chemistry, Nanomaterials, Bio-nano and Chemical Sensors.

Professor Julian Gage, who was recently awarded an Australian Professorial Fellowship by the Australian Research Council (ARC), directs a world-renowned theoretical chemistry team. The program has a key role in the development and application of computational methods that serve the NRI’s five other program areas and has numerous externally funded projects. These include investigations into hydrogen fuel cell technology, advanced membrane technologies for water treatment, and protein conducting materials, to name a few.

A large part of NRI’s expertise also serves to support the minerals industry. The Minerals Processing team focuses on fundamental processes in the growth and dissolution of minerals, and on environmental issues related to the management and reuse of industrial by-products. Current projects include the control and inhibition of scale formation (funded by the ARC) and minimisation and neutralisation of wastes. Within the emerging area of bio-inspired hydrometallurgy, researchers are investigating bio-inspired minerals processing and solvent extraction (both funded by the Parker Centre).

NRI Director Professor Eric Bakker and his collaborator, Professor Ronald De Marco, have recently secured major funding from the CSIRO as part of a collaborative sensor cluster program. Bakker explained that, while the institute consolidates its expertise in computational chemistry and minerals processing, research programs in advanced materials, sensors and bio-nanotechnology will expand.

“Bio-nano is a major growth area and requires a synergy of NRI expertise in computer simulation, crystallisation, solid state chemistry, functional molecules and nano characterisation,” he said.

“We have projects ranging from new nanomaterials for medical applications, through to advanced materials to address issues in the oil and gas industry, and sensor development for environmental monitoring and clinical diagnostics.”

A case in point is the work of program leader Associate Professor Xia Lou, who studies the development of biocompatible and nano polymers for use in medical implants, and for the controlled delivery of drugs and proteins. Lou also studies the development of polymer-based inhibitors for suppressing hydrate formation in subsea pipelines.

“Curtin should be very proud of how the NRI has developed into a major hub of expertise,” Bakker said.

**Curtin’s Nanochemistry Research Institute continues to lead the way in research expertise and instrumentation.**
Curtin recently welcomed Professor Urs von Gunten to the Curtin Water Quality Research Centre (CWQRC), which is world-renowned for its capabilities in groundwater and surface water chemistry. Previously a researcher at the Swiss Federal Institute of Aquatic Science and Technology, von Gunten has joined the CWQRC to work on projects that improve water distribution methods in Australia.

In parallel, the CWQRC has been funded by the Australian Research Council to develop advanced water treatment technologies to minimise the formation of disinfection by-products in water distribution systems. The three-year project will investigate chemicals that result from the reaction between natural organic matter (NOM) in source water and added disinfectants.

“Disinfectants cause undesirable chemical reactions that we want to address, such as nitrification in chloraminated drinking water,” explained Professor Anna Heitz, Director of the CWQRC.

However, it’s important to put this into context – we know that the health risk from water-borne pathogens in non-disinfected water is far greater than the risk posed by EDPs.*

The CWQRC laboratory comprises state-of-the-art instrumentation that has enabled the centre researchers to develop new analytical methods for extremely low concentrations of chemicals and disinfection by-products. The team is known particularly for its expertise in size exclusion chromatography for characterising NOM.

The project will inform new drinking water guidelines, and assist water utilities to balance the competing requirements of maintaining effective pathogen barriers versus disinfection by-product control. Another major, related area of research for the CWQRC is the ‘aesthetics’ of potable water – issues with taste, odour and appearance. “Bromide, for example, is naturally occurring in source water, but its reaction with chlorine creates chlorinous off-flavours and an unpleasant odour,” Heitz said.

“We’re hoping to trial some treatments for bromide removal using novel processes – this is an area in which Professor von Gunten has a great deal of expertise. His knowledge of disinfection by advanced oxidation processes will also help us to progress urgently needed research into treatment of wastewater for potable use.”

Injecting research into water

The CWQRC recently completed extensive analytical work for a major project that will eventually enable the injection of treated wastewater into the Grove’s Mound aquifer for re-extracting as a future potable water source. CWQRC researchers developed the methodology and project design, and created branch new analytical methods for complex organic compounds that may exist in treated wastewater.

Their analyses identified which chemicals of concern are removed by advanced treatment processes such as micro-filtration and reverse osmosis, and identifies those that survive the process and require ongoing continual monitoring and management in any large water-reuse scheme. Funded under the Primary Collaborative Research Program, the aquifer replenishment project is critical to advancing Western Australia’s water conservation strategy.

The project is a major collaboration led by the WA Department of Health and Industry (which includes the Water Corporation, CCMC Land and Water Chemistry Centre WAI, National Measurements Institute) and the University of Western Australia, and the State Department of Water and Environment.

Industry trusts in rust research

Marine corrosion continues to be a major concern for the oil and gas industry – particularly for those involved in deep water gas production. With the large number of developments taking place on Australia’s North West Shelf, continual growth in corrosion science research at Curtin is likely.

Curtin’s work in the area of microbial induced corrosion (MIC) is set to expand, due to the increasing need by oil and gas companies to preserve sunk subsea equipment. In parallel to this need, the University has strengthened its commitment to serving the oil and gas industry with a number of research appointments within corrosion science during 2008.

Central to this is the joint funding by Woodside Petroleum and Chevron Australia of a Professor of Corrosion Chemistry – a move that reflects both the significance of corrosion issues within the oil and gas industry, and the trust that industry has in Curtin’s expertise in the area.

Late in 2008, Dr Ralf Gubner left the Swedish Corrosion and Metals Research Institute for Curtin, taking up the position of Professor of Corrosion Chemistry and the directorship of the Western Australian Corrosion Research Group (WACRG). Gubner is a chemical engineer, with a particular focus on microbial-induced corrosion. His research interests also include corrosion of seawater injection wells in oil and gas plants, and organic coatings for marine and offshore environments.

Within the field of applied chemistry, the WACRG is the only research centre of its kind in Australia. The group was established at Curtin more than 20 years ago. It has since built an international reputation for research and consultancy in carbon dioxide corrosion, and for its focus on corrosion inhibition, in particular. Gubner takes over the WACRG leadership from Associate Professor Brian Kinsela, who is now a visiting Professor under a prestigious Stocker Fellowship at Ohio State University in the US. Kinsela will work with Professor Srdjan Nesic at the Institute for Corrosion and Multiphase Flow Technology which is heavily involved in modelling to predict corrosion in oil and gas production under both ‘sweet and sour’ conditions. Much of the institute’s work is sponsored by major petroleum producers, and the collaboration between Kinsela and Nesic – who is an adjunct Professor of Curtin – will not only progress research links between the two universities, but also further promote Curtin’s expertise in corrosion science among industry groups.

THE past 12 months has seen the WACRG’s number of PhD students rise to five; enabled by the increase in its industry-funded projects and the support of the Western Australian Energy Research Alliance (WAERA). Within WAERA’s Subsea Technologies program, the WACRG is leading a number of projects which address issues in carbon dioxide corrosion.

“MIC is a costly issue for oil and gas production, affecting the preservation and the performance of subsea equipment and pipelines. Industry needs guidelines for design criteria, risk assessment and asset integrity management, based on materials selection and water treatments in application to sunk subsea equipment – and we have the capabilities to provide.”
Anticipation is growing among Curtin’s research community as the Resources and Chemistry Precinct takes shape at the University’s Bentley Campus, not far from the Perth CBD.

Curtin researchers working in areas such as minerals resources, water chemistry, applied chemistry and hydrometallurgy will be able to pursue joint projects far more readily with other world-renowned research groups and industry partners, soon to be within walking distance.

The main building of the $110 million precinct – funded by Curtin, BHP Billiton, the Chemistry Centre (WA) and the Federal and State governments – will house the major research groups from Curtin’s Department of Applied Chemistry. These include the Nanochemistry Research Institute, the Curtin Water Quality Research Centre and the WA Corrosion Research Group. The WA Chemistry Centre, the Government’s flagship chemical science facility, will also relocate to the main building from the Perth city site, where it has been based for nearly 60 years.

Executive Director of the precinct Mark Woffenden sees the development as a vibrant, new neighbourhood for high-level research.

“The Chemistry Centre at the precinct, and CSIRO Minerals and the Parker Centre literally next door, the State’s research capabilities can only gain from the sharing of world-class research expertise and state-of-the-art facilities,” he said.

“CSIRO Minerals are establishing the Australian Minerals Research Centre next to Curtin’s development, so it’s inevitable that more and more industry partners will be drawn to such an influential neighbourhood.”

Securing Woffenden’s 30 years of experience within the minerals sector bodes well for the precinct’s success.

In 2007, he relinquished his role as CEO of the renowned Parker Centre (the national Cooperative Research Centre for Integrated Hydrometallurgy Solutions) after leading it through seven years of growth in both fundamental and applied research capabilities.

“The precinct’s business plan is now well advanced, which lays a foundation for the precinct to be an internationally acknowledged leader in chemistry for the minerals and energy sectors,” he said.

Late in 2007, Professor Paul Dunn commenced as the Director of WASM, following a period of seven years as Director of Canada’s Centre for Mining Technology, located at Laurentian University. Dunn recently moved to expand WASM’s mining research capabilities by appointing a Professor of Mining, Dr Roger Thompson, whose research focus is predominantly applied to surface mining-related problems, specifically mine haul road design and management.

Mining research at WASM has historically focused on underground mining technology. Roger’s expertise expands the current research capability to address some aspects of surface mining technology, Dunn said.

“Will he take a lead role in developing new research directions for the mining group at WASM – including haul road design, construction and management – while complementing our existing mining research capacity,” Dunn asked.

As Australian mining explores new depths, mine planners and engineers need better ways to predict and reduce geotechnical risks in underground operations.

A key challenge for underground mining is to better understand rock mass conditions and stresses at mine sites. Such geotechnical considerations determine the necessary ground support and excavation design required to safeguard against uncontrolled rock failure, and ensure the efficient recovery of ore.

Since its establishment in 2006, the Centre for High-Definition Geophysics (CHDG), based at Curtin, has been developing new seismic technologies to detect ore bodies such as gold, base metals and coal at greater depths than traditional exploration techniques allow. Recently the CHDG’s expertise was used to investigate the capability of seismic measurements to provide insights into geotechnical conditions of underground mine sites.

The CHDG’s Dr Milovan Urosevic – in collaboration with Professor Peter Bird, formerly from the University of NSW, and Dr Binzhong Zhou, from CSIRO Exploration and Mining – has been researching the capacity of seismic measurements to directly predict roof stability of underground mines.

One of the key goals was to determine the relationship between acoustic impedance derived from seismic data and the Geophysical Strata Rating (GSR) calculated from geotechnical data obtained via routine core drilling, geophysical logging and underground mapping.

Through seismic inversion of the seismic amplitude data to acoustic inversion, the team was successful in producing a 3D model able to assess geotechnical properties of the roof and floor strata for longwall coal mining operations.

“We’ve demonstrated that a sufficient correlation exists to provide mine engineers with geotechnical information about the sediments that host the coal seams,” Urosevic said.

“We now know that it’s possible to predict roof stability, directly from seismic measurements – and this will eventually lead to safer and more efficient underground mining.”

The team’s research was recently published in the Proceedings of the Environmental and Engineering Geophysical Society.

The CHDG was established at Curtin through the Western Australian Government’s Science and Innovation program. This project “Detailed Geological Characterisation from Seismic Data”, was also supported by the national Cooperative Research Centre (CRC) for Mining, the Australian Coal Association of Research Program (ACARP), and industry groups, including Peabody, Xstrata, Anglo Coal Australia and BHPB Coal.
In 2007, a team of highly regarded theoretical physicists established a new research institute at Curtin, as the university confidently expanded its academic territory into one of the most challenging areas of science and technology. The team’s fusion research, plasma displays and the lighting industry have all contributed to research in lasers, processing and mercury-free lighting, and our work is motivated by a mix of applications in science and technology. For example, the team’s access to advanced supercomputing facilities has helped us to be very productive – since coming to Curtin we’ve published more than 20 research papers on collision physics.

“Fusion is the process which powers the sun, where the hot plasma is confined gravitationally deep in the sun’s core. At ITER the plasma will be confined using electric and magnetic fields, and it is vital to understand the collision processes that occur,” Bray said. “Here at Curtin, we’ve been generating the required collision data, and have formal agreements with the International Atomic Energy Agency who make the data available to scientists at ITER and elsewhere.”

Bray said projects like this have come about not only because of the world-leading expertise in computational physics being amassed at Curtin, but also because of the team’s access to advanced supercomputing facilities. “The accuracy of our atomic collision data requires rigorous mathematical foundation. Accessing the best supercomputing facilities has helped us to be very productive – since coming to Curtin we’ve published more than 20 research papers on collision physics.”

“The group has also reopened an important branch of quantum mechanics – which has long harboured unresolved foundational problems in the theory, when interactions involve long-ranged potentials as in electromagnetic interactions. Following computational success in reproducing detailed experimental measurements, the Curtin team has returned to examine the foundations, and have put these on a firm mathematical footing for the first time.”

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“Australians now rely on GNSS for diverse applications from geodynamics to personal navigation systems and mobile telematic products or those that require high accuracy and high integrity solutions in mobile navigation, meteorology, location-based services.”

“Geodesy is the study of the Earth’s size, shape, gravity field, and forms the scientific basis of positioning and navigation. The promise of a combination of multi-satellite, multi-frequency GNSS offering autonomous geospatial positioning to within a few millimetres will provide a much broader range of capabilities than the current Global Positioning System (GPS) which has been the forerunner in satellite positioning and navigation activities.”

Professor Peter Tourniess will lead a team of researchers to improve Australia’s capability in utilizing a modernized GPS and GNSS by addressing critical theoretical and modelling issues. The team will aim to fulfil the high-accuracy and high-integrity requirements of tomorrow’s geospatial information needs in the Earth, atmospheric and space sciences.

The overarching strategy is to create one “virtual” GNSS (system of systems) by exploiting multi-constellation GNSS and the unique properties of their ultra-precise, multi-frequency, carrier-phase tracking data. The outcome will be a general theory, together with an integrated model that provides methods and techniques which will help to improve geospatial information for future geospatial technologies, such as vehicle navigation, automated machine guidance and location-based services.

Existing GNSS are Russia’s GLONASS, the US’ modernised GPS, China’s Compass and Europe’s Galileo. With India and Japan soon to launch their own satellites, Australia will be in an enviable position of being “in sight” of all satellite systems, and therefore stands to benefit greatly from a combined, next-generation GNSS.

Previous studies on GPS and GNSS modelling have used models that no longer take advantage of the full potential of the combined GNSS. The broader and more diverse GNSS model promises the highest accuracies, which can only be achieved by exploiting the unique properties of the received carrier signals through improved carrier phase Integer Ambiguity Resolution (IAR).

IAR makes high-precision positioning possible by allowing the ranges to the satellites to be known to a millimetre, hence the position. The success of the IAR depends on the strength of the underlying GNSS model. By contributing to improved technologies in positioning and navigation, meteorology, tomography and satellite placement, next-generation GNSS will also provide the capability for accurate short-term weather predictions; improvements in GPS products for precision agriculture and mining equipment; and improved communication technologies, to name a few.

Tourniess’s appointment is timely, as it follows Australia’s recent significant investment in geodetic infrastructure through the NCRIS (National Collaborative Research Infrastructure Strategy) funding of AuScope Geospatial, of which Curtin is a member.

One role for AuScope Geospatial is to install more than 100 Continuously Operating Reference Stations (CORS) GNSS receivers across Australia in a $15.8 million collaborative investment to develop an enhanced national geospatial reference system. According to Curtin’s Professor of Geodesy and Director of the Western Australian Centre for Geodynamics, Dr. Hanan Featherstone, enhancing the national geospatial reference system has significant implications. “Australians now rely on GNSS for diverse applications from geodynamics to personal navigation in remote areas. Improving our understanding of satellite constellations and navigation capabilities will provide more reliable results to the private sector, particularly for users of telematic products or those that require high accuracy and high integrity solutions in mobile navigation systems and mobile communication technologies,” Featherstone said.

A year since its formation, the Institute for Theoretical Mathematics and Physics has a core team of five world-class researchers comprising Australia’s only combined research institute and teaching department in the discipline. The institute also forms a major node of the national Centre of Excellence for Antimatter-Matter Studies (CAMS). Funded through the Australian Research Council, CAMS focuses on the interactions of electrons and positrons with different types of matter, from single atoms to biological molecules, surfaces and materials. Within that scope, work at the Curtin institute is primarily advancing research in atomic collisions. The Curtin team currently has two areas of focus: fusion research for energy sources of the future; and antimatter-matter collisions that find applications in medical science and in materials science, including plasma processing and mercury-free lighting technology.

“Our research is in the area of electrons, positrons, or photons scattering from atoms and ions, as well as laser-surface and atom-surface interactions,” said the institute’s Director, Professor Igor Bray – an Australian Research Council Professorial Fellow, regarded theoretical physicists around the world, renowned for his work in the field of atomic collisions.

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The international SKA system design work is now being process of further refining the technology options and producing a "reference design", converging on the most viable technology as the International Project Engineer for the SKA radio telescope. In this role he was central to the development of the SKA "reference design", converging on the most viable technology options (small dishes and aperture arrays) and designing strategies to link radio astronomy and industry in an earlier role, as CSIRO's SKA leader. Hall wrote most of the initial Australian strategies to link radio astronomy and industry. In an earlier role, as CSIRO's SKA leader, Hall wrote most of the initial Australian strategies to link radio astronomy and industry. In an earlier role, as CSIRO's SKA leader, Hall wrote most of the initial Australian strategies to link radio astronomy and industry.
Research at the Centre of Excellence in Cleaner Production is helping industrial estates to achieve greater efficiencies in energy, water and materials consumption, and reductions in waste and emission generation.

Regional synergies – which industrial symbiosis are the exchange of resources and by-products among neighbouring companies for their mutual benefit. Worldwide, regional synergies are seen as vital to the sustainable development of industrial areas. To help develop and implement regional synergies at Kwinana, Western Australia's major industrial estate, Curtin's Centre of Excellence in Cleaner Production (CECP) is leading a research project supported by the national Cooperative Research Centre for Sustainable Resource Processing.

The Kwinana Industrial Area (KIA) hosts heavy industry operations such as alumina, nickel and oil refineries; chemical factories; power plants; and fertiliser and cement works. Collaborating with the Kwinana Industries Council, CECP researchers have completed a series of studies to assess the feasibility of selected synergy opportunities in the KIA.

The CECP team conducted evaluations of the by-product streams (volumes and composition); a review of potential uses; an evaluation of possible processing and source treatment needs; concept designs; and assessments of the economic, technical, environmental and social factors.

The work has demonstrated that significant opportunities exist. Reuseable water can be sourced from treated industrial effluents; demineralised water and treatment of oily wastewater; energy is recoverable from flue gases; and useful by-products include gypsum, lime kiln dust, ammonium sulphate, spent catalyst and organic waste. All in all, more than 120 synergy opportunities were identified, and feasibility studies for 18 shortlisted, one-on-one synergies were conducted. The CECP team is now maintaining a company input-output and resource-flow database.

CECP Director Dr Michele John expects to see a number of synergy initiatives implemented in 2009.

"A good example of a synergy brought to fruition will be the treatment of the nickel refinery's oily wastewater by the oil refinery," she said.

"Another promising research area for the next two years will be the assessment of the business and sustainability case for an evaporative water treatment system utilising waste heat from flue gases. The CECP team will continue to support the Kwinana Industries Council with the development and evaluation of promising regional synergy opportunities, and the implementation of selected demonstration projects. A sustainability roadmap is being developed to assist the council and its industry members with strategic decision-making on the long-term sustainability of the KIA."

"There's a genuine desire to progress sustainable development at Kwinana. Surprisingly, the main barriers to implementation are regulatory processes and the time it takes to obtain governmental approvals for reuse of inorganic by-products," John said.

CECP in cooperation with the University of Queensland, has also developed a Regional Synergies Toolkit to help industrial estates worldwide identify, evaluate and prioritise synergy opportunities. Already the toolkit has been applied to two industrial regions in Australia – Geelong and Wagga Wagga – as well as in Rustenburg, South Africa.

The research team is using data from two hydroacoustic systems installed in the Indian Ocean as part of the International Monitoring System set up under the Comprehensive Nuclear Test Ban Treaty. The system is able to capture intense sounds that originate thousands of kilometres away. Over the past seven years, researchers have collected a significant amount of data and built complex numerical models in their attempt to show the relationship between the intensity, number and location of noise events with climate change. Preliminary results indicate that it is possible to detect the spatial and temporal characteristics of noise events with a significant level of accuracy. And while the project has detected seasonal change in the rate of sound generating ice events in Antarctica, it found no significant interannual trend over time. This data will now be used as a baseline for future monitoring.

"Our research will eventually contribute to a comprehensive system of monitoring climate change in Antarctica that uses acoustic monitoring in conjunction with the use of satellites and in-situ observations," Gavrilyov said.

"Our work is supported by a Discovery grant from the Australian Research Council and by the Antarctic Australian Division.

**SONIC BLOOM**

In addition to their oil and natural gas processing research, researchers at the Curtin-based Woodside Research Facility (WRF) are now working on an innovative technology project that aims to turn saltwater algae into biodiesel.

Their new technology will exploit the natural process whereby algae break down intracellular fats which can then be converted to oil. While the idea of algae biodiesel isn’t new, a key innovation in the project is a substantial reduction in the “transformation” processing time by the addition of a novel catalyst to the algal process that speeds up the extracted fat from the algae cells.

“Our new conversion process will take about 10 minutes, compared to four to five hours. The current method takes to ‘squeeze’ the fat from the algae cells,” explained Professor Robert Armit, Chair of the WRF.

A big advantage of using algae for biodiesel is that it grows 30 times faster than typical biodiesel source plants, and particular species contain enormous amounts of fat – between 50 and 70 per cent of their body mass.

"Furthermore, algae for biodiesel production on a large scale will be grown in controlled zones in the sea – as opposed to the large areas of land that other biocube sources require," Armit said.

"Algae are microorganisms that can be grown in factories that use photosynthesis to transform carbon dioxide and sunlight into energy in a very efficient way, producing fat in the process that generates 25 times more oil per acre than soybeans. The algae used in this biofuel are provided by the Curtin School of Agriculture and Environment at Muresk Institute," Armit said.

One of the project’s main aims is to employ the technology in small machines, which would make the possibility of motorists being able to produce their own algae biodiesel at home.

"We’re in the process of building a demonstration unit to prove the technology," Armit said.

"We think of it as a small project with huge benefits."
Public safety awareness has resulted in the deployment of a wide and disparate variety of technologies. An emerging development is in the use of roaming, vehicle-mounted devices on fleet vehicles to capture street vision and other data. Significantly, mobile sensors on such vehicle infrastructures capture data frequently, since the primary purpose of these vehicles is utility provision, such as transport or garbage collection. Data can be updated at least daily in the case of buses, and weekly in the case of garbage trucks. This roaming and ubiquitous surveillance data, Mobile Scattered Surveillance™ (MSS), is the ultimate infrastructure for wide-area surveillance and situational awareness. Unfortunately, it represents a massive level of complexity for access and retrieval.

Virtual Observer (VO) is an enabling technology that converts frequently updated data sources from a disparate, complex infrastructure of roaming and fixed sensors into a simple and extremely powerful system. VO integrates online technology with mobile sensors to deliver spatio-temporal situational awareness solutions, harnessing this frequently updated dataset. VO’s unique capability is to expediously and remotely access and interrogate massive volumes of data across a multitude of moving data sensors. It enables users to create, retrospectively or live, a ‘virtual’ camera at any point on a map covered by the mobile sensors, which can automatically retrieve all the relevant video segments from all the vehicles that passed that point within the selected time frame.

Developed by Professor Svetla Venkatesh and Dr Stewart Greenhill from Curtin’s Institute for Multi-sensor Processing and Content Analysis, VO uses a proprietary method based on scalable and robust algorithms to micro-stitch together different streams of data that match a user query. The reconstructed vision is then delivered directly by video feeds via a web-based system to a user’s desktop. The result is essentially a time-lapse sequence based system to a user’s desktop.

VO can be applied to a range of industries, with the immediate focus being the law enforcement, private security and geospatial markets.

“The technology significantly extends current surveillance coverage areas, without the enormous investment that would otherwise be required,” said Mr Conrad Crisafulli, Director of IP Commercialisation at Curtin.

“But it has many other applications. We are conducting a trial with a WA State Government agency, with the cooperation of a local government authority, for the use of VO in property valuation and related activities.

“ Cameras are being mounted on garbage trucks, providing quality street-level images which are updated weekly.”

Curtin itself has agreed to a one-year licence to enhance campus surveillance capability. Cameras will be mounted on three vehicles which continually roam the Bentley Campus. Crisafulli commented that it is the currency of information and its ease of access that makes VO so valuable.

“Imagine the appeal of a website where you could have a street view of selected properties as they changed over weeks and months,” he said.

“And, following an incident such as the 2005 London bombings, VO could be used to stream the relevant video instantly. This is real value.”

Proposals are being negotiated in three states for the use of VO in law enforcement, and a worldwide licence is being finalised for the use of the technology in the transit sector.

"The chances of sustaining another spine fracture increase by ten to seven-fold," said Dr Andrew Briggs, from Curtin’s School of Physiotherapy.

"It’s a downward spiral known as the fracture cascade, and it places a huge burden on the individual and on health care resources."

"To address the burden, Briggs is working to improve the application of routine DXA (dual energy X-ray absorptiometry) bone density scans. DXA is a useful tool to diagnose osteoporosis, but it is unreliable in predicting the risk of a patient sustaining a spinal fracture."

"Routine DXA scans of the lumbar spine provide an average measure of bone mineral density, which is often used as a surrogate of bone strength," Briggs said. "However, bone mineral density within the vertebral body, what we need is a picture of the joint mass distribution within vertebral."  

"Computed tomography (CT) scans can provide this, but the technique is expensive, delivers a high dose of radiation, and is not commonly used in routine clinical practice for bone density purposes."

"His aim is to have DXA, which is a safe and more accessible technology, provide directions with the capability to readily identify those at risk of vertebral fractures."

"If successful, we’d expect to see the new technique used in hospitals and by drug companies in monitoring bone responses to drugs,” he said.

"The technology in the transit sector."
Curtin’s commitment to excellent, industry-relevant research has led to numerous innovations becoming commercially viable. Many of these technologies are now being successfully commercialised on the global stage. Innovations 2008 provides a snapshot of some of these ventures.

**THEBUZZ CORP PTY LTD**

TheBuzz Corp Pty Ltd is commercialising a technology which delivers low-cost internet telephony to customers, without the need for broadband in the home, and allows them to continue to enjoy an easy-to-use conventional ‘landline’ experience. Users simply connect the ‘plug and play’ BuzzBox between their existing telephone handsets and the wall socket for connection. The cost savings, simple set-up and ease of use are what make TheBuzz appealing. The product is the result of innovative research at the Western Australian Telecommunications Research Institute. A pilot program over eight months has provided valuable information on customer acquisition and usage data, and has led to some 4,000 customers electing to use the service.

[thefbuzzcorp.com](http://thefbuzzcorp.com)

**SENSA RE PTY LTD**

Sensear Pty Ltd has developed and is distributing the world’s first combined hearing protection and speech enhancing technology. Sensear products allow users to enjoy clear communication while ensuring safe hearing protection in noisy environments. SENS™ technology allows companies and their employees to comply with occupational health and safety standards for hearing protection. Since launching the world’s first electronic speech enhancing hearing protection product in April 2008, Sensear developers have secured distribution agreements with leading Australian and North American distributors, and sales to marquee global clients, including Alcoa and Qantas.

The company is the recipient of prestigious design and innovation awards, including 2008 DuPont Innovation Awards Winner; 2008 Silicon Valley launch – Most Promising New Company; 2008 Dual Australian International Design Awards Winner in the Medical and Scientific Category; and 2008 Safety In Action Winner – Best Newcomer to Industry.

**SKY (SUB-KARST IMAGING) METHOD**

Many oil fields occur beneath uneven, fractured terrain known as karst topography. This geology prevents the seismic waves that are measured by most imaging technologies from reaching the surface in a uniform pattern, rendering the data useless and making it impossible to correctly profile areas prior to oil extraction.

Curtin Professor Brian Evans has developed SKI Method, which accurately depicts the size and placement of oil deposits in locations impenetrable to other imaging techniques. The technology delivers high-resolution images of oil fields located under karst topography at a cost-effective price. An industry-funded trial of an initial prototype is underway, and a second-generation prototype is being financed by Curtin’s pre-seed fund for use in a large-scale pilot in the Middle East in 2009.

**WHOOPING COUGH VACCINE**

Whooping cough is the least well-controlled of all vaccine-preventable diseases. Periodic outbreaks result in a significant number of fatalities among children. The high incidence rate of whooping cough is caused by the adult community’s lack of compliance with booster injections and waning immunity to the disease over time, turning them into carriers capable of infecting children. Dr Trilochan Mukkur, from Curtin’s School of Biomedical Sciences, is developing a vaccine that can be delivered intranasally and will offer long-lasting immunity, eliminating the need for injections and booster shots.

The non-invasive nasal delivery is expected to result in increased compliance, which will reduce the likelihood of outbreaks. Initial trials have demonstrated the efficacy of this vaccine, which is protected by patents in key markets.

**GLYCAN BIOSCIENCES PTY LTD**

Glycan Biosciences Pty Ltd is a life-sciences company developing carbohydrate-based pharmaceuticals for global medical needs. The unique drug discovery platform, conceived and developed at Curtin’s School of Biomedical Sciences, makes possible a whole new class of drugs. Glycan is initially addressing respiratory diseases such as allergic rhinitis and asthma. Its drugs will be fast-acting, will have virtually no side effects, and will alleviate the underlying inflammation as well as treat symptoms.

Having identified state-of-the-art drug delivery devices in conjunction with industry partners, Glycan has established a chemistry laboratory in the US, and is negotiating with US investment firms to fund the next stage of its development.

[glycanbio.com](http://glycanbio.com)
Australia’s population is undergoing dramatic changes in its health profile, and chronic illnesses associated with increased longevity and poor lifestyle now consume 70 per cent of Australia’s health care expenditure.

Current models of health care delivery are no longer providing effective approaches to this situation. New ideas need to be tested, including establishing early intervention strategies, empowering individuals to actively manage their own health, and determining more effective drivers for best practice in prevention and management of chronic disease.

Increasingly, focus is also required on vulnerable populations, such as indigenous peoples, the elderly and those with compromised mental health.

Established earlier this year, the Curtin Health Innovation Research Institute (CHIRI) aims to fundamentally change the way we conceptualise and address the nation’s health care.

The institute will address health through a sustainable model that is capable of responding to evolving community needs, research developments and economic circumstances. The approach is based on the synergy of alliances between researchers and practitioners from a diverse range of backgrounds that, collectively, enable innovative thinking about health problems.

“CHIRI is based on a radical new approach that considers not just the patient and their pathology, but entire communities,” said Professor Moyez Jiwa, Professor of Health Innovation (Chronic Diseases) and the first of five Chairs to be appointed to CHIRI.

This means addressing health issues on a number of levels, including the psychological, social, economic, commercial and policy. The approach is a systems-based one that is both comprehensive and coherent.

According to Jiwa, CHIRI has several distinctive characteristics that put it in the unique position of becoming a national leader in health care.

CHIRI has a dedicated design team, consisting of technical experts such as medical ethicists, bio-statisticians, health economists and librarians who help with rigorous and efficient planning of projects. The institute has also established a clinical think tank that includes general practitioners, occupational therapists, physiotherapists, radiographers, nurses and community pharmacists. The alliance will work in close consultation with academic and design teams, and provide the vital link between ideas and practice.

CHIRI is also committed to a strong academic team who will take leadership roles on projects. The team’s international collaborations will be just one part of the extensive networks that CHIRI can leverage outside the University.

“All our work will be underpinned by a sound dissemination strategy at the local state, national and international levels,” Jiwa said. “This strategy will operate in academia, clinical, media and policy forums.”

The institute will bring together research, education and practice, and focus on biological science, pharmaceutical research, preventive sciences, public health, psychological interventions, advocacy, and social research and data linkage systems.

Research and teaching will be clustered around four broad areas of chronic disease, mental health, indigenous health and ageing.

“An on-campus clinical setting developed in collaboration with industry partners will support not only teaching, but also field testing ideas or models that are innovative and affordable,” Jiwa said.

“All activities – research, education and commercialisation – will take into account social and environmental responsibility in the planning and execution of projects so that CHIRI will be a fully integrated model of sustainability.”

**THE FUTURE OF HEALTH**

The scope of the new Curtin Health Innovation Research Institute will give researchers unprecedented leverage in developing and testing ideas in chronic disease prevention and management.

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**Professor Patricia Davidson**

Director, Centre for Cardiovascular and Chronic Care
Faculty of Health Sciences

Based within the School of Nursing and Midwifery at Curtin, Sydney, the centre’s research aims to improve the health and wellbeing of people with cardiovascular and chronic conditions. Within these research aims, Davidson’s own work is focused on developing and evaluating models and systems of care, including management of heart failure and acute coronary syndromes, and older systems, patient and provider factors impact on health outcomes.

After 25 years as a cardiovascular nurse, Davidson completed her PhD in 2003 at the University of Newcastle. Funded by the National Health and Medical Research Council (NHMRC), her doctoral research consisted of a randomised controlled trial of heart failure-specific cardiac rehabilitation. Since then, she has been highly successful in obtaining competitive grants for projects across a range of health topics, including cardiac care and symptom management; women and cardiovascular disease (CVD); coordinated models of nursing care; Indigenous health, and nursing interventions in primary care.

Davidson’s current projects include an NHMRC-funded investigation of the use of oxygen in chronic heart failure with hypoxaemia. Her expertise enables her to make a significant contribution to advising and formulating government policy related to CVD and models and processes of care. Her evidence-based research has contributed, for example, to the national Guidelines for the Management of Chronic Heart Failure and, most recently, the Living Well with Chronic Heart Failure Consumer Information resource.

Since establishing the Centre for Cardiovascular and Chronic Care, Davidson has attracted a number of research students to the centre, and is now progressing research links with St Vincent’s Hospital in Sydney, and the Sydney West Area Health Service.

She holds numerous overseas visiting roles for key health organisations, including President Elect of the Australasian Cardiovascular Nursing College, Co-Chair of the NHMRC Cardiovascular Expert Reference Group and President of the International Council on Women’s Health Issues. Prior to joining Curtin, she was employed conjointly by the University of Western Sydney and Sydney West Area Health Service.
Curtin’s new bioscure PC3 laboratory is designed and engineered to not only contain exotic viruses (those not yet established in Australia), but also to contain pathogens that, because of their high virulence, pose a significant level of personal biosecurity hazard to researchers. Taking over from esteemed microbiologist Professor John Mackenzie (now retired), senior research fellow Dr David Williams has spent the past two years setting up the new laboratory, and is currently establishing Curtin-based research projects for the Australian Biosecurity Cooperative Research Centre (AB-CRC).

“Our research is focused on different aspects of emerging or re-emerging viruses,” Williams said. “A key area is the development of new diagnostic technologies to detect the genetic material of existing and emerging viruses.”

The team is developing new detection technologies for encephalitic viruses such as Japanese encephalitis virus (JE) and West Nile virus. Encephalitis is a significant cause of neurological disease and associated mortality worldwide, but current diagnostic methods fail to identify a causative infectious agent in as many as 60 per cent of cases. JE first appeared in Australia in 1995, and cases have occurred in Queensland and the Torres Strait. Of concern for Australian biosecurity is the prevalence of JE in Asia (where, each year, more than 50,000 cases are reported) and the fact that potential mosquito vectors for the JE virus exist on mainland Australia.

“Zoogenic and mosquito-borne viruses are responsible for nearly all recent emerging disease outbreaks in South-East Asia and Australasia,” Williams said, “and, due to the ever-increasing movement of people, increasing trade, and changing climatic conditions, the risk to Australia of new and emerging diseases like JE will continue to increase.”

“A major diagnostic problem is the huge number of pathogens – both pre-existing and emerging – able to cause viral encephalitis. Add to this the range of differences in epidemiology and clinical features, and you understand why the laborious diagnostic process can be a hit-and-miss situation.”

Williams’ research team at the Curtin node of the AB-CRC is now collaborating with the Center for Infection and Immunity at Columbia University in New York, and with PathWest, here in Perth, on the development of a multiplex diagnostic test called MassTag PCR (polymerase chain reaction).

MassTag PCR was recently developed at the Columbia centre. The PCR is able to target and amplify the genes of pathogens collected from clinical samples to detectable levels. Following the method’s success for differential diagnosis of respiratory disease and viral haemorrhagic fevers, the Columbia centre invited the Curtin AB-CRC team to participate in the development of the technique for encephalitic pathogens.

“Current assays generally test for about four different gene sequences of encephalitis-causing agents, whereas the MassTag PCR technique we’re developing will be able to rapidly detect up to 30 microbial gene sequences at a time,” Williams said.

The project – which is being funded by the AB-CRC under its “Technologies to Enhance Detection” program – also forms part of a global research program, coordinated by the Columbia laboratory, on the identification of emerging viral disease threats.

“Australia is at risk of many emerging viruses associated with human encephalitis – JE, Nipah, Hendra, Australian Bat Lyssa and Dengue – as well as several enterovirus serotypes associated with aseptic meningitis and encephalitis,” Williams said.

“Our involvement with this international project plays an important role in Australian biosecurity, as it ensures that new diagnostic technologies such as MassTag PCR can be developed and evaluated specifically for Australian diagnostic requirements.”

**Biosecurity**

**NEW DIAGNOSTICS FOR VIRUS RIDDLE**

Current commercial diagnostic tests for encephalitic viruses such as JE are reported to have a high rate of false negatives, meaning the results are inconclusive. To resolve this, Williams’ team in Curtin’s School of Public Health are pioneering research into lupin-based food products which, Jayaesena said, will change what people eat and contribute to a healthier lifestyle.

“With a great percentage of Australian men and women overweight or obese, public education programs don’t appear to be working,” he said.

“Our research identified an opportunity to address the growing obesity epidemic as well as the health burden of malnutrition in developing countries, using lupin-based food products.”

Support from the WA Government, through the Centre for Food and Genomic Medicine (CFGM) and the Grain Foods Cooperative Research Centre, meant the Curtin team had the resources to develop a range of palatable, high-protein, high-fibre, lupin-based foods, including muffins, biscuits, noodles, pasta, breakfast bars and crisps.

“Eating 100 grams of lupin crisps will provide teenagers with 70 per cent of their recommended daily intake of dietary fibre, 60 per cent protein, 50 per cent magnesium, 30 per cent potassium, 25 per cent phosphorus and 8 per cent calcium,” Jayaesena said.

“In recent ‘blind’ tasting trials of the lupin-based snack products, both adults and children expressed a desire to eat more of the product when readily available. This is a major step forward, as previous attempts to develop similar foods have been unsuccessful due to poor consumer acceptability.”

In a further collaboration with the Grain Foods CRC and the Indonesian Institute of Sciences (LIPI), the research team developed lupin-based Asian foods such as tempe. These foods offer cheap, high-nutritional alternatives in developing countries characterised by low standards of living and malnutrition.

Lupin-based product tests show consumption can reduce cholesterol levels, reduce weight, lower hypertension, improve bowel health and suppress appetite, while providing a high-nutritional value at a cheaper production cost when compared with other grains.

An added benefit is the cost of production. Lupins require less water and fertilizer than similar crops, and are ideally suited to Western Australia’s Wheatbelt, with WA producing 90 per cent of the world’s lupin crop.

With supply guaranteed, and production trials well underway, Jayaesena said some biscuit and pasta products will be commercially available within three to six months. He is working closely with local lupin growers, processors and food manufacturers, such as Clinton Valley Pty Ltd, Chid Group, Coorow Seeds, Bothi’s Bakehouse (biscuit products) and Belmar Foods (pasta products), to develop palatable products under the Curtain.”

The project continues to attract national and international attention. As well as the Indonesian Institute of Sciences, the University of Mumbai in India, and various organisations in Malaysia, Thailand, Japan and Sri Lanka, European nations are also keen to be involved in the project. Jayaesena’s team continues to work with the Department of Agriculture and Food, The University of Western Australia and Murdoch University to unlock the potential of this 21st-century food.
The truth about postmodernism?

Skeptically and not-so-scholarly debates about the role of critical literacy within secondary-school English have continued for most of this decade. Associate Professor Niall Lucy, from the Australia Research Institute, remains fully engaged with the issue.

For more than 20 years Associate Professor Niall Lucy has been a leading voice in the field known as postmodern studies. During this time, one of the more contentious claims to emerge in public and political arenas about postmodernism is that it is degrading secondary-school English in Australia. Since the release in 2006 of their book The War on English: An Answer to Postmodernism, the authors have been invited to discuss their positions in diverse venues, from the Australia Research Institute, to national radio, and at the 2007 New South Wales English Teachers’ Association conference. Their paper “The War on English: An Answer to Postmodernism?”, published as the lead article in Transformations, the journal of the Australian English Teachers’ Association, at the 2007 New South Wales English Teachers’ Association conference, their paper “The War on English: An Answer to Postmodernism?”, published as the lead article in Transformations, the journal of the Australian English Teachers’ Association, has been regularly been invited to discuss aspects of postmodernism. Following their keynote address at the 2007 New South Wales English Teachers’ Association Conference, their paper “The War on English: An Answer to Postmodernism?” was published as the lead article in Transformations (Issue No. 16 2008 – Democracy Under Fire, the use and abuse of democracy in the public sphere). The paper responds, Lucy said, to persistent claims that postmodernism, through the application of critical literacy strategies, is degrading Australian secondary-school English.

“Enough politicians and commentators have alleged that postmodernism has infiltrated the English curriculum to the extent that students are taught to ask questions that challenge the basis of ‘reality’ and to question the underlying values,” Lucy said. “A typical indictment against postmodernism is that postmodernism has destroyed the discipline of English. The truth is that postmodernism is opposing the status quo. The discipline of English is, at it’s best, a discipline in which students can question the status quo.”

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“The ability to communicate well is one of our most important developmental accomplishments, and is widely regarded as the foundation of success in life. However, an estimated seven per cent of children who have normal hearing and, and no other developmental problems, do not develop life skills with ease, and this may limit their educational achievement and social participation. Researchers at Curtin’s Centre for Developmental Health have found that, contrary to recent hypotheses, a mother’s level of education, income or parenting style, or other factors in the child’s family environment, are not responsible for a delay in a child’s early acquisition of language skills. “People have wrongly believed that children who are not reading well or are not talking well are the result of some other inadequacy in the family environment,” said the project’s chief investigator, Associate Professor Kate Taylor. “Our preliminary research showed that 13 per cent of two-year-olds are late talkers, and that boys are three times as likely to have a delay at that age. “What we now see from the data is that by age 7, 80 per cent of late talkers have caught up, and that there are no greater risk than girls. However, one in five late talkers was below age expectations for language at school-age.”

The results show that while a late start doesn’t necessarily predict ongoing language problems, most school-aged children with impaired language were late to start to talk. Based on the Telethon Institute of Child Health Research, Taylor and Professor Stephen Zubrick have been collaborating with researchers at the University of Kansas and the University of Nebraska Medical Center, in the US, to reveal why some children have difficulty developing language and, later, have trouble with reading.

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Higher degrees by research

Graduate Studies Overview 2008

The Graduate Studies team at Curtin has delivered a range of enhancements during 2008 to improve the research training experience for all of our higher degree by research students.

Higher degree by research (HDR) students have benefited from increased funding for consumables and feedback to support their research which is now accessible through a University-wide program. 2008 saw the introduction of the Curtin Research Scholarships for all new recipients of the prestigious Australian Postgraduate Awards and Curtin University Postgraduate Scholarships. These scholarships have provided substantial increases in these awards, being phased in over three years. In 2009, continuing recipients will receive enhanced levels of support.

During 2008 Curtin launched a new scholarship program – the Curtin Strategic International Research Scholarships. There were 15 scholarships provided in 2008, with a further round to be provided next year. The scholarships are targeted at Curtin’s priority research areas and are in addition to the Endeavour International Research Postgraduate Research Scholarships and Curtin International Research Tuition Scholarships. The Register of Supervisors for HDR Students has also been revised, with registration now compulsory for all supervisors. Membership of the register has grown from 270 in May 2000 to 1,300 currently. With increased membership, the register is now a valuable resource for prospective students to gauge their preferred supervisors. This register has been made available to the public and will continue to be updated by Curtin supervisors. The web provides comprehensive guidelines to assist students in preparing their application for candidacy, managing their research project, and structuring and submitting their thesis, among other content.

The development of generic attributes for research students is important. Curtin research students can choose to be involved in two significant programs to enhance career opportunities beyond their degree. The first program is the fully online Graduate Certificate in Research Commercialisation, offered under the auspices of the e-Grad School, an initiative of the Australian Technology Network (ATN), with students supported by scholarships from the Australian Government’s Commercialisation Training Scheme. The second program is the ATN’s Learning Employment Aptitudes Program (ATN-LEAP) which won a prestigious 2007 Curtin’s Award for Programs that Enhance Learning. Since 2003 there have been almost 3,000 enrolments in the six online modules that aim to enhance students’ generic skills. Building on the successes of the ATN-LEAP project, the five ATN universities have now launched the ATN-LEAP: Health Australia (ATN-MORE). These five short web-based modules are designed to assist students, both on and off campus, in managing and writing up their research.

Curtin uses the Curtin Annual Student Satisfaction survey and the national Postgraduate Research Experience Questionnaire to monitor the quality of the research student experience. The 2007 results for both of these measures have indicated high levels of student satisfaction and, due to the commitment of the Graduate Studies team, we expect this pleasing trend will continue into 2009.

Professor Graeme Wright
Dean, Graduate Studies
Research and Development

Graduate Profiles

Wenbin Liang
School of Public Health
Faculty of Health Sciences

Wenbin (Ben) Liang’s doctoral research took him back to his birthplace, Fushan, in southern China, to examine the association between his people’s dietary habits and lifestyles and their effect on the risk of ischemic stroke — the result of reduced blood supply to part of the brain which causes damage and increases the risk of death. The majority of strokes are due to ischemia — the result of a reduced blood supply to part of the brain which causes damage and increases the risk of death. The majority of strokes are due to ischemia — the result of a reduced blood supply to part of the brain which causes damage and increases the risk of death. Wenbin was motivated to examine these risk factors because of the high prevalence of ischemic stroke in his home country of China.

In order to apply comprehensive applied epidemiology and biostatistics methods, Wenbin conducted two major studies in Fushan. The first study examined the traditional dietary habits and lifestyles of the southern Chinese population from ischemic stroke. His research involved a hospital-based case-control study with a matched sample size of 832 individuals, consisting of ischemic stroke patients (cases) and people who had no history of stroke (controls). Data was collected over a period of 12 months, using face-to-face interviews. In designing the study and ensuring its validity, all previous published research in the field was scrutinized in order to apply comprehensive applied epidemiology and biostatistics methods.

The second study investigated the traditional dietary habits and lifestyles of the southern Chinese population from ischemic stroke. His research involved a hospital-based case-control study with a matched sample size of 832 individuals, consisting of ischemic stroke patients (cases) and people who had no history of stroke (controls). Data was collected over a period of 12 months, using face-to-face interviews. In designing the study and ensuring its validity, all previous published research in the field was scrutinized in order to apply comprehensive applied epidemiology and biostatistics methods.

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Curtin’s research on the ball

Unique in Australia, Curtin’s Centre for Sport and Recreation Research sits apart from the traditional sports-focused research disciplines to address new challenges for sport and recreation in Western Australia.

Keith Spence

Keith Spence is the newly appointed Chair of the Curtin-based Australian Sustainable Development Institute (ASDI) and a member of Curtin Council. He is also on the Board of Skills Australia, the Australian Institute of Management and three independent companies. He has more than 30 years of experience in the oil and gas industry, and was formerly Executive Vice-President Enterprise Capability at Woodside.

How did you come to be involved in sustainable development?

As a member of Council, I was on the Council Taskforce for ASDI in its initial phase. But I’m also personally passionate about the issue and have years of experience in sustainable development from working in industry. At Woodside, for example, I was involved in climate change modelling. And Curtin and Woodside have a long partnership in collaborating on R&D, so I’ve been aware, for some time, of the research issues that universities and governments are grappling with.

Sustainability has been identified as a key area of research at Curtin. Why has the University chosen this focus?

Sustainable development is a logical extension of Curtin’s current focus. Curtin has always been an industry-focused university. It also has strong research and teaching programs in resources. When you look at the challenges facing Western Australia, it makes sense for Curtin to apply its strengths to the pressing issues around sustainable development. Curtin already has 13 primary research centres and institutes that provide research across the sustainable development area. This positions ASDI as a unique opportunity to provide a vehicle for greater integration of research disciplines.

What does sustainability mean for the University’s research agenda and outcomes?

It means that we focus on key areas that align our strengths with pressing local, state, and national needs. These include work in energy, policy, efficiency and technology; water management; climate change; coastal development; sustainable food and security; urban and regional development; Indigenous futures; and community engagement.

There are dozens of groups across the University currently doing research in the sustainable development area. Some of the initiatives include the Curtin University Sustainability Policy Institute, Curtin Research Centre for Stronger Communities, and the Centre in Cleaner Production and Curtin Water Quality Research Centre.

As the newly appointed Chair of ASDI, what do you hope this research initiative to achieve?

In addition to its research focus, my vision for ASDI would be an institute that contributes to teaching and coordination in sustainable development within Australia, and provides sustainability training and professional development to government, industry and community. It also sees ASDI contributing to the adoption of sustainable development principles in government administration and business management through contributions to policy and legislation. And I think the institute must play its full role in promoting sustainable development awareness within the wider community.

What role do partnerships play in achieving sustainability?

Significant capacity already exists at Curtin. Partnerships complement this capability. By using expertise from a wide range of disciplines, unique project outputs can be convened to solve business and government research issues. Partnerships, with business, industry and government are the preferred investment model for the University.

How do you see the University’s focus on sustainable development contributing to pressing local, State and national issues?

Developing research teams with a cutting-edge understanding of sustainability will tackle multidisciplinary problems facing business and government. For example, climate change modelling and adaptation to climate change has global, national, State and regional significance. The need for global response and translating this to a regional context is at the core of formulating policies and plans for responding to this issue.

Modelling has been a key tool in analyzing past data and predicting future scenarios, and the models are crucially growing in sophistication, scale and acceptance. A local level of expertise is crucial to Western Australia. It is an interesting area to be placed at the forefront with those of the rest of Australia.
Drugs and Mental Health: Effective and Coordinated Responses

Beneath the Bloodwood Tree
By Julienne van Loon
Allen & Unwin, 2008

The second novel by award-winning author and Curtin lectuer Julienne van Loon is a character-driven, literary work, at the heart of which are themes of intimacy, violence and trust.

The protagonist, Pia Ricci, is a dentist who has given up her complicated Melbourne life in favour of a quiet life in Port Hedland, only to have it become complicated again after a mysterious find.

The find is a bundle of money and clothing which were buried beneath a bloodwood tree and which Pia discovers one morning while walking her dog. The discovery becomes a catalyst for change in Pia's life and soon she becomes involved with two men, one of whom is married.

The story turns back on itself when a dying patient of one of the men reveals a connection to the mysterious bundle.

Van Loon is interested in the status of women, not so much in a public sense, but in a private one, and particularly in the way that status impacts on intimate relationships with men.

She was born in 1970 and grew up in country New South Wales. Her first novel River Story won the Australian Vogel Literary Award in 2004.

Learning with Animation: Research Implications for Design
Edited by Richard Lowe and Wolfgang Schnotz
Cambridge University Press, 2008

Professor of Learning Technologies at Curtin Richard Lowe has collaborated with Professor Wolfgang Schnotz, head of the Multimedia Research Group at University of Koblenz-Landau in Germany, to edit a book on the use of animation in conveying educational, scientific and industrial information.

Increasingly, within large organisations and educational institutions, animations are being incorporated in computer-based instruction to deliver information about procedures and operations. The rapid increase in the use of animation as a resource for teaching and learning has been driven largely by advances in ICT and the assumption it increases interest and helps direct attention. However, recent research demonstrates that animation is not inherently effective, and can sometimes be counterproductive.

Learning with Animation examines how an animation's effectiveness depends on the degree to which the learner is involved with the animation, how the learner is matched with the psychological functioning of the learner, Lowe and Schnotz have brought together leading international researchers in the area of learning with animation to explore how people perceive and cognitively process animations. The book discusses the capabilities of animation as a powerful tool for technology-based learning, the functions of animations and how they are best designed and applied.

Orphaned by the Colour of My Skin: A Stolen Generation Story
By Mary Terszak
Verandah House, 2008

The story of the psychological impact of institutionalisation on an indigenous woman, her search for family, community and identity, her brokendown and her personal reconstruction is told by Mary Terszak (Woolkoo) as an autobiographical journal in Verandah by the Colour of My Skin.

The book was developed from Terszak's master's thesis Who is Mary Rose? A Sister Katala's Home Kid? It reveals the experiences of her life at Sister Katala's Children's Home, where she was taken from her mother at age 2 as part of the Commonwealth Government's 1905 Aborigines Act which saw the removal of Aboriginal children from their families.

She said the mental trauma she suffered as a child caused her at the time to retaliate against other children, and today she lives with many regrets.

Terszak completed a degree in Primary Health at age 57, through Curtin's Centre for Aboriginal Studies, in 2000. Her prior schooling was an equivalent year-nine level. After completing her bachelor and honours degrees, she embarked on her master's degree as a way of helping her children understand her experiences as a child.

UNIVERSITY RESEARCH INSTITUTES
Centre for Advanced Studies in Australia, Asia and the Pacific

Curtin University Sustainability Policy Institute
Digital Ecosystems and Business Intelligence Institute
Institute for Multi-sensor Processing and Content Analysis
Institute for Theoretical Physics
John Curtin Institute for Public Policy
Nanotechnology Research Institute
National Drug Research Institute
Science & Mathematics Education Centre
The Institute for Geoscience Research
Western Australian Biomedical Research Institute

GOVERNMENT-FUNDED INSTITUTES AND CENTRES
Centre for High Definition Geophysics
Centre for Sport and Recreation Research
John De Laeter Centre of Mass Spectrometry
Western Australian Nanotechnology Research Institute
Western Australian Telecommunications Research Institute

INDUSTRY RESEARCH CENTRES
Curtin Research Centre for Stronger Communities
Curtin Water Quality Research Centre

UNIVERSITY RESEARCH CENTRES
Curtin Indigenous Research Centre
Centre for Behavioural Research in Cancer Centre
Centre for Developmental Health
Centre for Ecosystem Diversity and Dynamics
Centre for Fuels and Energy
Centre for International Health
Centre for Labour Market Research
Centre for Marine Science & 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 Aging
Centre for Rock Characterisation
Communication Economics & Electronic Markets Research Centre
Curtin Industrial Modelling & Optimisation
Isotope Science Research Laboratories
Psychological Wellbeing Across the Lifecycle
Rehabilitation Centre for Applied Psychology
Western Australian Organic and Isotope Geochemistry Centre
Western Australian Centre for Health Promotion Research

COOPERATIVE RESEARCH CENTRES
CORE PARTICIPANT
Australian Biosafety CRC
CRC for Coal in Sustainable Development
Australian Seabed CRC
CRC for Construction Innovation
CRC for Greenhouse Gas Technologies
CRC for Landscape Environments and Mineral Exploration
CRC for Sustainable Resource Processing
CRC for Water Quality & Treatment
CRC Mining
CRC for Sustainable Tourism
Desert Knowledge CRC
Parker CRC for Integrated Hydrometalurgy Solutions
Spatial Information CRC

SUPPORTING PARTICIPANT
CRC for Contamination Assessment and Remediation of the Environment
CRC for Innovative Clean Food Products
CRC for Integrated Engineering Asset Management CLEAR

MULTI-INSTITUTIONAL RESEARCH CENTRES
Australian Housing & Urban Research Institute
Australian Centre for Geomechanics
Centre for Exploration Targeting
Institute for Coal Strategies
MEC – The Hub of Advanced Computing in Western Australia
Nanoscience Characterisation Centre
Planning and Transport Research Centre
Western Australia Energy Research Alliance
Western Australian Centre for Cancer and Palliative Care
Western Australian Marine Science Institute
Western Australian Standards Technology and Applications Consortium

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RESEARCH CENTRES

Centres & Institutes

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