

Review of activities



Research and research training

Vigorous research efforts at all levels attracted increased public and private funding, achieved discoveries of world significance, expanded commercialisation prospects and provided a wealth of training opportunities to nurture a new generation of researchers.

Assessing performance

Benchmarking and review

We rigorously evaluate our research performance by annually measuring our achievements against those of our peers in Australia and overseas. We assess progress by reviewing against:

- strategic research targets;
- success in competitive funding rounds; and
- performance within *Universitas 21* and the Group of Eight (pages 4, 5).

These activities inform our research management practices, as do regular school and centre reviews chaired by national or international experts. Resulting recommendations are analysed 12-18 months post-review. This year we considered 18-month implementation reports for the Schools of Biomedical Sciences, of Engineering, and of Medicine; and reviewed research activities in our:

- School of Human Movement Studies;
- School of Physical Sciences;
- School of Natural and Rural Systems Management;
- School of Social Work and Applied Human Sciences;
- Sustainable Minerals Institute;
- Centre for Marine Studies;
- School of Geography, Planning and Architecture;
- School of Music;
- School of Molecular and Microbial Sciences; and
- Australasian Centre on Ageing.

In 2005, we expanded our quality performance monitoring mechanisms by piloting an *Assessment of the Quality of Research Outcomes* exercise. This involved a school-level peer review describing the quality of research conducted by school staff over the past five years.

We supported the creation of a national research performance benchmark, in response to the Australian Government's Research Quality Framework issues paper. We welcomed its investigation into how the quality and impact of research output from universities and other publicly-funded research agencies could be evaluated and communicated.

- ◀ Dr Tom Baldock and PhD student Paul Guard, School of Engineering... using a new tsunami impact model in research aimed at predicting initial run-up and impact as leading tsunami waves hit a coastline. The project, prompted by the 2004 Boxing Day tsunami in Asia, is a significant advance on classical tsunami impact research based on offshore waves that break as they steepen in shallow water.

Competitive funding

Leading the way

We continued to excel in competitive funding rounds.

Our total reported research income in 2004 (latest data) was \$156.7 million – a \$2 million increase from the previous year. Competitive grants funding grew to \$73.06 million (up from \$63.5 million in 2004), while income from our CRCs (pages 4, 47-48) remained the highest of any university at \$14.6 million.

Under the Institutional Grants Scheme (IGS), universities receive performance-based block funding using a formula recognising research income (60 percent), research student load (30 percent), and the number and type of research publications produced (10 percent). In 2005, we boosted our performance in each of these categories, receiving \$29.05 million (10 percent of the total funding pool). Preliminary figures indicate that our performance in the **2006** IGS should remain steady.

In other 2005 Commonwealth Block Grants we ranked third nationally for:

- Research Training Scheme (\$53.23 million; 9.6 percent); and
- Research Infrastructure Block Grant (\$17.28 million; 9.4 percent).

ARC funding

We will receive \$32.6 million in funding from the Australian Research Council (ARC) Discovery and Linkage Projects announced to date for 99 projects starting in **2006**.

This was the third-highest allocation in Australia (following the University of Sydney and the Australian National University). It represented almost 10 percent of total national funding, and 68 percent of the \$52 million allocated to projects in Queensland.

In 2005, we topped the **ARC's Linkage Project** grants list with \$20.8 million cash for nine percent of projects awarded nationally. Next were the University of Melbourne (\$15.4 million) and the University of Sydney (\$14.5 million). We raised a further \$17.8 million in-kind from industry partners to complement the \$20.8 million cash received as public funds.

In both Linkage rounds, we had the most Australian Postgraduate Awards Industry projects (35), Australian Postdoctoral Fellowships Industry projects (four) and Collaborative Research projects (41). This result demonstrates our commitment to, and pre-eminence in, collaborative research with industry.

Objectives

- promote the value of research to the community, boost our leadership role and critically assess our performance against international standards
- achieve international distinction in areas of strategic priority
- collaborate with government, industry and global communities and increase funding from all sources
- enhance our role as a major provider of research training

Key outcomes

- \$156.7 million total reported research income – \$2 million increase on previous year
- first in Australia for Linkage Project grants
- world's first cancer vaccine (100 percent effectiveness in clinical trials)
- first in four critical areas for commercialisation by Australian universities and publicly-funded institutions
- second-largest PhD (and largest international PhD) enrolment in Australia

Outlook for the higher education sector

- focus on assessing quality and impact of research outputs
- more research commercialisation
- less reliance on government funding
- competition for postgraduates
- projects aligned to national research priorities

Our year ahead

- reporting on research quality and impact
- winning more competitive funding
- continuing development of world-class research infrastructure
- attracting more higher-degree-by-research students

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Research and research training

Research income* from

- industry and other private sources (\$39.12m)
- competitive grants (\$73.06m)
- CRC funding (\$14.64m)
- other public sector funding (\$29.85m)

* 2004 data – latest available

Queensland Government support 2005

- Dept State Development, Trade and Innovation: \$10m core funding for IMB
- Queensland Health: \$7.1m to help establish the Queensland Breeding Facility (\$1.7m), support education in the School of Dentistry (\$1.9m) and fund research (\$3.5m)
- Motor Accident Insurances Commission: \$2.2m for research
- Other State Government research grants: \$2.7m

ARC Linkage Project Grant highlights included \$8.6 million for the world-first Australian Minerals Science Research Institute, a consortium of which we are a member. The grant will back research into energy efficiency, frugal water use, efficient management of waste, innovative processing, material and interface science, advanced analysis and mathematics in mineral processing.

We placed equal first in the country for **Linkage Infrastructure, Equipment and Facilities (LIEF) Grants** (\$5 million for nine of 14 applications); and we were third nationally with 15 **Discovery Project Fellowships**. An additional \$26.1 million flowed from the ARC Discovery Scheme for 83 successful project applications.

Our researchers led three of the 24 **ARC Research Networks** awarded nationally, attracting \$4.85 million in ARC funding. The networks connect people, disciplines, organisations and countries, bringing together leading researchers from Australia and overseas.

Eight of our projects – the most of any university in Australia – attracted a total \$640,000 in **ARC E-Research Support Grants**. This confirms our leadership in developing innovative technology applications.

Other major ARC grants included:

- \$1.9 million for projects including satellite tracking and behavioural studies of crocodiles in remote regions and improving the growth of barramundi (School of Integrative Biology – Linkage and Discovery grants);
- \$1.1 million to develop tools for managing ecosystem responses to climate change on the

Great Barrier Reef (Centre for Marine Studies – Linkage Project);

- \$1 million to establish online infrastructure to facilitate interdisciplinary research collaborations (Institute for Molecular Biosciences – LIEF);
- \$540,000 for the *AustLit* project, to develop databases relating to Aboriginal and Torres Strait Islander writers, multicultural writers, and regional and colonial writing from Queensland and Tasmania (LIEF);
- \$372,000 to develop an *in vitro* method for identifying morphine-like analgesics with reduced side effects (School of Pharmacy – Linkage Project);
- \$275,000 to improve warning systems for tsunamis (Earth System Science Computational Centre – Discovery Project); and
- \$275,000 to reduce the emotional costs of divorce for families and children (School of Psychology – Discovery Project).

Innovation funding

The Federal Government's **Higher Education Innovation Program** funded two projects:

- *PhD graduates three to five years out: employment outcomes, job attributes and the quality of research training* – the first phase of a longitudinal study of PhD graduates from seven Go8 universities; and
- *Development and implementation of curriculum articulation model for nursing between the university and TAFE sectors.*

Research grants (non-government)

\$45 million in 2005, including major gifts (\$500,000 and above) as follows...

Grantor	Total
United States National Institutes of Health	\$4.4m
The World Bank	\$3.5m
Royal Children's Hospital Foundation	\$1.6m
Australian Mineral Industries Research Assoc. Ltd	\$1.2m
Australian Cancer Research Foundation	\$0.9m
Meat and Livestock Australia	\$0.65m
Wellcome Trust (UK)	\$0.64m
Queensland Cancer Fund	\$0.62m
Australian Coal Research Ltd	\$0.57m
Gordon and Betty Moore Foundation	\$0.56m
United Nations Educational, Scientific and Cultural Organisation	\$0.55m
Dairy Australia	\$0.55m
Colonial Foundation Limited	\$0.5m

Research funding (Commonwealth Government) \$183 million in 2005, including...

Grantor	Total
Department of Education, Science and Training	\$100m
Australian Research Council	\$41.5m
National Health and Medical Research Council	\$29.1m
Department of Health & Ageing	\$2.6m
Australian Centre for International Agricultural Research	\$2m
Department of Defence (Commonwealth)	\$1.6m
Grains Research and Development Corporation	\$8m

Health research funding

Forty-five of our projects attracted \$22.25 million (up \$6 million from 2004) from **National Health and Medical Research Council (NHMRC) grants** – the best score in Queensland and the fifth-highest nationally. Grants included:

- \$1.84 million to form the southern hemisphere's only Arrayed Retroviral Expression Cloning Facility (Centre for Immunology and Cancer Research – CICR);
- \$779,500 to develop a Health Intervention Package for people with intellectual disabilities (Queensland Centre for Intellectual and Developmental Disability);
- \$422,625 to research a drug for blocking growth of fat cells (School of Medicine); and
- \$243,750 to study seizures in newborn babies (Perinatal Research Centre).

Our researchers shared in more than \$23 million in funding as part of the 2005 **NHMRC Program Grants scheme**. We led two successful applications and were involved in a further two as a supporting partner. Successful applications included:

- \$4.7 million to develop therapies using the human immune system to treat disease (CICR);
- \$7.1 million for a study using marine snail toxins to improve understanding of chronic pain (Institute for Molecular Bioscience – IMB);
- \$4.3 million to study the molecular genetics of sex determination and gonad development (involving the IMB); and
- \$7.07 million to bring together a multi-skilled team of researchers to investigate diabetes, heart and kidney disease in Indigenous Australians (involving the School of Medicine).

Other health research funding included:

- \$1.5 million in grants from the Rotary Health Research Fund;
- a \$650,000 bequest for a study of paralysing spinal injuries (pages 66, 72);
- a \$3 million bequest to advance research into Motor Neuron Disease (pages 66, 72);
- \$150,000 each to four researchers with UQ appointments in the first round of the Queensland Clinical Research Fellowships Program of the Smart State Health and Medical Research Fund; and
- \$625,000 from the Queensland Government for IMB studies of the genetic mechanisms of testicular cancer.

International funding

International highlights included \$34.7 million from the Bill and Melinda Gates Foundation *Grand Challenges in Global Health* initiative to advance international collaborations investigating:

- strategies for population health measurement, to facilitate distribution of public health resources (\$24.7 million, our School of Population Health in partnership with Harvard University, Johns Hopkins University and Broad Institute in the USA); and
- halting spread of the dengue fever virus (\$10 million, our School of Integrative Biology working with scientists from Thailand, Vietnam, Japan, Australia and the USA).

Industry links

In 2004 (latest data available, chart page 4), we received \$39.12 million in funding from industry and other private sources. This was \$11.09 million less than funds received in 2003. However, the decrease should be considered in the context of steadily increasing research income overall (\$154.66 million in 2003, \$156.66 million in 2004).

We maintained high levels of participation in the Federal Government's **Cooperative Research Centres**



Involvements in five of 11 new ARC Centres of Excellence – Centres in

- Coral Reef Studies
- Structural and Functional Microbial Genomics
- Design in Light Metals
- Vision Science
- Ore Deposits

Industry collaborations: 16 Linkage Project grants

- Centre for Marine Studies (3)
- ARC Centre for Functional Nanomaterials
- School of Population Health
- School of Integrative Biology (2)
- Centre for Magnetic Resonance and Centre for High Performance Polymers
- School of Land and Food Sciences
- National Research Centre for Environmental Toxicology (2)
- Pyrometallurgy Research Centre
- School of Nursing
- School of Engineering (2)
- Earth Systems Science Computational Centre

◀ 2005 Roche Medal winner Associate Professor Jennifer Martin of the IMB... an international reputation for research in structural biology and protein crystallography, and a force behind start-up drug development company Xenome Ltd

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Research and research training

In tune with industry... new chairs

- Xstrata Chair of Metallurgical Engineering: support for 10 years from Xstrata to address skills shortages in the resources industry
- Partnership with BHP Billiton Mitsubishi Alliance: support for five years for a teaching and research package including new chairs in (1) mining engineering and (2) mineral process engineering; and a coal processing lecture series

(CRC) Program, receiving \$14.63 million in 2004. Over the year, we were involved in 36 CRCs (25 as core partner, 11 as a supporting partner).

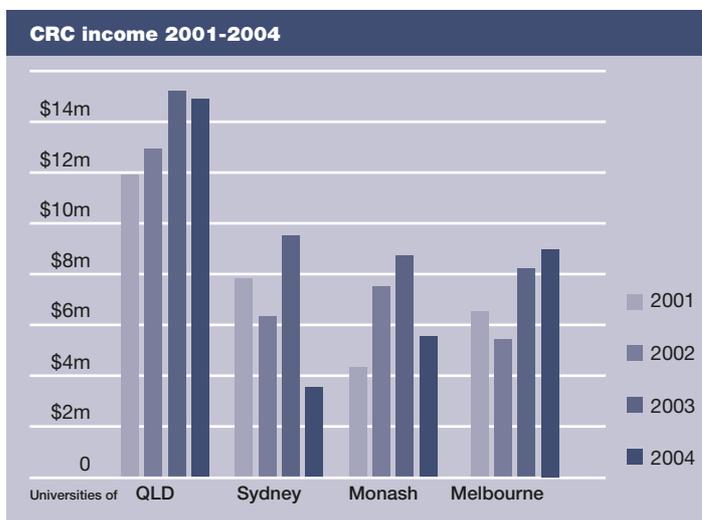
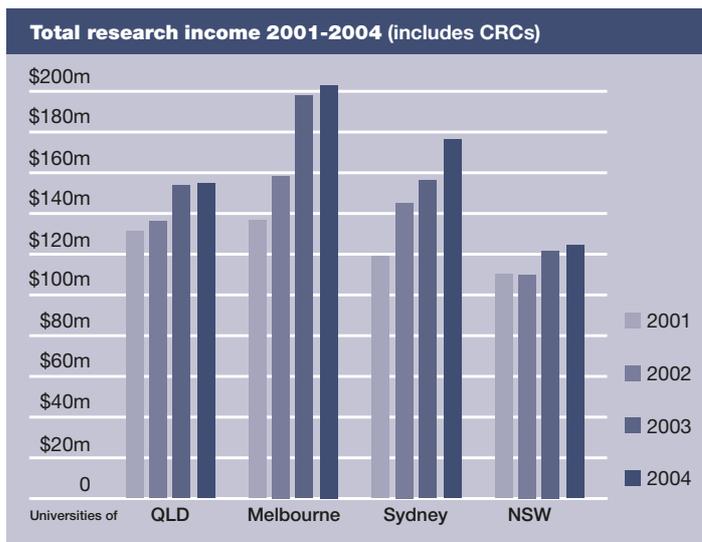
A new research hub for the Cooperative Research Centre for Mining (CRCMining) opened at the Pinjarra Hills headquarters during the year. CRCMining engineers built the Advanced Dragline Dutymeter, a damage detection monitor for \$100 million draglines, to cut maintenance costs and boost production rates of draglines. Six Dutymeters have been sold so far to mine companies in South Africa, Australia and the United States.

Outcomes

World-firsts

Leading-edge research outcomes included the following.

- A CICR team developed a novel technique of “gene silencing” and used it to stop the growth of cervical cancer cells in laboratory tests, and eliminate formation of cancer tumours in animal models.
- Queensland Brain Institute (QBI) researchers identified processes in the hippocampus (a part of the brain associated with memory) likely to facilitate repair mechanisms for people suffering from dementia and acquired brain injury.
- A series of discoveries by an international consortium of scientists, including a team from our IMB, transformed understanding of how our genome works to produce a complex organism like a human being.
- A School of Molecular and Microbial Sciences researcher developed the first-known specific immunotherapy product using monoclonal antibodies to combat the potentially-lethal West Nile virus. The mosquito-borne virus affects the central nervous systems of humans, horses and birds in North America, Africa, the Middle East and Europe.
- Faculty of Health Sciences researchers developed a novel device enabling physiotherapists to assess and rehabilitate specific neck muscles contributing to neck pain and neck-related headaches.
- A School of Human Movement Studies project was the first to evaluate the effectiveness of Qigong and Tai Chi in combating Type Two diabetes (page 57).
- A PhD student solved a mathematics problem (in combinatorial design theory) which had baffled experts since it was posed by a US professor in the 1970s.



Finding answers

Other significant research outcomes included:

- defining structures in the first stage of particle and nutrient uptake into cells; may lead to new methods of drug delivery and better understanding of viral infection (IMB, CMM);
- a method for authenticating ancient Chinese porcelains (art history, geochemistry);
- a numerical model to simulate the mechanics, and measure effects, of Shaken Baby Syndrome (civil engineering, child health);
- a literacy-improving program which led to National Literacy Awards for three Queensland schools (education); and
- mining technology to help drain methane from underground mines, saving millions of dollars in delays and using the gas to produce energy (CRCMining).

Publications

Publications represent a significant measure of a university's research performance. This year, our scientists communicated their non-commercial work internationally through a wide range of media such as learned journals, books and conference papers.

Our research output consistently ranks as one of the highest in the country, with a continuing upward trend in the DEST publications point score (page 45) for our University. This increased by six percent between 2003 and 2004 (latest data available), building on the previous year's increase of 15 percent between 2002 and 2003.

This year's highlights included the following.

- One of the world's longest-running health studies, the *Mater-University of Queensland Study of Pregnancy*, yielded 16 papers in prestigious journals such as *International Journal of Obesity; Obesity Research; Hypertension; American Journal of Epidemiology; Epidemiology; and Addiction*. The study has 2006 funding to look at gene-environment interactions.
- Our Environmental Management Centre launched the *Green Chooser* document, a list of national guidelines to help commercial fishermen sustain their industry through an Environmental Management System.
- School of Education researchers launched *Teaching Middle Years: Rethinking Curriculum, Pedagogy and Assessment* as a resource for school administrators and teachers, academics and pre-service teachers; and published a report on *Developing Lifelong Learners in the Middle Years of Schooling* to help Queensland schools prepare for schooling reforms.

- UniQuest and Queensland Health launched a book aimed at encouraging sun safety in young children. *Dorothy the Dinosaur and her Magic Hat* originated as a research tool developed by a UQ Cancer Prevention Research Centre PhD student.
- School of Physical Sciences researchers published a physics theory likely to revolutionise superconductors, in the American Physical Society's *Physical Review Letters*.
- Centre for Marine Studies work on the decline of the world's coral reefs, and possible government conservation strategies, appeared in *Science*.
- School of Integrative Biology researchers published a paper in *Nature* supporting a 50-year-old-evolutionary hypothesis of how species are formed, after testing the theory on the tree-frog *Litoria genimaculata* found in north Queensland.

Powerful partnerships

We forged national and international research collaborations with industry, government and private enterprise. Examples include the following.

- The Triple P – Positive Parenting Program, a School of Psychology initiative, featured in the eight-week UK reality television program *Driving Mum and Dad mad*; and drew a UK government research grant to run *The Great Parenting Experiment* in partnership with the University of Manchester, measuring the show's impact on more than 2000 UK parents.
- School of Information Technology and Electrical Engineering researchers partnered with NASA scientists on the space agency's Reconfigurable Scaleable Computing project.

Nurturing the nation's best ...

- two Federation Fellows (grand total 12)
- two Australian Professorial Fellows
- a QEII Fellow
- a Royal Society of Arts (London) Fellow
- three Australian Postdoctoral Fellows
- a Nobel Peace Prize nomination
- an Eisenhower Fellow



- ◀ 100 percent success in final trials this year for the world's first viable cancer vaccine... founder and leader of our CICR Professor Ian Frazer, 2006 *Australian of the Year*, celebrates the culmination of his and the late Dr Jian Zhou's quest for a vaccine to protect women against papillomavirus strains causing cervical cancer. Gardasil™ and Cervarix™ are expected to become available in the developed world in 2006.

Established research strengths*

- Australian and postcolonial studies
- cognition, performance and human interaction
- cultural, historical and media studies
- governance and citizenship
- institutional and organisational change
- social and economic disadvantage
- aetiology and management of disease
- population health and health promotion
- biotechnology
- cellular and molecular bioscience
- complex and intelligent systems
- environment, biodiversity and sustainability
- food and health
- hypersonics
- imaging science and technology
- marine studies
- materials and nanotechnology
- neuroscience
- quantum and photon science and technology
- sustainable agricultural production systems

*acknowledged strength internationally, outstanding record in generating external income and quality publications, first-rate records of graduate supervision and employing Research Fellows

- Our Queensland Clinical Trials Centre (based at Princess Alexandra Hospital) coordinated a \$1.29 million Australasian Kidney Trials Network involving leading kidney disease researchers from Australia and New Zealand.
- Our Centre for Marine Studies worked with the National Oceanic and Atmospheric Administration and others on a study of the Great Barrier Reef and climate change.
- The Telepaediatric Service – a partnership between our Centre for Online Health and Brisbane’s Royal Children’s Hospital – received Queensland Government funding to continue a service which since 2000 has facilitated nearly 3000 consultations for patients and local doctors in regional areas.
- The Ipswich Hospital Foundation committed \$120,000 per year for five years for a new health research program at UQ Ipswich.
- We signed a memorandum of understanding with the Solomon Islands Government to research and conserve the biodiversity of one of the world’s largest double barrier enclosed lagoons.
- Scientists from our Vision, Touch and Hearing Research Centre and the University of California Berkeley studied (with the support of His Holiness the Dalai Lama) meditative practices of 76 monks in the Himalaya, Zanskar and Ladakhi Ranges of India, to discover how meditation affects perception, and how visual perception is regulated within the brain.
- UniQuest’s innovation competition, Trailblazer, identified commercially-viable possibilities in a range of Australian industries (page 52).
- Our computer experts built a software prototype that identifies faces in real-time under varying lighting conditions and with different facial expressions. The software is one of many new approaches by Australia’s new National Information and Communications Technology Centre, to identifying threats in public spaces.
- An academic staff member was appointed to the National Research Priority Standing Committee formed in 2005 to assess progress in achieving the initiative’s objectives. Members will report to the public through the Federal Government’s Innovation Report.

Operating in the Smart State

The Queensland Government launched the second stage of the Smart State Strategy at our St Lucia campus. This included announcement of three new innovation funds totalling \$200 million. Our Queensland Bioscience Precinct, partly funded by the State Government and The Atlantic Philanthropies, was recognised as a prime example of the Smart State Strategy in action.

Queensland Smart State Awards recognised three of our initiatives:

- Alchemia Limited, a company founded by current and former staff: Smart Award (science or technology category) for piloting development of an anti-cancer drug – and Premier of Queensland’s Smart Award of the Year;
- JKTech Pty Ltd (page 54): Smart Award (mining or minerals processing category) for flotation optimisation technology; and
- UniQuest Pty Ltd (pages 10, 33, 51-52, 65): finalist (services category) for injecting more than \$180 million into Queensland in the past five years.

Five staff and students (a biochemist, science students, an engineer and a physiotherapist) won the lion’s share of nine Smart Women – Smart State Awards on offer this year.

Commercialising IP

We strengthened the nation’s knowledge economy and realised opportunities to commercialise University-owned intellectual property (IP) through research contracts, licence agreements and spin-off companies. Our success relies on a well-established commercialisation strategy executed through the UQ Holdings Group framework described on page 10.

According to the latest Australian Government national survey of commercialisation by Australian universities and publicly-funded institutions (report released in 2005, figures relate to 2001 and 2002), we rank first in several critical areas:

Serving nation and state

National priorities

Many of the research initiatives described in this Report supported the four National Research Priorities, i.e. an environmentally sustainable Australia; promoting and maintaining good health; frontier technologies for building and transforming Australian industries; and safeguarding Australia. Representative examples include:

- Our Moreton Bay Research Station (pages 60, 68), Australia’s foremost marine research and education station, earned the prestigious Green Globe Benchmarked Certificate under the new Green Globe Certification program. The Certificate recognises the operation’s commitment to operating at the world’s highest environmental standard.
- A long-running School of Population Health study found maternal depression and early teenage behaviours such as aggression and delinquency increased risk of alcohol disorders in young adults.
- The ongoing *Mater-University of Queensland Study of Pregnancy* (page 49) continued to release findings impacting on future health policy in Australia.

- licence income (\$27.9 million in 2002);
- startup companies formed (13 in 2001; nine in 2002);
- value of equity holdings (\$46.4 million in 2002); and
- invention disclosures (85 in 2001; 95 in 2002).

UniQuest Pty Ltd

www.uniquest.com.au

Our main commercialisation company, UniQuest Pty Ltd (pages 10, 33, 50, 66), realises the commercial potential of our emerging technologies, expertise and facilities. Its output has included more than 45 startup companies, a large patent portfolio and some of Australia's most lucrative university licences. These include the licence to CSL Limited for the HPV vaccine against cervical cancer (page 49) developed at CICR.

This year UniQuest generated billings of \$37.2 million. This included \$19.6 million in payments and provisions for payment to the University, and \$1.07 million in profits. Spin-off companies raised an extra \$13.25 million in investments and grants.

Twenty percent of researchers and 10 percent of postgraduates attended UniQuest programs aimed at developing a research commercialisation culture. These included new and revised offerings plus one-off events to launch or promote projects.

UniQuest received 171 disclosures (compared with 154 the previous year), filed 26 provisional patent applications, issued 20 new licences and contracted eight major research and development projects. It also established or helped to form four startup companies:

- ActiveTorque Pty Ltd (an engine tuning system promising better fuel efficiency, prolonged engine life and reduced greenhouse emissions): winner of the ilab Prize in the UQ Business School's Enterprize competition;

- Spinifex Pharmaceuticals Pty Ltd www.spinifexpharma.com.au (therapeutics to treat neuropathic pain);
- Lucia Publishing Systems Pty Ltd www.luciapublishing.com (printing software for the education sector): a finalist (along with UniQuest technology *Golf Swing*) in the Secrets of Australian IT Innovation competition; and
- Leximancer Pty Ltd www.leximancer.com (text mining software).

ActiveTorque, Spinifex and Lucia Publishing received their first rounds of external investment, as did three established startup companies:

- Neurotide Pty Ltd (an oral pain-fighting pharmaceutical based on the body's own natural pain killer, endomorphin);
- XeroCoat Pty Ltd (anti-fogging and anti-reflective coating technology); and
- HerdVac Pty Ltd (a salmonella vaccine to improve cattle productivity).

UniQuest facilitated about 300 new consulting or research contracts for researchers and established consultancy businesses for three research groups: the UQ Boilerhouse Community Engagement Centre (page 63), Theravet and Event Trends.

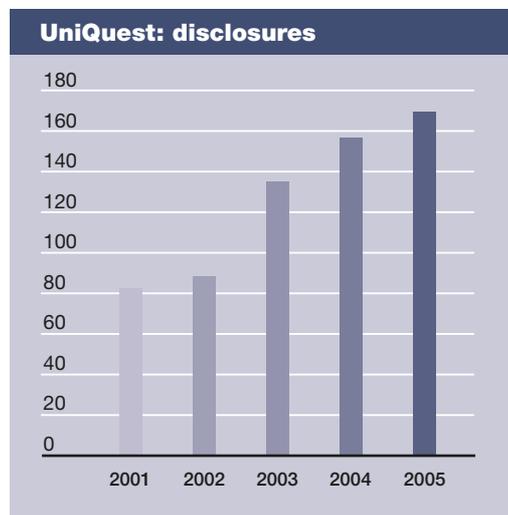
Other highlights included:

- establishing the *Pathfinder* proof-of-concept fund to advance research projects with commercial potential (25 applications received, 13 granted up to \$50,000 each);

Dr Louise Faber at work in our Queensland Brain Institute... her studies with colleague Professor Pankaj Sah have identified a protein crucially involved in how memories are stored and processed. This could lead to new strategies for treating mental disorders such as panic attacks, post traumatic stress, anxiety and depression. ▼

Emerging research strengths

- educational research, ethics, youth, families and social institutions (arts, humanities and social sciences)
- animal health and welfare, clinical neuropsychology, online health and education (health and medical sciences)
- fresh water management, biopharmacology, ecommerce and cyber-law (science and technology)



Our institutes: world-class research and training...

- AIBN (Australian Institute for Bioengineering and Nanotechnology): seeking improvements to human health and quality of life (nine research postgraduate students)
- IMB (Institute for Molecular Bioscience): research ranging from genomics and bioinformatics to development of new drugs and diagnostics (129 research postgraduates)
- QBI (Queensland Brain Institute): investigating brain physiology, cell and molecular neuroscience, systems physiology, behavioural and cognitive neuroscience (10 research postgraduates)
- SMI (Sustainable Minerals Institute): working with industry to achieve responsible socio-economic growth and researching ways to bridge gaps between high-level ideas and their coal-face implementation (77 research postgraduates)

- joint appointment of a commercialisation manager, Faculty of BEL (position now current in all faculties and in two of our four institutes);
- \$3.2 million raised in a second private offering of shares by UniQuest startup company Symbiosis Group Limited, established in 2004; and
- recognition for UniQuest startup company Hydrexia, established in 2004: winner of the UQ Business School Enterprize competition, and recipient of a Queensland Sustainable Energy and Innovation Fund grant.

UniQuest's annual innovation competition, Trailblazer (sponsored by Fisher Adams Kelly Patent Attorneys, Davis Collison Cave Patent Attorneys and Allen and Buckeridge), awarded \$40,000 in prizes for ideas or research with commercial potential. Winners included:

- MiCel: battery replacement technology for portable electronic applications;
- a concept to create a simple, quick and non-invasive method to determine the contractility of the heart from the wrist pulse; and
- enzyme-activated Magnetic Resonance agents for imaging physiological processes underlying human disease – monitoring both disease progression and efficacy of treatments.

Uniseed

www.uniseed.com

Uniseed, an early stage venture capital investment fund commercialising intellectual property at the Universities of Queensland, Melbourne and New South Wales, won

the *Best Early Stage Deal of 2005* prize awarded by the Australian Venture Capital Association.

Established in 2000 by UQ Holdings Pty Limited (page 10) and Melbourne Ventures, Uniseed expanded this year to include the University of New South Wales, following an investment from Westscheme, Western Australia's largest private sector superannuation fund, in 2004. Uniseed is now the largest fund of its type in Australia, managing more than \$60 million in capital for investment in early stage technology ventures across three of the country's leading universities

Since inception, Uniseed has committed \$14.3 million to 26 companies, with \$10 million paid to date. As a result, Uniseed's companies have been able to leverage more than \$80 million of external capital from private venture capital funds, government grants and co-investors. This represents an additional \$5.78 for every \$1 that the fund has committed. A substantial part of this total investment will flow back to the universities through targeted research contracts.

Uniseed has eight active investments originating from The University of Queensland. These are Adipogen, Thrombostat, QRxPharma, Neurotide (page 51), Fultec, Spinifex Pharmaceuticals (page 51), ActiveTorque (page 51) and Combinomics.

This year, software company Vintela (formerly Wedgetail), established in Queensland with Uniseed funding, became Uniseed's first exit via a \$100 million trade sale to US-based Quest Software Inc. Existing company Adipogen raised more than \$2 million to develop its obesity drug and three new companies – Neurotide, ActiveTorque and Spinifex – raised a total of \$4.3 million.

IMB researcher Dr Neville Young, one of a team of genetics researchers investigating cancer, looks in on lungfish research conducted by PhD student Helena Bailes. Her findings include the fact that the fish have genes for five different forms of visual pigment in their eyes (humans have three).

The two researchers were among 13 early-career scientists selected nationally to take part in *Fresh Science*, a program of researchers presenting their work to the public for the first time. ▶



IMBcom Pty Ltd

www.imbcom.com.au

IMBcom Pty Ltd commercialises high-value applications arising from research conducted at Australia's largest bioscience research organisation, our Institute for Molecular Bioscience (IMB).

In the financial year 2005, venture capital investment and government funding for IMBcom companies exceeded \$1.4 million. This included: Mimetica \$860,000; ElaCor \$335,000; Kalthera \$85,000; and Nephrogenix \$250,000.

Over the past five years, IMBcom has helped create and retain equity in 11 startup companies (total capital investment exceeding \$41 million). Ongoing involvements include board representation and assistance with commercialisation activities.

This year, IMBcom established startup company ElaCor Pty Ltd to develop treatments for heart disease; and helped secure more than \$820,000 in grants to support research programs with commercial potential. These included:

- Biotechnology Innovation Fund grants (\$250,000 each) to ElaCor (IMBcom/UQ/Baker Heart Research Foundation) and Nephrogenix (IMBcom/UQ/Monash University/Renal Regeneration Consortium) to fund commercialisation activities and renal stem cell research respectively;
- Queensland Government Innovation Start Up Scheme grants (\$80,000 each) to ElaCor and Kalthera; and
- a one-year ARC International Fellowship for a professor from Bielefeld University, Germany to continue collaborative research into algal hydrogen production at the IMB.

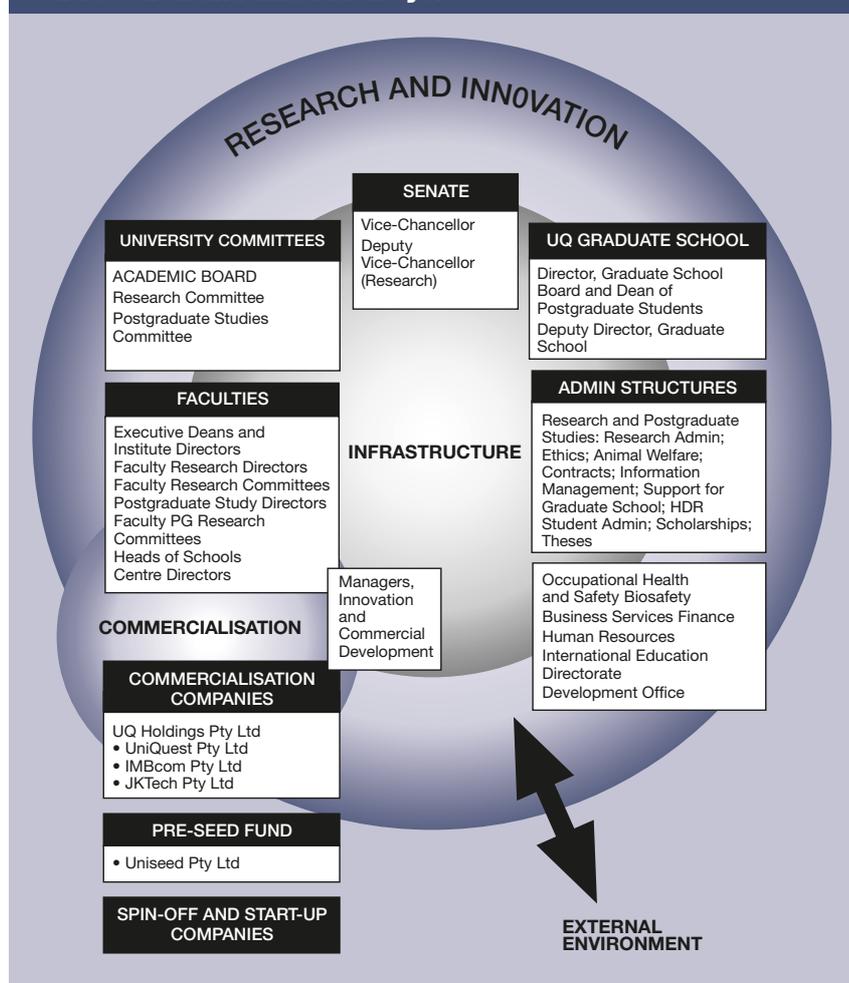
IMBcom protected intellectual property by filing five provisional patent applications relating to:

- anthelmintics for livestock treatment and human therapeutics;
- novel anti-cancer molecules derived from Australian biodiversity;
- a growth factor for use in renal regeneration; and
- a class of enzyme inhibitors with potential application in a range of human diseases.

Three other patents proceeded to the Patent Cooperation Treaty system for international patents. The remaining managed portfolio continued through varying stages of examination, with IMBcom managing examination issues and refining scientific and business cases. IMBcom also managed patents for spin-out companies including ElaCor Pty Ltd, Nephrogenix Pty Ltd, Kalthera Pty Ltd, Cyclagen Pty Ltd and Nanomics Biosystems Pty Ltd.

IMBcom's annual BioBusiness program for postgraduates featured speakers from industry and legal practitioner firms. Their real-life stories of BioBusiness and commercialisation enhanced the theoretical components

Our research and innovation cycle



of courses, and we plan to extend the program to include a focus on intellectual property and its development.

JKMRC and JKTech

www.jktech.com.au

Our Julius Kruttschnitt Mineral Research Centre (JKMRC), led by a new Director, strengthened its research base this year in both traditional and emerging research areas.

We incorporated our AMIRA-funded Geometalurgical Mapping and Mine Modelling project (GeM) into the ARC Centre of Excellence in Ore Deposit Studies (CODES). This involves a strategic alliance with the University of Tasmania. The project sought new fundamental approaches to the quantification of geological characterisation information, and integration with mineral processing performance and mine optimisation models.

Postgrad travel awards

Seventy-seven postgraduates received Graduate School Research Travel Awards* in disciplines including:

- engineering: study of biological removal of phosphorous from wastewater (research at Aalborg University, Denmark);
- art history and religion: Princeton Index of Early Christian Art (Utrecht University, Netherlands; Bibliotheque Nationale, Paris, France; historical sites in Italy);
- health: ovarian cancer and genes (Dana-Farber Cancer Research Centre and Harvard Medical School, Boston, USA);
- human movement studies: female artistic gymnastics in the 1970s (International Federation of Gymnastics, Moutier, Switzerland); and
- ecology: comparison of Australian and Taiwanese eagle ray populations (C.O.A. Fisheries Research Institute, Penghu Islands, Taiwan).

* Total of 588 awards since scheme's inception in 1998

New sponsors joined the industry-funded P9 Mineral Processing project (and the associated ARC Linkage project in flotation). Novel technology developments emerging from this program will benefit both sponsors and industry.

We remained an active research participant in the CRC for Sustainable Resource Processing. A focus on enhancing the energy-efficiency of processing plants generated research in areas such as CFD modelling, cyclone design and coal preparation, and we began developing an industry-funded third/fourth year coal preparation elective course.

We shared in the largest Linkage project yet supported by the ARC, as part of a collaboration of four universities led by the University of South Australia. JKMRC is a key participant in this research, which will underpin fundamental changes in mineral processing operations into the next decade.

JKTech Pty Ltd, incorporated in 2001 to transfer JKMRC technology to the minerals industry, achieved a turnover of \$9.2 million. This resulted from consulting, laboratory testing and mineral characterisation services; plus sales of Mineral Liberation Analysis systems and industry courses.

JKTech secured several international contracts for products and services and increased staffing by more than 25 percent. In addition to achieving commercial success, JKTech won a Queensland Smart State Award (page 50).

Encouraging excellence

Supporting our own

Our research-related expenditure supports researchers across all disciplines.

We allocated most funds received through the Commonwealth Institutional Grants Scheme and Research Training Scheme to faculties, based on their research performance. In 2005, this performance-based component totalled \$52 million (up from \$51.6 million in the previous year).

Our internal Research Only Budget used \$10.08 million (seven percent more than in 2004) to:

- fund staff development in research;
- support research excellence;
- seed research initiatives; and
- support research infrastructure.

Encouragement for quality research included:

- 50 Early Career Researcher Grants totalling \$955,000 to assist excellent, new researchers to establish a competitive track-record;
- 108 New Staff Research Startup Grants totalling \$1.22 million (including Research Only Budget and faculty/institute funds);
- recognition of the value of research via clearly-stated criteria in the Academic Portfolio (including rewards for team and industry-related outcomes);

- seminars, workshops, a mentoring system and readership scheme to help staff develop competitive grant applications; and
- UniQuest programs to develop a research commercialisation culture (page 51).

Our seventh annual round of UQ Foundation Research Excellence Awards provided \$450,000 to advance seven early-career projects. These are investigating:

- corporate adaptation to long-term global climate change (UQ Business School);
- bio-organic polymers to conduct electricity (Centre for Computational Molecular Science);
- neuronal diseases (biomedical sciences);
- knowledge economies of leading OECD countries Australia, Sweden, Ireland, France, the USA and Taiwan (international studies);
- echidnas, including establishment of a national research centre at the Gold Coast (animal studies);
- personal and health costs of whiplash injury (health and rehabilitation sciences); and
- neural stem cells (Queensland Brain Institute).

Research training

We ranked among the top few of Australia's 39 universities for research training performance, according to measures such as the following.

- We enrolled large numbers of PhD students (3036, including 538 international students).
- The number of PhDs awarded continued to rise, from 224 in 1995 to 426 in 2005 (a 1.4 percent increase on 2004).
- We maintained a high success rate for PhD completions and nationally-competitive scholarship awards.
- Our research-by-higher-degree student body constituted just over eight percent of our total number of enrolled students.

Postgraduate profile

This year we enrolled 9823 postgraduate students, representing 26.4 percent of the student body – thus exceeding our target of 25 percent.

These figures show a 4.7 percent decrease in postgraduate enrolments since 2004 – compared with a 0.9 percent decrease in undergraduate enrolments. The decrease in postgraduate enrolments may be due to influences such as the following.

- Australia in general and Queensland in particular experienced a very strong employment market, with high job availability and security (at such times, some people defer postgraduate study).
- The decrease follows several years of lower employment and concurrent rapid rises in postgraduate coursework enrolments.
- The Australian dollar strengthened, making Australia a more expensive education destination for international students.

- The Commonwealth Government effectively capped the total number of Australian research higher degree (PhD and MPhil) students.

We enrolled 3036 doctorate by research students (538 international), and 547 masters by research students (81 international). The one postgraduate area to show an increase in student numbers (five percent) was the doctorate by coursework, with 86 students. Despite the overall decreases, international enrolments increased across several postgraduate degrees (doctorate by research, up six percent; doctorate by coursework, up 25 percent, and masters by coursework, up seven percent).

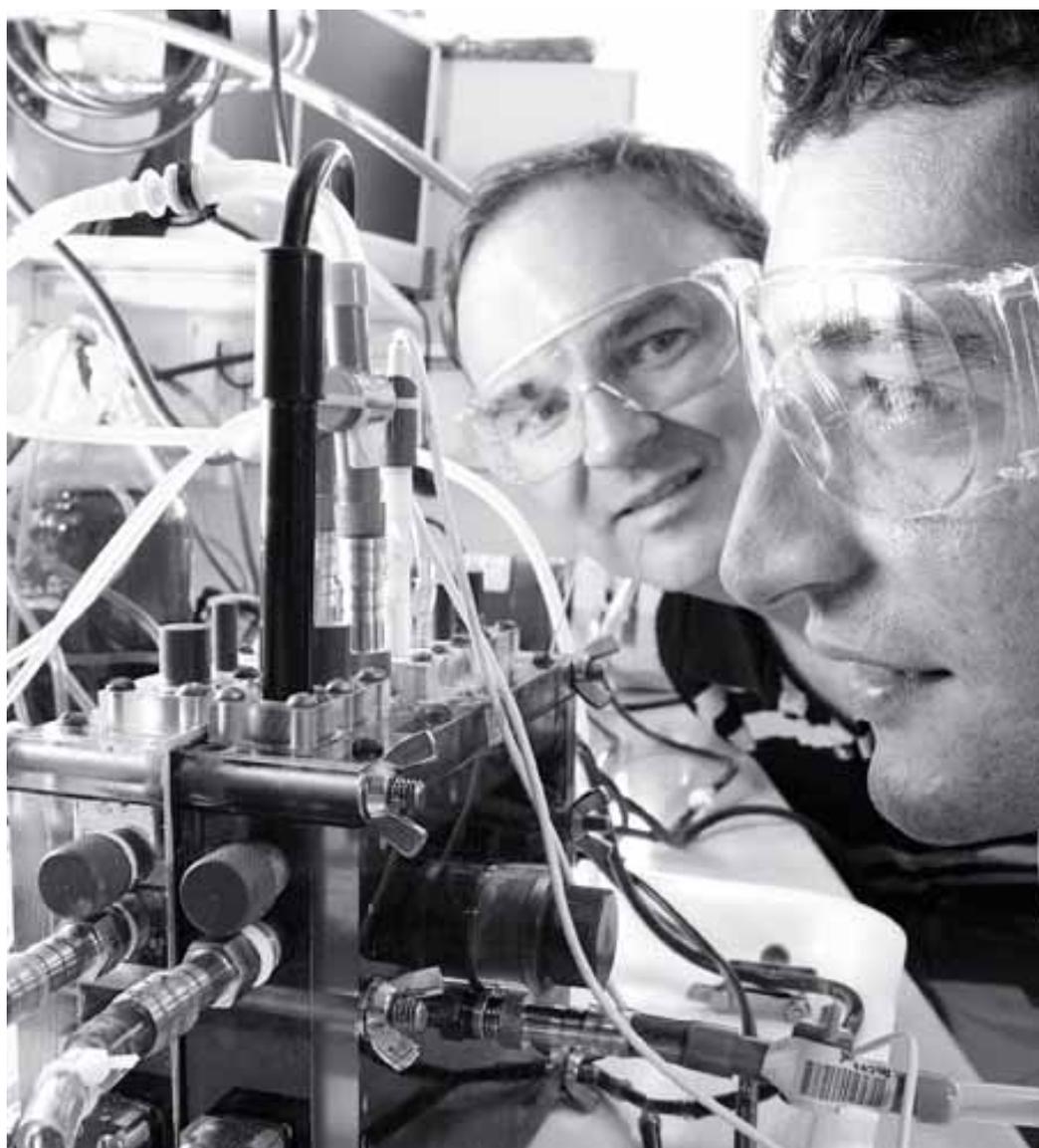
Our postgraduates secured:

- 143 Australian Postgraduate Awards (APA) – nine percent of the national total, placing us third among Australian universities;
- 30 International Postgraduate Research Scholarships; and
- 35 Australian Postgraduate Awards (Industry) Scholarships.

We conferred 3075 postgraduate degrees in 2005, including 426 doctorates by research and 118 masters by research (419 and 95 in 2004, respectively).

Faculty of SBS inaugural awards for early-career researchers...

- Research Awards for work in
- rural and regional governance (social science)
 - multiculturalism and inter-group relations (psychology)
- Commercialisation Award for
- contributions to Triple P – Positive Parenting Program (psychology)



- ◀ A watershed for renewable energy ... Advanced Wastewater Management Centre researchers are looking for ways to turn dirty water into electricity. Centre Director Professor Jürg Keller (left) and PhD student Stefano Freguia won our largest ARC Discovery Project Grant in a round announced in November. \$1.3 million over five years will enable them to pursue development of a cheap, plentiful and eco-friendly power source.

Advancing our postgrad profile...

- identifying graduate attributes for postgraduate coursework programs (completion due **2006**)
- review of professional doctorate programs (completion **2006**)
- the first *Graduate School in Mathematics* event in Australia (mathematics)
- *Postgraduate Coursework Expos* for prospective students and employers (School of Physical Sciences)
- initiatives to attract quality research students, e.g. national competitive grants providing return airfares to recruitment events (School of Physical Sciences)

Graduate attributes for higher degree researchers...

- interpersonal understanding
- interpersonal and team-based communication
- critical thinking
- problem solving
- project management

UQ Graduate School

www.uq.edu.au/grad-school

Our Graduate School fostered intellectual and professional academic growth while supporting initiatives to enhance the graduate student experience. These included opportunities for travel, exchanges and internships, and industry collaborations.

Supporting our own

We monitored activities to ensure quality experiences and outcomes for our graduate students. Strategies included advanced tracking systems for completion rates, and exit surveys for both completing and withdrawing students. The latter revealed a high level of satisfaction within our PhD program.

Scholarships at APA rates supported our best candidates. This year we gave:

- 19 Postgraduate Research Scholarships (UQPRS);
- 59 Graduate School Confirmation Scholarships (UQCS);
- 70 Joint Research Scholarships (UQJRS);
- 29 International Living Allowance Scholarships (UQILAS); and
- 18 Mid-Year Scholarships (UQMYS).

This year we replaced our Graduate School Scholarships with Graduate School Confirmation Scholarships, a new scheme offering research higher degree students \$19,231 per student per annum.

Other support included:

- the Library-developed RAPID (Researchers and Postgraduates Information Discovery) program – a flexibly-delivered, user-centred and problem-based information skills course imparting effective research techniques to researchers and postgraduate students;
- establishment of block confirmation seminars (School of Economics) and other new practices, as a result of a policy and process review; and
- funding assistance for 11 postgraduate research student conferences for specialisations including

health and rehabilitation sciences, human movement studies, life sciences, education, integrative biology, history, philosophy, religion and classics.

Research infrastructure

Our research strategies recognise a need to build critical mass, foster collaborative and interdisciplinary research and reward research excellence. Consequently, we expanded our portfolio of world-class research infrastructure.

Utilities, services and data cabling were installed for a new \$28.76 million Centre for Advanced Animal Science at UQ Gatton, due to begin construction in **2006** for completion in **2008**. The Centre will be a world-class facility for research into livestock health and production. It will include a small animal clinic, equine hospital, administration block and research and teaching laboratories.

We established the \$17 million Queensland Nuclear Magnetic Resonance Network. Supported by Smart State Research Facilities funding, the Network will include a 900 MHz high-resolution spectrometer – the most powerful machine of its kind in the southern hemisphere – and will position Queensland at the forefront of international research in structural biology, biodiscovery and animal neuroimaging.

We unveiled plans for a \$60 million UQ Centre for Clinical Research, due to start construction in **2006** at the Royal Brisbane and Women’s Hospital (RBWH). Funding comprises \$20 million each from the Queensland Government’s Smart State Research Facilities Fund, Atlantic Philanthropies and our University. The Centre will focus on established Faculty of Health Sciences and RBWH research specialties such as cancer, genetic diseases, infectious diseases, population health risks, critical care, clinical neurosciences and psychiatry; plus areas of chronic disease management including renal, orthopaedic and vascular disorders.

Other initiatives (page 77) included our:

- Faculty of Arts Research Precinct, home to our Centre for Critical and Cultural Studies, Australian Studies Centre and Centre for the History of European Discourses; and
- \$1.2 million Dynamic Imaging Facility for Cancer Biology, funded by the Australian Cancer Research Foundation as the only one of its kind in Australia.

Postgraduate enrolments		
	2004†	2005*
Doctorate by research	3079	3036
Doctorate by coursework	81	86
Masters by research	603	547
Masters by coursework	4717	4663
Postgrad/graduate diploma	929	721
Graduate certificate	895	770
Total	10,304	9823

† at August 31, 2004 * at December 31, 2005

Equity and diversity

www.uq.edu.au/equity/

We nurture equity and diversity in all our pursuits. Strategies relating to research and research training in 2005 included:

- six Promoting Women Fellowships to increase promotion prospects for academic women;
- four inaugural Research Completion Equity Fellowships to help general staff overcome personal circumstances interrupting their PhD, research masters or professional doctorate studies;
- three UQ Postdoctoral Research Fellowships for Women (one full-time, two part-time); and
- two UQ Return to Research Scholarships.

The International Equity Benchmarking Project initiated by our Equity Office in 2004 continued in 2005 with presentation of Stage One summary findings,

along with suggested management strategies for institutions to consider. Benchmarking partners included our University, Queensland University of Technology, University of Melbourne, University of Western Australia, University of Auckland, and University of British Columbia.

The project addressed issues of student access and success for women in non-traditional areas, and promotion for academic women, especially those in non-traditional areas. Preliminary findings suggested:

- little variation in the proportion of women students in engineering between 1992 and 2002;
- women students generally outperform men in engineering, information technology and architecture; and
- a marginal increase in the proportion of women associate professors in all universities between 1999 and 2002.

The year 2006

- A University-led international team will conduct two experimental HyShot™ flights near Woomera, South Australia, as the second round of flight testing of an air-breathing supersonic scramjet engine developed as a long-term research project in our Centre for Hypersonics. The initiative builds on our HyShot™ Team's successful test flight – the first in the world – on July 30, 2002.
- Completion of our \$60 million Australian Institute for Bioengineering and Nanotechnology at St Lucia will expand our portfolio of world-class research infrastructure.
- We will start building a \$28.76 million Centre for Advanced Animal Science at UQ Gatton, as a world-class facility for research into livestock health and production.



- ◀ Qigong and Tai Chi master Xui Liu leads a group of volunteers in Australia's first clinical trial evaluating the effectiveness of traditional Chinese exercises in combating Type Two diabetes. Funded by the Diabetes Australia Research Trust, the School of Human Movement Studies project involves Professor Wendy Brown (project leader), Dr Yvette Miller and Dr Nicola Burton (picture courtesy Xui Liu).