Research and research training

Our researchers attract major funding and produce quality outcomes. This proves the value of their work, since government, industry and other backers commit money only to useful projects they believe will succeed.

Leaders in research funding

We ranked second nationally in total reported research income for 2000 (latest data; see table page 4). Our total of $115.6 million was a 17.7 percent jump on 1999 ($95.1 million) and 65 percent more than in 1995.

The increase, due partly to changes in Co-operative Research Centre (CRC) reporting arrangements, signifies strong performance and, along with top-four placing in major university funding schemes, confirms our leadership among the nation’s 39 universities.

Industry and other related income totalled $41 million in 2000 (latest data; see chart page 4), the most of any Australian university and up from $36.1 million in 1999.

We placed third nationally (behind the Universities of Melbourne and Sydney) in the 2001 Research Quantum, the Federal Government’s annual funds allocation based on overall research performance (see chart page 32).

In 2002 the Institutional Grants Scheme will replace the Research Quantum. Figures announced this year indicate a continuing third place nationally with $26.8 million, thanks to our ability to attract funds from diverse sources.

ARC recognition

The “Big Four” universities (of Queensland, Melbourne, Sydney and New South Wales) again dominated major Australian Research Council (ARC) funding rounds in 2001 and grants announced for 2002 (see charts page 29).

More than $3.3 million for 25 projects (a 33.3 percent success rate) placed us fourth nationally in the 2001 Strategic Partnerships with Industry – Research and Training (SPIRT) Grants, with funding over three years. From 2002, SPIRT will be renamed Linkage Projects Grants and we will receive $8.9 million for 35 initiatives – topping the program with $1.5 million more than the University of New South Wales.

We advanced in the 2001 ARC Large Grants with a 26.7 percent success rate for 62 grants worth $10.4 million. This compares with a 20 percent success rate for 48 grants the previous year. From 2002, this scheme will be renamed Discovery Grants and we will place among the top three with $20.54 million for 71 projects. This includes the largest grant (worth $443,000 in 2002 and $2.35 million over five years) to investigate new drug therapies derived from the venom of marine snails.

We placed fourth in the 2001 ARC Research Infrastructure Equipment and Facilities (RIEF) Grants with four grants worth $1.8 million.
(7.43 percent of available funds). This complemented pledges of $2.3 million from collaborating institutions and another seven collaborative projects (valued at more than $2 million) administered by other institutions.

Queensland biotechnology and the search for new drugs enjoyed a boost with $1.1 million in funding for a world-class structural biology facility for visualisation of protein structure. The main facility will be housed at the University, with other nodes elsewhere.

From 2002, RIEF will be renamed the ARC Linkage Infrastructure (Equipment and Facilities) (LIEF) scheme, giving us:

- equal highest number of grants with Monash University;
- $2.45 million ($650,000 more than in 2001) for six collaborations, with another $2.72 million coming from industry partners; and
- the largest single University of Queensland LIEF grant of $735,000 to our Institute for Molecular Bioscience (IMB) (see pages 30, 32, 40, 49, 50), for a Queensland proteomics research facility. This will help scientists understand how molecules interact in the body, and could lead to more effective pharmaceuticals, diagnostics and treatments.

We also excelled in the Linkage-International Grants category with two International Fellowships totalling $111,144 to begin next year.

Our students won 32 Australian Postgraduate Awards (Industry) to complete research higher degrees in collaboration with industry partners.

Other successes

The Federal Government’s Major National Research Facility scheme funded us for:

- the Australian Genome Research Facility ($14 million);
- the Nanostructural Analysis Network Organisation ($11.5 million); and
- the Australian Computational Earth Systems Simulator ($4.8 million).

In the Federal Government’s new Systemic Infrastructure Initiative, we won two bids as lead institution and four as a support partner. These included the largest award, worth $10.8 million from 2002 to 2004, for the Marine Research and Education Network.

**Encouraging excellence**

Our UQ Foundation Research Excellence Awards (launched in 1999 as an Australian university first) again rewarded performance and leadership potential in our early-career researchers. We gave a record nine awards to:

- Dr Arne Dahle, Engineering, Physical Sciences and Architecture ($75,000: developing lighter, stronger metals);
New facilities such as…

- a $40 million State Government-funded Food for Life Centre of Excellence for studies involving plant and livestock genomics and food sciences
- a $2 million Visualisation and Advanced Computation Laboratory (ViSAC) – a virtual reality resource for exploring topics ranging from the operation of a living human cell to Barrier Reef environments
- a NanoMaterials Centre for studying new materials made of building blocks the size of a nanometer (one billionth of a metre), with applications as diverse as computing, communications and renewable energy (see page 34)
- an Ecology Centre for multidisciplinary research related to pure and applied ecology, especially spatial and quantitative ecology and interdisciplinary research
- a Centre for Human Ageing (see page 21) for age-related research and education – the first of its kind in Australia
- a Sustainable Minerals Institute (similar to a CRC) conducting work for Australia’s mining sector (project topics range from mine efficiency and rehabilitation to public relations and industrial relations)

Dr Robyn Gillies works with Year 8 students at Forest Lake High School, where the focus is on cooperative group learning. Dr Gillies won a $70,000 UQ Foundation Research Excellence Award (see below) to advance research which has won three ARC grants totalling $230,000 since 1995. Her work aims to realise the potential of small-group learning as a way of developing academic and interpersonal skills.

- Dr Robyn Gillies, Education ($70,000: small-group learning in schools);
- Dr Judith Greer, Medicine ($70,000: causes of Multiple Sclerosis);
- Dr Michael Jennings, Molecular and Microbial Sciences ($75,000: meningococcal meningitis vaccine);
- Dr Justin Marshall, Vision, Touch and Hearing ($80,000: animals’ use of colour for communication);
- Associate Professor Michael Nielsen, Quantum Computer Technology ($80,000: quantum information processing);
- Dr Joanne Tompkins, English, Media Studies and Art History ($70,000: analysis of theatre spaces);
- Dr Alpha Yap, Biomedical Sciences, IMB ($80,000: cell recognition research with potential for understanding cancer); and
- Dr Jian-xin Zhao, Physical Sciences, ($70,000: dating of human fossils up to 620,000 years old) (see page 34).

Links with industry

We are among the biggest participants in the national Cooperative Research Centre (CRC) Program. We will be major or supporting partner in six of the 19 CRCs announced in 2001, worth $325 million over the next seven years. These are:

- Coal in Sustainable Development;
- Chronic Inflammatory Disease;
- Water Quality and Treatment;
- Tropical Savannas Management;
- Sustainable Aquaculture of Finfish; and
- Australian Weed Management.

Five relate to sustainability, reflecting our strengths in natural resource management and sustainable technologies.

The CRC for Coal in Sustainable Development will develop the work of its predecessor (the CRC for Black Coal Utilisation) within a new framework for environmental, social and economic sustainability.

Our IMB is a major partner in the CRC for Chronic Inflammatory Diseases, seeking new treatments for chronic degenerative inflammatory diseases such as rheumatoid arthritis, obstructive pulmonary disease, bowel disease, atherosclerosis and psoriasis.

We are now core participants in 17 CRCs and an affiliated partner with another three centres.

Collaborative R&D

Positive outcomes for research and development partnerships included the following.

- White French millet, grown commercially for the first time this season, will boost the niche industry producing birdseed for domestic and export markets (UQ Gatton
Commercial returns
Commercial activities flourished and outcomes included the following.

- Comquest Pty Ltd (see page 7) paid $1.5 million as the University’s share of commercial income related to licensing of patented Medical Resonance Imaging techniques to GE Medical Systems and Siemens.

- The Australian Defence Department’s DefSafe Project extended our consultancy with a year’s contract worth $260,000 on top of $420,000 earned since 1999. The project addresses safety assurance for Defence projects involving software-intensive systems.

- A University-led team was commissioned to develop the State’s first comprehensive Trauma Plan, with a three-year $654,000 grant from the Motor Accident Insurance Commission.

- The New South Wales Department of Corrective Services contracted our Key Centre for Human Factors and Applied Cognitive Psychology to develop an automated system for psychological testing of inmates. The system is likely to be used in all NSW prisons and in other states.

Nine new companies
In 2001 UniQuest established nine spin-off and start-up companies to commercialise technologies developed by our researchers:

- immune system research which could provide therapeutics for diseases such as Multiple Sclerosis (CBIO Ltd);
- a way to identify and modify genetic codes used in particular cells (Coridon Pty Ltd);
- a continuing education package for dentists (Dentil Pty Ltd);
- a diagnostic tool for detecting mood disorders (Bireme Pty Ltd);
- a tool for modularizing gene expression in animal and plant cells (GeneDimmer Pty Ltd);
- a diagnostic for chronic fatigue syndrome (Myalgen Pty Ltd);
- a vaccine delivery system for human and animal use (Vacquel Pty Ltd); and
- “designer arteries” grown in the peritoneal cavity of a human patient for transplantation (Vascam Pty Ltd).

Realising research potential
UniSeed Pty Ltd is an early-stage seed venture capital fund established in October 2000 by UQ Holdings Pty Ltd (see page 7) and Melbourne Enterprises International Pty Ltd to help commercialise intellectual property here and at the University of Melbourne.

Nine of the 15 investments approved by the
Review of activities
Research and research training

Government/industry support included…

- $1.55 million from Boeing Australia to set up the Boeing Chair in Systems Engineering
- $1.06 million from the Queensland and Federal Governments and $200,000 from the Meat and Livestock Association, lifting donations to more than $2 million for a new chair in animal welfare at UQ Gatton

end of 2001 provided more than $3 million for University of Queensland-related investees (see page 31): Myalgen, GeneDimmer, Dentil, Wedgetail, Vacquel, Fultech, Mutagenix, Adipogen and Haempatch. Substantial levels of invested funds will flow back to our University via research contracts with commercial milestones.

Other UniSeed activities included:
- negotiations for CSIRO to become a shareholder in 2002; and
- groundwork for a capital raising of more than $100 million for a follow-on fund expected to become operational in 2002.

More spin-offs for IMB
IMBcom Pty Ltd (see page 7) added four spin-off companies to the four (Promics Pty Ltd, Xenome Ltd, Genset Pacific Pty Ltd and Alchemia Pty Ltd) launched in 2000.

Protagonist Pty Ltd develops molecules that inhibit or mimic protein interactions and attaches them to special-delivery frameworks to increase availability.

Nanomics Biosystems Pty Ltd uses nanotechnologies to produce large libraries of biological molecules that are barcoded for information.

Mimetica Pty Ltd creates molecules modelled on natural peptides and related compounds to mimic their behaviour, and Kalthera Pty Ltd discovers and exploits circular proteins from plants.

JKMRC
As recommended by the Julius Kruttschnitt Mineral Research Centre (JKMRC) Board, JKTech Pty Ltd (see page 7) began trading in March 2001 as an incorporated company after 15 years as a division of UniQuest (see page 31). Now operating as a wholly-owned subsidiary of UQ Holdings (see page 7), the new venture facilitates technology transfer and strengthens client relationships with the minerals industry.

JKMRC annual revenue for 2001 exceeded $11 million, primarily from private industry funding including 40 percent from overseas. JKMRC’s international success reflects the continuing development of its network of overseas agencies and research collaborators.

JKTech now has agents in USA, Brazil, Peru, South Africa, U.K., and India, and JKMRC has research collaborations and sponsorships in more than 10 countries.

JKMRC won two prestigious engineering awards this year:
- the Automation, Control and Instrumentation National Project Excellence Award (Institution of Engineers Australia) for process control work in the mineral sands industry plus design and development of a conductor non-conductor (CNC) gauge, which monitors electrical properties, mainly of rutile and zircon.
- the AusIMM Mineral Industry Operating Technique Award for a mine-to-mill integration technique which boosted productivity and cost-effectiveness in...
open-pit mining and comminution (milling) operations. JKMRC also won the award in 1993 for the mineral processing software JKSimMet.

**Equal opportunity**

Increasing numbers of women as chief investigators accounted for:
- 32.8 percent of ARC Large Grant chief investigators (22.8 percent in 2000);
- 40.7 percent of SPIRT grant recipients (29.6 percent in 2000); and
- 37.3 percent of successful NHMRC grant winners (32.1 percent in 2000).

Six women won our Promoting Women Fellowships, releasing them from teaching and administrative duties to complete research or special projects.

The scheme showed some positive outcomes.
- In 2001, four of five earlier Fellowship winners were promoted to associate professor.
- Of the 26 winners since 1997, 13 have been promoted or taken higher-level positions and another nine will apply for promotion next year.

The proportion of women receiving Early Career Research Awards decreased from 55 percent in 2000 to 35.9 percent in 2001.

Our operating budget (see page 49) provided $50,000 for three Short PhD Fellowships in 2002. We also awarded three UQ Postdoctoral Research Fellowships for Women, continuing our support for women wanting to resume academic or research careers put on hold due to work and/or family commitments.

**World firsts for science**

Discoveries of global value included:
- a way to reduce drag on aeroplanes and spacecraft, with potential multi-million-dollar savings for industry;
- a finding that lack of sunlight (and consequent low levels of maternal vitamin D) during pregnancy may predispose offspring to adult schizophrenia;
- identification of a toxin in tick venom which, if untreated, can cause heart failure;
- observation of spontaneous reversals of motion of clouds of atoms, a behaviour forbidden by classical physics but predicted by quantum physics;
- dating of human fossils in China as at least 620,000 years old, supporting the multi-regional model of human evolution rather than the “out-of-Africa” hypothesis;
- discovery of an “unzipper” gene which may lead to techniques for reversing
Colorectal cancer, which kills one in 30 Australians; and
- a new dating of Earth’s global climate showing an unstable phase heralding the next Ice Age is long overdue. The results represent the first high-precision continental record (Southern Hemisphere) comparable with other sea-level indicators such as corals from the sea off Western Australia.

Saving the environment

Our researchers sought ways to meet human needs while protecting the world’s environments. For example, a project at our new NanoMaterials Centre (see page 30) is studying how molecules and particles assemble themselves into porous layers and act as filters. Knowledge of the process could help clean up air and water pollution.

Research outcomes (see also pages 30, 31, 33) included:
- the Koala Venture program at Blair Athol Coal Mine in central Queensland (our School of Life Sciences and Pacific Coal) – a $400,000 research and management strategy to preserve a koala population alongside sustainable land use;
- successful trials of FILTER: Filtration and Irrigated Cropping for Land Treatment and Effluent Re-use (UQ Gatton, State Department of Natural Resources and Mines, and local councils) – a cost-effective alternative to biological and chemical ways of reducing nutrients in sewage effluent; and
- a provisional patent on cheap, biodegradable plastic, made of wheat starch, polyester and synthetic clay, for use in packaging industries (our Materials Characterisation and Processing Centre).

Postgraduate students

In 2001, we enrolled more PhD students (see page 19) than any other Australian university and postgraduates represented one-fifth of our total student population.

Among them was the largest group from 12 Fulbright Scholars who came to various Australian universities this year – four USA researchers drawn by our track record in physics, pharmacy and zoology.

We awarded 346 PhDs and 108 research masters, compared with 333 and 107 respectively the previous year.

Graduate School

More than 270 awards have been granted since the scheme was launched in 1996.
The year 2002

- Our scientists will be involved in three Major National Research Facilities – the Australian Computational Earth Systems Simulator (ACESS), the Nanostructured Analysis Network Organisation (NANO), and the Australian Genome Research Facility (AGRF).
- We will be a major or supporting partner in six of the nation’s 19 new Cooperative Research Centres.
- We will install a new $550,000 Robotic Nuclear Magnetic Resonance (NMR) Spectrometer for Accelerated Drug Discovery, to help characterise drug-protein interactions and facilitate discovery of new drugs or agrochemicals.
- We will join James Cook University in creating the Marine Research and Education Network, funded for $10.8 million over three years by the largest grant awarded in 2001 under the new Systemic Infrastructure Initiative.

Postgraduate training

National performance indices reflected our strengths in postgraduate research. Our students won:
- the highest number (30 of 310) of International Postgraduate Research Scholarships (IPRS) and
- the third-highest number (144 or 9.3 percent) of the 1550 Australian Postgraduate Awards (APA).

Graduate School Scholarships, all at APA rates, reinforced that position by supporting our best students. Awards included:
- 14 Mid-year Scholarships (UQMYS) to launch research degrees;
- 29 Postgraduate Research Scholarships (UQPRS);
- 33 Graduate School Awards (UQGSA) for high achievers ineligible for APA/UQPRS;
- 30 UQIPRS, a living allowance to complement IPRS; and
- the inaugural 70 PhD Completion Scholarships – equivalent to an APA – for up to 16 weeks. The aim is to increase the number of PhD completions before the University census on March 31, 2002.

Other postgraduate support included:
- HECS exemptions for all (3398) research higher degree students;
- 84 Graduate School Research Travel Awards;
- $10,000 prizes to encourage excellent supervision (see page 23); and
- funding assistance for seven graduate student conferences. These included a medical research week, an international conference on discipline, a clinical psychology conference and an Australian aquatic and ecology workshop.