CSIRO

Annual Report 2004–05

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Letter of transmittal

The Hon Dr Brendan Nelson MP
Minister for Education, Science and Training
Parliament House
CANBERRA ACT 2600

We have pleasure in submitting to you, for presentation to Parliament, the fifty-seventh Annual Report of the Commonwealth Scientific and Industrial Research Organisation. This report has been prepared in accordance with the requirements of the *Science and Industry Research Act 1949* and in accordance with section 9 of the *Commonwealth Authorities and Companies Act 1997* (CAC Act).

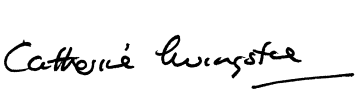
Under section 9 of the CAC Act, CSIRO Board members are responsible for producing an annual report in accordance with the rules laid down in Schedule 1 of this Act, including a 'Report of Operations' prepared in accordance with the Finance Minister's Orders.

This report presents fairly the information required by the Minister for Finance and Administration as set out in the *Commonwealth Authorities and Companies (Report of Operations) Orders 2005*.

The report has been approved for presentation to you, signed this 24th day of August 2005 in accordance with a resolution of the Board members.

The report includes an appendix comprising a report from the Chief Executive of CSIRO, as trustee of the Science and Industry Endowment Fund established under the *Science and Industry Endowment Act 1926*, on the operations of the Fund together with a report by the Auditor-General on the accounts of the Fund.

We commend the Organisation's achievements to you.



Catherine B Livingstone
Chairman of the Board

Geoff G Garrett
Chief Executive

October 2005

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About CSIRO

Our history

The Council for Scientific and Industrial Research (CSIR) was established in 1926 with its primary research devoted towards agriculture. In the late 1930s this was extended to include industrial research.

In 1949, the CSIR was reconstituted as CSIRO, and gradually expanded its activities so that its research was related to almost every field of primary, secondary and tertiary industry.

Today, CSIRO is a trusted source for creative ideas and practical technologies. It seeks to be a valuable partner with strong international relationships.

Our purpose

By igniting the creative spirit of our people, we deliver great science and innovative solutions for industry, society and the environment.

CSIRO is a research enterprise dedicated to delivering benefits to industry and the community through world-class science.

What we do

CSIRO carries out scientific research in areas including energy, information technology, health, minerals, agriculture, the environment and natural resources. Our research delivers:

- innovative technologies to improve the competitiveness of existing industries
- technologies to transform or create new markets for Australian industry
- integrated solutions to meet major national challenges
- advice, information and research to meet specific community needs
- knowledge-based services to governments and businesses.

Research and outputs

- CSIRO ranks in the top one per cent of world scientific institutions in 12 of 22 research fields (based on the Institute for Scientific Information data on total citations of publications, as at 30 June 2005)
- CSIRO produced over 4 000 scientific publications in 2004, and also transfers know-how through over 8 000 client reports and around 240 media releases annually, plus secondments, industry workshops, seminars and specialist publications
- CSIRO leads six National Research Flagships that bring focus and scale to research addressing some of Australia's most important and complex challenges and opportunities
- CSIRO is the largest single participant in the Cooperative Research Centre (CRC) Program (participating in 49 of the 69 centres, as at 30 June 2005)
- worldwide, CSIRO is involved in over 750 current or recently completed research activities, working with leading scientific organisations and firms in the United States, Japan and Europe, and with developing countries, especially in Asia
- CSIRO offers more than 50 specialised technical and analytical services. These include analyses for air pollutants and satellite imaging of natural resources through to fire testing of materials and diagnosis of exotic animal diseases
- CSIRO is Australia's leading patenting enterprise, holding over 3 900 granted or pending patents

- over 90 spin-off companies are based on CSIRO generated intellectual property and expertise.

National facilities

- CSIRO hosts three major National Research Facilities (the Australian Animal Health Laboratory, the Australia Telescope, the Oceanographic Research Vessel *Southern Surveyor*) and over 30 other research facilities such as the Riverside Life Sciences Centre, CSIRO Discovery centre and the Australian Resources Research Centre
- CSIRO manages 11 national reference collections including: the Australian National Fish Collection, the Australian National Insect Collection, the Australian National Herbarium, the Australian National Wildlife Collection, the National Tree Seed Collection and the Scientific Marine Data Collection.

Our staff

- as at June 2005, CSIRO has 6 576 staff located across 57 sites throughout Australia and overseas
- 61 per cent of staff hold university degrees, including more than 2 000 doctorates and 470 masters
- in collaboration with university colleagues, our staff supervise or co-supervised 538 postgraduate research students in 2004–05, 23 per cent in collaboration with CRCs.

Our budget

- total revenue per annum now exceeds $925 million
- in 2004–05 CSIRO received Parliamentary appropriation funding of $577 million
- 84 per cent of CSIRO's total expenditure is directed towards the priority goals associated with the National Research Priorities
- in 2004–05 CSIRO generated $281 million in external research and services earnings for research, specialised consultancy and other services. This revenue was derived from the Australian private sector, Federal and State governments, the Rural Industry R&D Corporations and international companies and organisations.

Science communication and education

- stories involving CSIRO science are reported in around 12 000 news or feature items every year in print, radio and television and involve Australian and international media
- CSIRO Enquiries, our central telephone and email contact point, handles over 35 000 enquiries a year (1300 363 400, enquiries@csiro.au)
- CSIRO Education involves over 700 000 students, parents and teachers each year in activities that encourage appreciation of science. CSIRO jointly produced the *Totally Wild* science TV program, which has a viewing audience of over 400 000 each week. There are nine CSIRO Science Education Centres across the nation that provide hands-on classes for more than 260 000 students. These workshops are both in the Centres, and through each Centre's *Lab on Legs* travelling program operating throughout Australia. CSIRO's Double Helix Science Club offers two magazines – *The Helix* (circulation 13 000) and *Scientriffic* (circulation 12 000), as well as events and activities for members. CSIRO Education also offers a range of other programs for school students and teachers
- the Discovery centre in Canberra is CSIRO's showcase. Visitors can explore an interactive exhibition or make use of the modern events facilities. Discovery's education program gives children a chance to explore real research issues in a scientific setting complete with working laboratories
- **CSIRO** PUBLISHING produces books and CD-ROMS as well as journals in partnership with the Australian Academy of Science and other scientific societies.

Foreword by the Chairman and Chief Executive

Catherine Livingstone
Chairman

Geoff Garrett
Chief Executive

Over the past year we have concentrated our efforts on the execution and delivery of our Strategic Plan 2003–07, a strategy aiming to embed CSIRO's continuing relevance and impact. In addition, we have put in place the building blocks for our strategy through to 2012, retaining our focus on science that makes a difference to industry, the community and the nation.

CSIRO's contribution to innovation in Australia

Global and national trends in innovation have important implications for CSIRO as a research enterprise. Many major economies are making significant strategic investments in their National Innovation Systems (NIS). As the pace and competitiveness of innovation increase globally, CSIRO's contribution to Australia's challenges and opportunities through multidisciplinary, strategic science becomes more important than ever. Innovation is not linear; it is chaotic, dynamic and fluid. A winning innovation strategy for Australia must strike an appropriate balance between the adoption and integration of offshore technologies with carefully selected investment in research and development aligned with national priorities.

To this end we have, this year, focused strongly on more clearly defining our role within the NIS, both for ourselves and for our stakeholders. It is obviously important that we know where we fit in relation to other players in the system, for example, the universities and other public and private R&D providers, in order to maximise our differentiated contribution for the benefit of Australia.

As such our core roles are as follows:

- addressing major national challenges and opportunities, through harnessing the breadth and depth of our expertise
- similarly, creating new, or significantly transforming industries to increase the competitiveness and sustainability of Australian industry
- delivering incremental innovation to improve the efficiency and competitiveness of existing industries
- providing fact-based solutions which meet community needs, and knowledge that informs Government policy
- advancing the frontiers of science, an essential component of maintaining long-term capability.

Every part of CSIRO's 'ecosystem' must be healthy for innovation to occur. By building multidisciplinary teams, that work actively with national and international partners and are supported by good governance and sound leadership, CSIRO will continue to deliver on the investment made by every Australian.

Over the last year, we have delivered quality science-based solutions for Australian and global challenges as diverse as water, counter-terrorism, human health, meeting energy demands while protecting the environment, and connecting people through information technology.

Convergence and the collaboration imperative for enhanced success

Innovation is not just about new ideas or new science. More often than not it's a product of collaboration – the 'oxygen of innovation'.

Australian challenges and opportunities are complex in nature. Cross-fertilisation between scientific disciplines is fundamental to addressing them effectively. No single individual, group or organisation can possibly encompass the full breadth of skills and competencies needed. This means that researchers must increasingly transcend geographic, discipline, and organisational boundaries – and it means that effective teamwork is pivotal.

CSIRO has undertaken a number of initiatives in this area. For example, the National Research Flagships are delivering outputs and ensuring 'Team Australia' can seize opportunities only attainable through large-scale partnerships and investment, examples of which are included in this Annual Report.

Presently over 20 per cent of CSIRO's staff work in a Flagship and this proportion will continue to increase in the years ahead. In 2005, the Australian Government announced the $97 million seven-year Flagship Collaboration Fund, designed to support partners who wish to collaborate with CSIRO in helping to meet the major goals defined in this national program.

Our strategy of co-location and increased collaboration with Universities, enabling us to work in new ways and with new partners, has continued unabated; similarly, several divisional mergers and joint ventures were also completed, which will strengthen our research capabilities and alignment with end-users.

Sound strategy and good governance allow CSIRO to deliver

As we confront new challenges and opportunities, and as expectations from Australian communities change, CSIRO will continue to evolve as an enterprise. As part of managing this ongoing adaptation, in 2004–05 we refined our Governance Framework to help us continue to deliver excellent science.

We continued to improve and apply our rigorous performance management framework to regularly monitor progress around strategy implementation, program performance, outcomes and organisational health. We also continued our program of independent, internationally-benchmarked, Divisional reviews of science quality, with over a third of Divisions assessed since September last year and six reviews planned for completion during 2005–06.

We adjusted the Group structure of Divisions, from four to three (Agribusiness; Information, Manufacturing and Minerals; Sustainable Energy and Environment) to better align the Groups to anticipated science and impact needs, for example, in the increasingly intersecting areas of environment and energy.

As a result of the boost to our funding in 2004, both through the triennium agreement and the Government's additional appropriation of $305 million over seven years for the National Research Flagships, we have advanced our research efforts. We are developing a more rigorous Science Investment Process to carefully consider the balance of our research so as to maintain a sustainable mix of short and long-term science that anticipates the evolving needs of industry and the community, and which maximises impact. This new process will be the basis of all future investment decisions CSIRO-wide.

We also made very good progress in more clearly articulating key strategic and operational risk factors and are effectively managing within this risk framework.

Our people make CSIRO successful

We wish to thank all CSIRO staff for their commitment to science that makes a difference and for their resilience during the continuous process of organisational adjustment in a dynamic and changing external environment. The changes implemented across the Organisation during the year associated with the refocusing and reprioritising of our research, the introduction of new systems and processes, and the 'ramping-up' of Flagships have presented staff with increased challenges and opportunities, and understandably increased uncertainty. However, the flexibility and adaptability that our scientists, support staff and managers have shown during this period makes us proud and confident of the ongoing success of CSIRO. We are continuing to invest in our people and their learning and development. We are striving to improve internal and external communications. Our One-CSIRO culture becomes stronger every day as we realise the benefit of working increasingly effectively across boundaries.

Results from our internationally benchmarked staff poll showed our overall Staff Satisfaction Index has remained stable in 2004–05 at 67 per cent, and remains significantly above the Global R&D Norm, by four points, some 13 points above other organisations going through considerable change, and four points ahead of the Australian companies/organisations' norm. It is encouraging to see that the vast majority of our staff, close to 90 per cent – and right at the top of the top quartile in comparison to other R&D organisations worldwide – are proud to be part of CSIRO.

Net staff numbers remained stable over the year at approximately 6 500. We strive to attract and retain the best people in Australia and world-wide, and our staff continue to receive significant national and international recognition and awards for their work as highlighted in this report. The last 12 months also saw the launch of our CSIRO Alumni (see Appendix 3) which enables past colleagues to stay in touch with the Organisation and each other.

Some farewells and new faces

With the Federal Election in 2004, The Hon Peter McGauran was assigned a new portfolio; the Hon Dr Brendan Nelson became CSIRO's Minister and we have greatly appreciated his support and encouragement. The Hon Peter McGauran served as Minister for Science for many years and was, and continues to be, an enthusiastic advocate for CSIRO. We acknowledge his significant contributions with gratitude. In 2004, Dr Jeff Harmer was appointed Secretary of the Department of Family and Community Services and therefore stepped down from CSIRO's Board. We also warmly acknowledge Dr Harmer's valuable contributions and thank him most sincerely. Ms Lisa Paul replaced Dr Harmer as Secretary of the Department of Education, Science and Training and continues in the value-adding role in having our portfolio Secretary as a member of the Board. We were all saddened by the unexpected death of Board member, Dr Ed Tweddell. He made a special contribution to the Board over a number of years and his wise business counsel will be sorely missed.

CSIRO's purpose remains constant: *'By igniting the creative spirit of our people, we deliver great science and innovative solutions for industry, society and the environment.'* Over the last year we have worked to build our focus around world-class teams, boost investment in areas with highest promise, ensure effective knowledge transfer and deepen our enterprise culture within CSIRO to fulfil our purpose and deliver relevant science and technology to meet national priorities.

The coming year will see the next phase of strategy implementation with a further focusing of our research effort through our newly-constituted Science Investment Process, together with a series of initiatives aimed at building a stronger, unified CSIRO through introducing common systems and business practices, shared support services and improving operational effectiveness.

While committed to the ongoing internal transformation of the Organisation, and acknowledging the very significant time and effort required to deliver on these objectives, we also recognise the need to balance this with reliably servicing our customers and the continued delivery of quality science outcomes to our many and diverse stakeholders. By openly and honestly accepting these challenges, we will continue to see CSIRO evolve as a research enterprise that is committed to helping to underpin Australia's social, economic and environmental wellbeing into the future.

Catherine B Livingstone
Chairman of the Board

Geoff G Garrett
Chief Executive

Performance

Some key achievements 2004–05

Analysing health data confidentially

CSIRO has developed prototype software designed to enable researchers to analyse data vital to the development of public health initiatives, without compromising the confidentiality of patients' medical records.

The new Privacy-Preserving Analytics (PPA) software allows researchers to analyse raw data held in a secure computer system.

The traditional approach to protecting privacy has been to modify data before releasing it for research purposes. Data modifications are kept secret from researchers running analyses, making the results less reliable than they could be.

CSIRO's approach is to run secure analyses on unmodified data, so that the results are exact and reliable. To protect privacy, the results may be modified before being revealed to the researcher, but what is revealed is accurate.

The prototype software is attracting interest from health data custodians, researchers and policy analysts in Australia and overseas.

PPA also has potential research applications in other areas where privacy issues are paramount, such as banking and finance.

CSIRO scientists Dr Christine O'Keefe, Dr Warren Jin and Damien McAullay are part of the research team developing software for preserving privacy during analysis of health data. Photo: David McClenaghan, CSIRO

Searching for life beyond our solar system

CSIRO's success with a new manufacturing technique for a piece of astrometry equipment is helping American scientists detect planets in our galaxy and beyond.

CSIRO has mastered the manufacturing technique for the retro-reflector, called a cube corner.

This technology underpins America's National Aeronautics and Space Administration's (NASA's) hunt for life on other planets. NASA's Space Interferometer Mission will use cube corners in space-based telescopes mounted on each end of a ten-metre long scaffold to locate 'wobbly' stars – a sure sign that large planets are close by.

Spotting abnormal star vibrations relies on knowing the distance between the telescopes to extraordinary precision, around fifty millionths of a micrometre. This is measured by bouncing laser beams between cube corners mounted on the telescopes. Unlike mirrors, which have to be perfectly aligned, it doesn't matter from which direction light enters a cube corner, it bounces straight back to where it came from.

Cube corners produced by CSIRO are the most precise on Earth. They are made by fabricating an ultra-smooth disc and three wedges of Zerodur – a glass-like substance similar to ceramic hot plates. A double cube corner means two of the three corners on the base plate have to meet stringent specifications.

The demanding process of machining, grinding, polishing, super polishing, coating, assembly and alignment using techniques developed by CSIRO, results in near perfect surfaces and geometry. After the delicate process of assembly, the right angles between the wedges and the base plate are accurate to better than one ten thousandth of a degree and the vertices of the two cube corners are within five micrometres of each other.

The first double cube corner was collected by NASA at the end of March 2005. The device has been tested and it has met or exceeded their expectations in every facet of its operation. CSIRO's unique technology has applications in highly secure optical communications (including Earth to space), the aerospace industry and in general precision metrology over long distances.

Artist's impression of NASA's Space Interferometry Mission. Photo: NASA

New materials for the 21st century

CSIRO and the NanoTech Institute (NTI) of the University of Texas in Dallas have achieved a major technological breakthrough that should soon lead to the production of futuristic strong, light and flexible 'smart' clothing and other high-tech materials.

In discovering how to spin pure carbon nanotubes into yarns, CSIRO and NTI researchers have overcome one of the major technological impediments to the commercial manufacture of carbon nanotube materials.

Interest in the potential to create a range of new materials from carbon nanotubes has been high since details of their structure were revealed in the early 1990s. Measuring about ten millionths of a millimetre in diameter, carbon nanotubes are immensely strong. They are also excellent conductors of heat and electricity.

An international effort is underway to optimise the process and develop products based on pure spun carbon nanotubes. Further refinement of the spinning process could lead to carbon nanotube yarns suitable for manufacturing high-value commercial products such as artificial muscles, electronic textiles and anti-ballistic clothing.

Once the manufacturing process becomes commercially viable, carbon nanotube materials will have a major impact on the textile industry into the 21st century.

Chris Skourtis, chemical engineer from the carbon nanotubes project team, examining a petri dish of raw carbon nanotubes. Photo: Bea Lipson, CSIRO

CSIRO's total wellbeing diet

Research at CSIRO has identified dietary approaches that can assist Australians to improve their lifestyle to achieve better health. Created on the basis of the findings of several clinical trials, *the CSIRO Total Wellbeing Diet* is designed to provide a more nutritionally balanced alternative to a number of currently popular diets.

The more traditional low-fat/high-carbohydrate diets for weight loss have recently been challenged by alternative weight loss plans such as very-low-carbohydrate (Atkins), moderately-high-protein (ZONE) or low-glycemic-index diets.

CSIRO has conducted several of the largest published studies showing that higher protein dietary patterns for weight management have metabolic advantages over high carbohydrate patterns in overweight people with insulin resistance. The research suggests that an increased level of satiety experienced after eating high-protein foods helps to control weight. Other observed benefits include better nutrition and a greater lowering of cardiovascular and Type-2 diabetes risk factors.

Following strong public demand for more information about CSIRO's science-based weight management program, the Organisation agreed to publish a book on the subject. The work could not have been completed without a team of researchers, commercial and communication staff. In addition to the main authors Dr Manny Noakes and Dr Peter Clifton, key chapters were contributed by Dr Grant Brinkworth, Ms Jane Bowen, Ms Jennifer Keogh, Dr Michael Fenech, Dr Paul Foster and Dr David Topping.

Since its release by Penguin Publishing in June 2005, *the CSIRO Total Wellbeing Diet* has been a runaway success in Australia. Initial sales of more than 200 000 copies in less than three months, and several subsequent reprints, prompted a prediction by the publisher that total sales could reach one million copies. The book has also been released for sale in the UK and New Zealand.

CSIRO continues to conduct lifestyle related research that will assist in guiding government and the Australian public.

CSIRO science goes from laboratory to kitchen.
Photo: CSIRO/Studio Mode

The UltraBattery

Transport is one of the largest sources of human-induced greenhouse gas emissions. These emissions have led to a growing demand for hybrid electric vehicles (HEVs) to reduce air pollution and consumption of fossil fuels.

CSIRO is developing the UltraBattery, a new technology that will reduce the cost and boost the performance of batteries in HEVs. The UltraBattery combines a supercapacitor and a lead-acid battery in one unit cell, taking the best from both technologies without the need for extra electronic controls.

The capacitor will enhance the lifespan of the lead-acid battery as it acts as a buffer in discharging and charging. Consequently, this hybrid technology is able to provide power and absorb charge rapidly during vehicle acceleration and braking which makes for more efficient motoring.

At present, most HEVs use nickel/metal-hydride battery technology, which is much more expensive than the lead-acid counterpart. The UltraBattery is a high performance, high power, and longer life alternative to the lead-acid battery. The integration of the supercapacitor gives the UltraBattery a life close to that of the nickel/metal-hydride technology but with greatly reduced cost.

To date, research shows that the power of the UltraBattery is 20 to 50 per cent higher and its life-cycle is at least three times longer than that of the conventional lead-acid counterpart.

The success of the UltraBattery will make HEVs more affordable and widespread. This in turn will reduce the consumption of our limited supplies of fossil fuels and reduce greenhouse gas emissions in the urban environment.

Negotiations to commercialise the UltraBattery technology are now underway.

Rosalie Louey prepares materials for the assembly of an UltraBattery – a high performance, high power and longer life alternative to the conventional lead-acid battery. Photo: Christian Pearson

New remote controlled mining methods

Significant improvements to mining safety and efficiency can be achieved by using automation to remove people from hazardous areas.

For hard rock mining, a remote controlled method called ROES™ is being developed by CSIRO in collaboration with several partners. The system uses a new generation of remote controlled equipment to drill, load explosives and initiate blasts.

In traditional mining methods, underground roadways provide access to the ore body at a number of levels. However, with ROES™, one vertical shaft runs down through the ore body and an underground roadway provides access only to the base of the mining area. Automated equipment is lowered down the shaft to drill, load explosives and blast. The blasted ore is collected from the base. Because access is only required at the top and base of the mining area, mine development costs are dramatically reduced.

Current estimates are that ROES™ will reduce mine operating costs by between ten and 20 per cent. This will result in savings of up to $200 million a year in 18 target mines alone. It also means that at least $100 billion of metal currently in sub-economic ore may become economic, creating large new reserves for Australia. In addition, the method is applicable to underground quarrying near cities.

CSIRO, Orica, BHP Billiton and Stem Partnerships are currently working together on the feasibility of trialling ROES™ at Olympic Dam in South Australia. This follows earlier work between CSIRO and Curtin University of Technology, through the Western Australian School of Mines. Valuable strategic funding has also been provided by the Western Australian Government through the Australian Resources Research Centre.

Donna Anderson in a control room on the surface demonstrates an application of underground mining by remote control. Photo: CSIRO

Identifying mental illnesses earlier

Imaging software from CSIRO is helping doctors identify early changes in the brains of patients with diseases such as Alzheimer's and schizophrenia.

The software uses powerful mathematical analysis to measure the extent of thinning of the outer layer of the brain – the cortex – which is a factor known to be associated with the onset of many neurological disorders.

Doctors see the development of tools to aid the early identification of mental illness as essential and the software is currently being trialled at the Brain Dynamics Centre, a research centre of Westmead Hospital in New South Wales.

Patients with mental illnesses like schizophrenia are often diagnosed after significant changes have already occurred in the brain. This software will help in identifying serious illness earlier on, and with that lies the promise of earlier and hopefully more effective intervention.

The software takes images created by routine magnetic resonance imaging (MRI) scans, and uses them to create a three-dimensional map of a patient's brain.

The use of high-resolution images has allowed the development of novel image processing techniques which, for the first time, accurately and simply show cortex tissue loss over time. This allows doctors to quantify this decrease for the purposes of monitoring at risk patients.

For patients this means treatment can begin earlier so the onset of these diseases can be delayed or even prevented.

As well as benefiting patients directly, the software will help to improve our understanding of neurodegenerative diseases by allowing comparisons over time and across different patient groups, so that health strategies can be improved and extended.

Patient undergoing an MRI scan. The software combines the MRI images and uses them to create a three-dimensional map of a patient's brain. Photo: Westmead Hospital, Sydney

CSIRO vaccine protects Australia's cattle

CSIRO scientists have developed a vaccine for bovine respiratory disease (BRD) – also known as 'shipping fever' – a severe and often fatal form of pneumonia in cattle.

Found in herds throughout the world, BRD can manifest in cattle when the animals' stress levels are raised and immune status compromised.

BRD has been identified as causing between 50 and 90 per cent of the sickness and deaths suffered by cattle in Australian feedlots. It is estimated to cost the domestic industry $60 million a year.

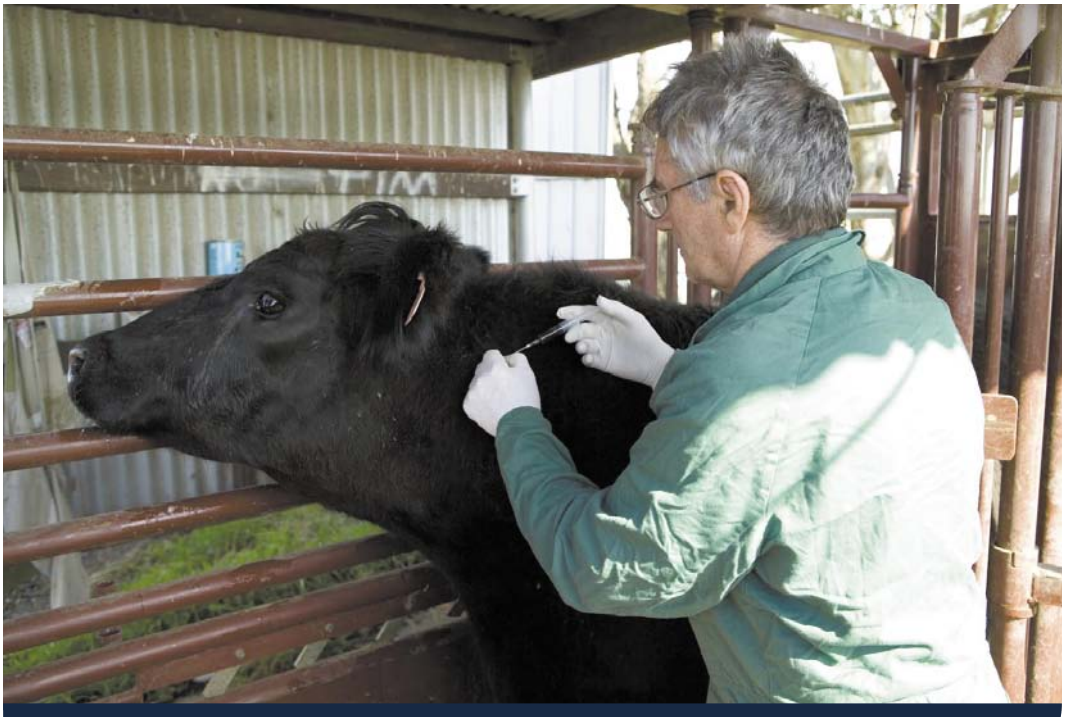
Designed to protect feedlot cattle against BRD, the vaccine – Bovilis® MH – was developed by CSIRO in collaboration with Intervet Australia and the Cooperative Research Centre for Cattle and Beef Quality.

It provides protection against the main bacterial pathogen associated with BRD – *Mannheimia haemolytica*. Until recently, the only treatments for pneumonia resulting from BRD were antibiotics and anti-inflammatory drugs.

CSIRO scientists worked with Intervet for several years to test the prototype vaccine in controlled trials involving 10 000 head of cattle in six feedlots in Victoria, NSW and Queensland.

In cattle vaccinated soon after feedlot entry, Bovilis® MH proved to be highly effective in reducing mortality and sickness rates and thereby increasing feedlot productivity levels.

More than 500 000 doses of the vaccine were sold to Australian feedlots within six months of the vaccine's official registration in July 2004.



CSIRO research led to a new vaccine to protect cattle against disease. Photo: Frank Filippi, CSIRO

Evidence of change in the Southern Ocean

CSIRO scientists have found evidence of major changes in deep ocean currents in the Southern Ocean which influence global climate patterns. Scientists on the Research Vessel *Aurora Australis* repeated measurements made ten years ago to observe changes in the currents which form part of the Southern Ocean 'conveyor belt'.

The deep layers of the Australia-Antarctic basin are supplied by water sinking in two locations near the coast of Antarctica, where cold temperatures and sea ice formation make water at the sea surface so dense that it can sink to depths of four or five kilometres.

The sinking near Antarctica is part of a global pattern of ocean currents sometimes known as the 'ocean conveyor belt'. The conveyor belt influences climate by carrying heat around the globe and by absorbing the greenhouse gas, carbon dioxide.

This release of heat to the atmosphere, perhaps thousands of kilometres away from where it was absorbed, in turn drives motions in the atmosphere that determine large-scale, slowly-evolving temperature and rainfall patterns that make up our climate.

At every measurement site in the deep basin adjacent to Antarctica, scientists found the waters near the sea floor cooler and less salty than they were a decade ago and were surprised at the speed and widespread distribution of the changes.

The results suggest the deep ocean is a much more dynamic environment than anticipated and that changes in the sinking regions can influence a large region of the ocean in just a few years.

Because the 'conveyor belt' is so important to climate, evidence of rapid changes in one part of the conveyor belt is a significant finding. However, the results cannot be interpreted as evidence of climate change. Long-term natural cycles may have caused the observed changes.

Whether the observed changes are due to natural climate cycles or human-induced climate change, the changes suggest the deep ocean is closely connected to the surface layers in the Southern Ocean.

The *Aurora Australis* is funded by the Australian Antarctic Division. This expedition was supported by the Australian Greenhouse Office, the Cooperative Research Centre program, the Australian Antarctic Division and CSIRO.

Crew retrieve moorings from the Antarctic resupply vessel, Aurora Australis, in January 2005. Mooring instruments record ocean conditions from the sea floor to the surface. Photo: CSIRO

Healthy new future for omega-3 grains

CSIRO has developed plants that produce DHA, a healthy omega-3 oil component normally only available from fish sources and vital for human health.

Showing that plants can produce DHA in their seeds is a remarkable scientific feat and an important first step towards improving human nutrition. This also has the potential to reduce pressure on declining fish resources worldwide and provide Australian grain growers with new high-value crops.

DHA and other long-chain omega-3 fatty acids are made by lower plant forms, such as microalgae, which are then acquired by fish through the food chain. More advanced plants that grow on land cannot produce them.

The prototype plants were developed to demonstrate, for the first time, that land plants can make their own DHA and other important long-chain omega-3 fatty acids when they are equipped with the required genes.

DHA is important for optimal brain and eye development and is recognised for its health attributes including lowering coronary heart disease risk, Type-2 diabetes, Alzheimer's disease and asthma.

Nutritional authorities recommend a daily intake of at least 500 milligrams of long-chain omega-3 including DHA, yet dietary surveys show that most Australians consume only a tenth of this amount.

To increase intake, many foods are now supplemented with omega-3 oils from fish, but with projections for declining natural fish stocks, and aquaculture's current reliance on fish-based feeds, additional sources of long-chain omega-3 oils are needed.

Dr Surinder Singh, part of the CSIRO team involved in developing plants with omega-3 oils. Photo: Carl Davies, CSIRO

Crops to help fight against acidic soil

In a world's first, scientists from CSIRO and Japan's Okayama University have isolated an aluminium tolerance gene from wheat which will accelerate the development of crops that can help battle Australia's $1 billion soil acidity problem.

Acidity affects more than 40 per cent of the world's arable land, limiting agriculture when naturally occurring aluminium dissolves and inhibits root growth in sensitive plants.

The CSIRO team and their Japanese collaborators, isolated a wheat gene that enables roots to exude malate, a normal constituent of plant cells, binding aluminium into a non-toxic form and protecting roots from damage.

Acid soil can be improved by using lime, but it takes decades to correct acidity at depth. By combining liming with acid tolerant crops and pastures, nutrient leaching can be reduced and acidity effectively managed.

Aluminium tolerance is not present in many crop and pasture species, including barley, so they cannot be improved by conventional plant breeding. But as a single gene is responsible, gene technology is an ideal way to introduce the tolerance trait.

To test the gene's effectiveness, scientists used genetic technology to introduce the gene into barley – a plant normally very sensitive to aluminium. The experimental barley showed a high-level of aluminium tolerance in both hydroponic culture and acid soils.

While CSIRO is not planning to release an acid soil tolerant genetically modified barley, the gene is already used as a molecular marker for tracking aluminium tolerance in standard wheat breeding trials.

CSIRO's Dr Manny Delhaize (left) and Dr Peter Ryan (right) in a glasshouse examining wheat plants – their research has isolated an aluminium tolerance gene from wheat which will accelerate the development of crops that can help battle Australia's $1 billion soil acidity problem. Photo: David McClenaghan, CSIRO

More vibrant colours for wool clothing

CSIRO has discovered the key to enabling manufacturers to produce wool garments in a wide range of more vibrant colours.

Wool currently suffers in the marketplace – especially in the growth areas of sports and leisurewear – because it is impossible to produce stable bright white or bright pastel colours.

Rapid yellowing of wool after it has been treated with fluorescent whitening agents is a problem that has eluded a satisfactory technical solution since it was first identified in 1956.

Yellowing of bright whites and pastels on wool severely limits the range of shades of colours that can be applied to wool products. Despite previous research in this area, uncertainty remained regarding the fundamental photochemical mechanisms responsible for the degradation of both natural wool and wool treated with fluorescent whitening agents.

However, in a project funded by Australian Wool Innovation, CSIRO has discovered that the mechanism of wool photo-yellowing occurs via photoinduced electron transfer from the wool protein to the whitener, rather than via singlet oxygen as previously reported.

This finding is the key to developing strategies designed to reduce the rate of photo-yellowing in wool, thereby allowing wool garment manufacturers to produce a more marketable range of vibrantly coloured wool products.

Sports and leisurewear are rapidly expanding markets, especially amongst the younger generation. Bright white and pastel shade wool and wool-blend products that do not yellow, would allow Australian Merino wool to establish a presence and compete with cotton and synthetics. Photo: Bea Lipson, CSIRO

Painless genetics with morphine-free poppy

A handful of genes discovered in a morphine-free poppy could hold the key to producing larger quantities of improved pain-management pharmaceuticals.

Norman, the 'no-morphine' poppy, has an advantage over standard morphine-producing poppies in that it produces thebaine and oripavine – compounds preferred by industry in the manufacture of alternative high-value pain-killers.

Working with Tasmanian Alkaloids, CSIRO found a small set of genes in *Norman* poppies which behave differently to standard morphine producing poppies. The genes were consistently associated with blocking the production of morphine while enhancing Norman's ability to produce thebaine and oripavine.

Understanding the genes responsible for the production of morphine, thebaine and oripavine is an important step in developing poppies capable of producing larger yields of these valuable compounds.

The morphine-free poppy variant was first discovered in 1995 by Tasmanian Alkaloids then released as *Norman* for commercial production in 1997 in Tasmania, where it is now widely grown.

While Tasmania already produces over 40 per cent of the world's legal poppy crop, the discovery of *Norman's* special characteristics should ensure the state continues to be the international leader in the supply of raw materials and value-added analgesics from poppy compounds.

The thebaine from *Norman* poppies is already used internationally in the production of derived pain-killers and the most effective treatments for opiate addiction.

The molecular genetic analysis of *Norman* was supported by voluntary contributions from industry, with matched funding for R&D from the Australian Government through HAL (formerly Horticulture Australia) and involves collaboration between CSIRO, the Australian National University, Tasmanian Alkaloids, the Institute for Plant Biochemistry (Germany) and the University Halle (Germany). Ongoing genetic research is supported by Tasmanian Alkaloids and CSIRO.

CSIRO has identified a handful of genes in a morphine-free poppy that could hold the key to producing improved pain management pharmaceuticals. Photo: David McClenaghan, CSIRO

Termites feed through good vibrations

Researchers have revealed that termites are not the indiscriminate eaters that many of us think they are. CSIRO has been conducting experiments on the feeding behaviour of termites by recording the vibrations made while they feed.

They found that the termites can determine whether a piece of wood is their favourite size by measuring the wood's natural resonance. If the resonance doesn't match their preferred size or composition, they move onto another sample.

The finding has provided a new insight into how scientists can interfere with the termites' ability to select wood, and this discovery may lead to novel control methods that reduce termite impact on wooden structures, such as houses.

Termites cost the Australian economy around $780 million per year by damaging buildings, but also provide useful environmental services such as nutrient cycling and soil aeration. Targeted and non-polluting pest management is essential to balance these costs and benefits. Exploitation of termites' information gathering and communication systems may provide cost-effective protection with low environmental impact.

CSIRO's Dr Theo Evans revealed how termites used vibrations to choose their food. This may lead to chemical free pest control. Photo: David McClenaghan, CSIRO

New contact lens for healthier eyes

A new contact lens which has high oxygen permeability and the flexibility to be worn by users on an occasional basis has been developed by CSIRO.

Building on research that produced the highly successful Focus Night and Day contact lens, CSIRO and its partners have created the new lens which has greater flexibility in how it is worn.

CSIRO's Extended Wear Contact Lens team has had a longstanding partnership with the Vision Cooperative Research Centre and its major industrial partner CIBA Vision Corporation. This partnership resulted in the development of the Focus Night and Day (FND) lens, a silicone hydrogel soft contact lens which may be worn continuously for 30 days and nights.

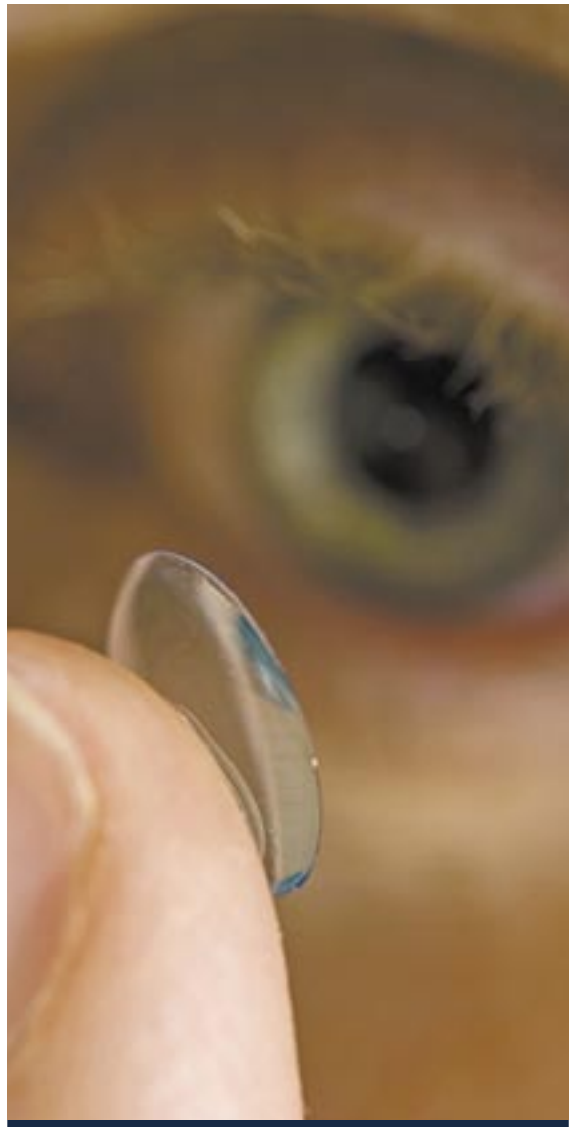
Many patients and contact lens practitioners said they would like a lens which has the oxygen permeability of the FND product but which may be worn on a more flexible schedule (daily wear, occasional overnight use).

Several years ago CIBA Vision and the Vision CRC embarked on a project to produce a silicone hydrogel contact lens which would meet those needs.

The skill set and capabilities in surface chemistry and characterisation which the CSIRO team brought to the project (specifically expertise in X-ray photoelectron spectroscopy and atomic force microscopy) were unique in the collaboration.

These skills, in combination with expertise in lens manufacturing, lens design and clinical studies from the Vision CRC and CIBA Vision resulted in the development of the new silicone hydrogel material, lotrafilcon B, from which the recently released O_2OPTIX™ lenses are constructed.

The structure and properties of the material allows considerably more oxygen to pass through the lens than traditional contact lens materials, in combination with the unique lens coating has resulted in increased comfort for the user and allows for more flexible wear.



O_2OPTIX™ contact lens for healthier eyes
Photo: David McClenaghan, CSIRO

The year in summary – and looking ahead

Our focus in 2004–05 was on **execution** and **delivery** on our Strategic Plan 2003–07. Throughout this past year we have continued to deliver scientific and technological achievements of significance – the core of our business – which are highlighted throughout this Report (see pages 31–66).

Through better defining our core roles, we also clearly articulated our differentiated position within the National Innovation System and began the ground work for the formulation of our strategy through to 2012. We continued to **focus** and increase our investments in Flagships, which are gaining traction and delivering real outcomes for Australia. In addition, several new multidisciplinary initiatives were created, for example, Coasts and Minerals Down Under, and we strengthened our research capability through mergers to create three new business units – in Marine and Atmospheric Research, in Food Science and Nutrition, and in Molecular and Health Technologies – each with greater alignment to their customer base.

Looking out for our science, we expanded a program of science reviews using panels of internationally-recognised experts to benchmark the quality of our science and its impact. We extended our **partnerships** with universities, publicly funded research agencies and industry through the creation of a series of joint ventures and a commitment to ten new Cooperative Research Centres. In support of the implementation of our **One-CSIRO** strategic theme, we committed to sharing support services and common business practices to increase our internal efficiency and also make CSIRO easier to work with externally. We continue to foster a **service from science** culture through operating as a single enterprise to **grow our impact** by delivering integrated science solutions that help drive national innovation.

Focus, and building critical mass

Flagships currently account for 20 per cent of CSIRO appropriation expenditure with over 20 per cent of CSIRO staff now involved, with these numbers increasing in the coming year. Total Flagship funding revenue grew to $145 million in 2004–05 from $82.8 million in 2003–04.

By way of example, during the year the Flagships:

- developed land plants that produce a healthy omega-3 oil component normally only available from fish sources, and vital for human health (Food Futures)
- together with Comalco, worked to reduce the energy consumed in primary aluminium production by focusing on a revolutionary electrolytic cell technology that could lead to a paradigm shift for the aluminium industry (Light Metals)
- engaged with Holden Australia to develop energy management control systems which integrate supercapacitors and advanced batteries for the next generation of hybrid powered vehicles (Energy Transformed)
- in close collaboration with Neurosciences Australia, examined the molecular basis for protein deposition and toxicity in Alzheimer's disease and are identifying possible paths for protection against it (Preventative Health)
- in partnership with the Western Australia (WA) Department of Environment and Water Corporation completed a 'whole-of-system' review of existing and potential water resources in southwest WA including demand, current levels and costs of allocation and extraction, and the potential impact of two climate scenarios to inform planning for WA's Integrated Water Supply Scheme (Water for a Healthy Country)
- are in the advanced stages of producing, with the Australian Bureau of Meteorology, a global ocean model and analysis system to provide ocean forecasts. A regional model, nested within the global model, is being used by the Royal Australian Navy to provide coastal ocean forecasts (Wealth from Oceans).

This year also saw some further consolidation of our research base. The Divisions of Atmospheric Research and Marine Research joined forces to form a single Division of Marine and Atmospheric Research, now with 520 staff, focusing and strengthening our contributions to research areas such as climate and earth system modelling, with strong links to the Bureau of Meteorology.

The Health Sciences and Nutrition (HSN) Protein and Structural Biology Research Groups at Parkville, Victoria, joined Molecular Science to create CSIRO Molecular and Health Technologies. The HSN Nutrition Research Group based in Adelaide joined forces with Food Science Australia, to form a single operating entity. These mergers will strengthen scientific capabilities and build critical mass, with each of the new Divisions more closely aligned to their respective customer base.

Ensis, CSIRO's unincorporated joint venture with New Zealand's Scion (formerly Forest Research), was created in July 2004 to enhance CSIRO's critical contribution to forest research in the region. We have now consolidated all of our forestry and forest products research into the joint venture, now a 300 person and $55 million per annum turnover operation.

We also took the opportunity to rationalise our former four Group structure to three groupings of Divisions, joint ventures and Flagships to better anticipate changing national priorities and build research synergies. The three Groups are: Agribusiness; Sustainable Energy and Environment; and Information, Manufacturing and Minerals. In addition, new seed investments were made in six cross-cutting research initiatives, specifically: Climate, Coasts, Sustainable Agriculture, Synchrotron Science, Security/Counter Terrorism and Minerals Down Under.

Looking out for our science, and our people

Excellence in science is our core business and recruiting, developing and retaining our top scientists is a key to our success. This year we developed a new enterprise-wide Science Investment Process to ensure that we have a sustainable and balanced portfolio of short, medium and long-term high-quality science that delivers benefit to Australia, consistent with our strategy of increasing our relevance and impact. We began a series of independent, internationally-benchmarked science reviews of Divisions to critically assess both the quality and impact of the science we do. These reviews have indicated that overall the vast majority of our research is internationally competitive, with a few areas requiring improvement and a need to continue to increase and focus our publication effort. Over one-third of Divisions have now been assessed with the remainder subject to review over the next two years.

CSIRO remains a high-impact contributor to the international scientific literature. Over the last four years, the total of our journal articles, books/chapters in books and conference proceedings publications, have increased 35 per cent. Based on the Institute for Scientific Information's (ISI) *Essential Science Indicators* for 2004–05 (monitored across 3 400 institutions), CSIRO ranked in the top one per cent of institutions worldwide in 12 of ISI's 22 research fields (based on the total number of citations over a rolling ten year period). In late 2004, the prestigious American journal *Science* cited the Australia Telescope National Facility team's discovery of the first known pair of pulsars as one of the year's ten most significant scientific achievements.

CSIRO scientists continued, throughout the year, to receive a range of international and national awards. 2005 also saw the development of three new initiatives in the ongoing development of our people, young and old: a new, organisation-wide program to build project leader skills that will roll out

over the next two years; the CEO Science Leader Scheme geared to attracting the best from around the world; and the CSIRO Alumni program aimed at maintaining strong networks between past and present staff.

Staff satisfaction continues to be a key metric of organisational health, and remains well above international and Australian benchmarks. The vast majority of staff are proud to work for CSIRO; however, both formal and informal feedback indicate that we still have considerable work to do in the areas of information dissemination, organisational leadership and direction, the management of organisational change, and reducing bureaucracy. Understandably, staff concerns and uncertainty remain relatively high during this transition period as we continue to make tough strategic decisions around research priorities, seek to improve the efficiency of our support systems, and increase investment in Flagships (with the associated challenges of matrix management). We will continue to listen to, and work with our staff, to seek to ensure that this transition runs as smoothly as possible. As such, in late 2004, we established the Change Program Office to better coordinate and manage the implementation of enterprise-wide change projects and facilitate better information flow across the Organisation. In June/July 2005 we also ran the first of a series of Strategy in Action workshops for over 300 senior leaders organisation-wide aimed at increasing levels of awareness and engagement with our strategy and its implementation.

Partnerships

The Flagship Collaboration Fund was announced by the Minister for Education, Science and Training, the Hon Dr Brendan Nelson in May 2005. Over seven years the Fund will allocate $97 million to develop collaborative partnerships to enhance the overall research effort in the Flagships Program, by increasing scale and focus and by bringing together complementary expertise. By the end of June 2005 we had received 24 applications for collaborative funding involving nineteen universities, one CRC, one Centre of Excellence and five other publicly-funded research agencies.

A review of collaboration between the Australian National University and CSIRO found a breadth and depth of existing collaborative activities (in Canberra and nationally), and a unanimous willingness by staff to partner; a number of potential new research initiatives were also identified. This is but one example of the growing strength of our relationships with the university sector which include, among others: James Cook University in the areas of Tropical Science and Tropical Forests; the University of Queensland, Griffith University and Queensland University of Technology for the establishment of the Australian Ecosystem Science Precinct in Brisbane; Monash University in the area of early-career scientist development; and the University of Western Australia and Curtin University of Technology as part of the Western Australian Energy Research Alliance. As part of this strategy, notwithstanding the great benefit that will accrue from these partnerships, it must be recognised that our contracting processes involved, as with some CRC negotiations, were on occasion far from painless. More work is necessary to smooth these paths to enhanced collaboration into the future.

We are advancing our program of co-location and sharing of major items of research infrastructure, recognising that growth consolidation processes do not happen without unsettling some staff. We also committed to ten new Cooperative Research Centres, involving an investment of approximately $30 million per annum over the next 7 years, as well as committing to Australian Research Centres of Excellence and significant joint ventures with State and Federal agencies.

In 2004–05, CSIRO continued to develop and maintain its international standing and building on our strategic partnerships with overseas institutions. CSIRO is also currently actively involved in project work in more than 80 countries.

Service delivery from our science

We continue to work closely with industry, Government and the community to deliver integrated science solutions to meet their needs. Several major ventures were established in 2004–05. These include the aforementioned Ensis, the $15 million e-Health Research Centre between CSIRO and the Queensland Government, and the multi-Divisional $13.5 million Crop Biofactories initiative with the Grains Research and Development Corporation. The Australian Animal Health Laboratory was accredited as an international collaborative centre for new and emerging diseases by the World Organisation for Animal Health. In response to the December tsunami, we joined forces with the Australian Institute of Marine Science, the Great Barrier Reef Marine Park Authority and AusAid to assist the Maldives in assessing the impact on the local marine ecosystem.

In assessing our performance for our external clients, we monitor this through our Customer Value Surveys (CVS), and qualitative and quantitative brand and marketing surveys. While it is pleasing to see that our customers continue to strongly value our science excellence, their feedback has also identified areas where we could do considerably better, for example, in contract negotiation, cost, and intellectual property management. Improvement in these areas will be a major focus for us in the year ahead as we strive to improve our approach and commitment to partnering and service delivery.

One-CSIRO

One-CSIRO is all about bringing together the significant depth and breadth of the Organisation to address major national challenges. Some of the world's greatest scientific breakthroughs have come from working across traditional disciplinary boundaries, or from the interface of seemingly unrelated subjects. We have improved on our Emerging Science Scheme to further facilitate such multidisciplinary approaches to areas of cutting-edge science. Ten new topics were selected this year for seed funding including environmental nanovectors, new materials for renewable energy, and small molecule transport.

Some other highlights from the Emerging Science program include:

- Nanophotonics – Advanced techniques have been developed to fabricate high precision nanoscale structures for various applications (for example sensors, meta-materials, advanced optical coatings and molecular electronics circuits).
- Complex Adaptive Systems – A prototype electricity demand model has been developed for the National Energy Market SIMulator. This model is designed to generate realistic scenarios of electricity demand based on climate data.
- Social and Economic Integration – In the Northern Territory's Daly Basin, new methods being developed for indigenous engagement and incorporation of cultural values into ecosystem services theory have exceeded expectations.
- Complex Systems Science – A series of case studies have demonstrated the value of applying complex systems approaches to the analysis of terrestrial ecosystems and associated human systems.

One-CSIRO is also about creating seamless and flexible systems across the entire Organisation that will allow us to readily meet the challenges of a rapidly changing operating environment. An in-depth review of Research Support Services was initiated this year and we committed to establishing enterprise-wide shared services in, for example, finance, human resources and legal support, from 2005–06 onwards. Along with the Business Process and Enabling Technology Review (BETR) and our commitment to an Enterprise Resource Planning (ERP) system, this is a critical milestone in our strategy of implementing common processes and systems in support of our Strategic Plan, to enhance collaboration and efficiency, and to reduce overhead costs. Success in these initiatives will create significant efficiencies, thereby freeing up resources to invest in science.

Growing our financial foundation

2004–05 was a challenging year financially for CSIRO. While Government appropriation resources increased in line with earlier triennium

and Flagship funding decisions and external coinvestment revenue increased by more than $15 million over the last financial year to $209 million, the level of consulting and research services revenue fell by $18 million to $60 million. This was driven in part by the successful implementation of the Organisation's decision to seek to eliminate the level of subsidisation of these services. It is also important to note that externally-generated Flagship funding for CSIRO has taken time to ramp-up and it will not, in the short-term, leverage the same level of funding to CSIRO from external partners as some of our more traditional activities. However, investment in Flagship-related activities by external partners themselves has meant that the overall investment in the achievement of the Flagship Program outcomes remains in line with plan, as anticipated.

Intellectual property revenues remained strong at just over $20 million but slightly down on the 2003–04 outcome, a result adversely impacted in part by the delay in execution of a number of planned year-end transactions. During 2004–05, greater efficiencies were achieved across a range of research support services which saw a further decrease in the Organisation's overhead ratio. While the operating result missed its breakeven target by $9.2 million, it should be noted that over the past four years CSIRO has exceeded its budgeted target by over $10 million.

Looking ahead to 2005–06

In 2004–05, we focused hard on delivering the necessary changes required to deliver on our Strategic Plan 2003–07. This clearly created understandable turbulence in the Organisation and we did not achieve the financial targets we set ourselves. Further feedback from staff and customers suggests that we need to improve the way we engage with them.

In the coming year, we will give greater attention to the coordination and communication of our key change programs to ensure that they are properly embedded in the Organisation. We will deliver on the scientific outcomes which we have planned and are committed to. We will continue to work harder to improve our relationships with clients and others – seeking simplicity and clarity where currently there may be complexity and ambiguity. We will also continue to enhance our discipline in the management of projects and our performance.

Substantial changes to the operation of the Organisation continue to be required in 2005–06 to achieve our long-term vision and to deliver on our strategy. In the coming year we are committed to:

- full implementation and further investment growth of the **National Research Flagships Program** with removal of any impediments to their operational effectiveness and research delivery, and investing through the Collaboration Fund in partnerships with universities and other publicly funded research agencies
- further focus our investments; in 2005–06 we start the next stage of the enterprise-wide **Science Investment Process (SIP)**, with broad direction setting to be completed by September in preparation for theme-based research investment in 2006–07
- moving to the next stage of the **Business Processes and Enabling Technologies Review (BETR),** with the goal of delivering enterprise-wide business processes and systems
- migrating our current Divisional and corporate-based delivery of **Research Support Services** to enterprise-wide delivery of services, improving operational effectiveness and reducing costs
- focusing on continually improving **Project Leadership** and **Client Impact**; recognising that research projects and our relationships with clients are the building blocks of our science excellence and its delivery.

The next year will continue to be an exciting and, as always, challenging time, during which we can build on the best of the past and present to forge a vibrant and sustainable future for CSIRO, in the service of Australia.

As we continue to evolve as an organisation and increasingly operate as a single enterprise, we will pay keen and close attention to our primary purpose – providing integrated science solutions to meet the needs of our external stakeholders.

Delivering impact from our science

CSIRO's Outcome and Outputs framework

This section highlights a wide selection of achievements – outcomes and outputs consistent with the outcome-outputs framework as agreed with the Australian Government (Figure 1).

The achievements illustrate the numerous ways CSIRO is able to contribute to economic, social and environmental benefits for Australia and are arranged under headings for each of CSIRO's four Research Groups (Information Technology, Manufacturing and Services; Sustainable Minerals and Energy; Environment and Natural Resources; Agribusiness and Health). These Groups correspond to the four outputs in the Outcomes and Outputs framework.

Some of the achievements described in this report represent further milestones in achievements that have been reported in previous years. This reflects the long-term nature of many of CSIRO's research and commercial partnerships, and the varying time-frames over which research results may be adopted. CSIRO acknowledges that many of its achievements result from successful partnerships with clients and collaborators, both private and public. Unfortunately, space prevents specific acknowledgement of all partners who have contributed to the achievements reported here.

Figure 1: CSIRO's Outcome and Outputs Framework

Outcome			
The application or utilisation of the results of scientific research delivers: • innovative and competitive industries • healthy environments and lifestyles • a technologically advanced society			
Outputs			
Research products and services for Information Technology, Manufacturing and Services	Research products and services for Sustainable Minerals and Energy	Research products and services for the Environment and Natural Resources	Research products and services for Agribusiness and Health

How do CSIRO's outputs contribute to benefits for Australia?

CSIRO delivers four major types of research products and services:

- new/improved technology and management systems
- new/improved intermediate and final products
- 'catalyst' services and advice for policy and business
- new knowledge and skills.

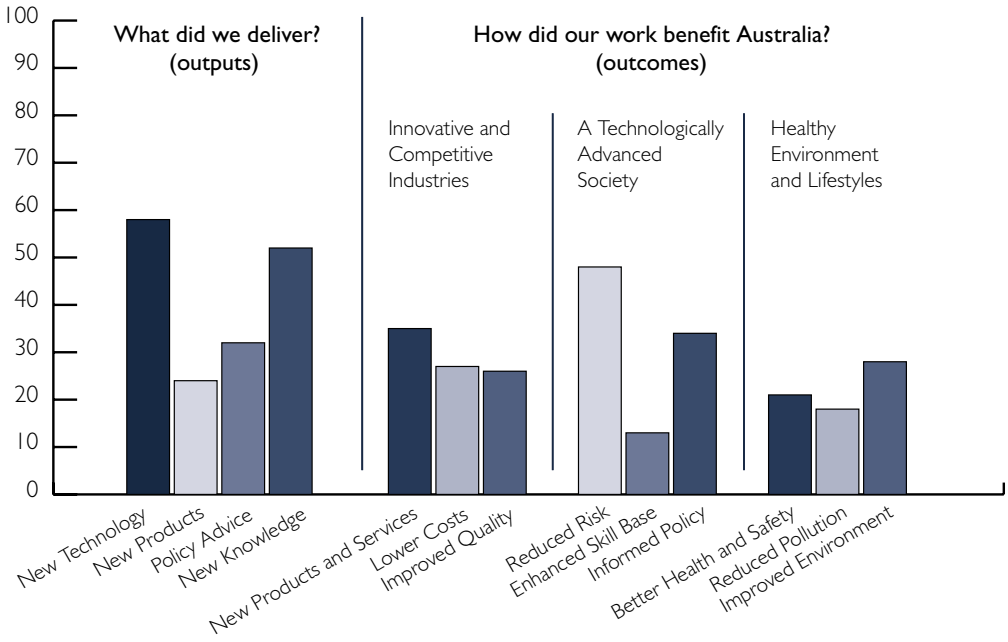
These four types of outputs contribute to economic, social and environmental benefits in a variety of different ways but, specifically by contributing to:

- innovative and competitive industries, through:
  - lower/more competitive production costs
  - improved quality of goods and services
  - new products, services and businesses

- a technologically advanced society, through:
  - reduced risk (economic, environmental and/or social)
  - development of skills (enhanced human capital)
  - informing policy (cost-effective public programs)
- healthy environment and lifestyles, through:
  - improved human health, safety and wellbeing
  - reduced pollution
  - improved environmental health.

Figure 2 illustrates how the achievements described in the following pages are distributed across these different types of outcomes and outputs. However, this CSIRO-wide view disguises the fact that the nature of outcomes and outputs varies across the four research groups. This variation can be seen by comparing Figures 3 to 6. For example, the largest category of outcomes in the Environment and Natural Resources Group is *'informing policy (cost-effective public programs)'*, but in the Information Technology, Manufacturing and Services Group the largest category of outcomes is *'lower/more competitive production costs'* followed closely by *' improved quality of goods and services'*.

Figure 2: Overview of Selected CSIRO Achievements, 2004–05



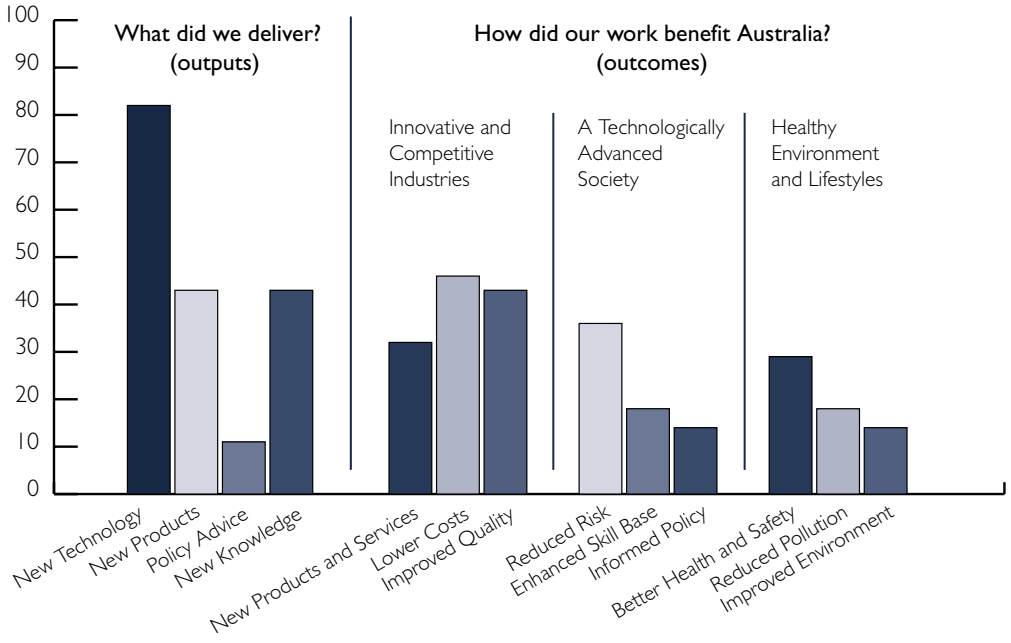
Information Technology, Manufacturing and Services

(The group includes the following Divisions: Australia Telescope National Facility; Industrial Physics; Information and Communication Technologies Centre; Manufacturing and Infrastructure Technology; Mathematical and Information Sciences; Molecular Science; and Textile and Fibre Technology).

Outcomes and outputs in this group include:

- Measuring atmospheric winds on Titan
- Improved intelligence for security
- Reducing salt in tannery effluent
- Magnesium manufacture opens new markets
- Software for faster drug discovery
- Enhancing satellite communications
- Stormwater project addresses water crisis
- Identifying mental illnesses earlier
- Improved motors for domestic appliances
- Monitoring water quality in the Douglas Shire
- P@noptic search engine
- Progress toward corneal implants
- Spinning wool and wool blends faster
- New asset management technology saving money and water
- New receiver systems for the Australia Telescope Compact Array
- Improving road safety
- Sustainable urban water management in Australia's capital
- Successful semiconductor spin-off
- Sensitive detectors for mineral exploration
- Machine washable wool blend suits in China and India
- Innovative technologies enhance water resistance for paper packaging
- Delivering integrated rangeland monitoring to the pastoral industry
- New software to manage operational risk
- Searching for life beyond our solar system
- New technology to assist aircraft of the future
- Major new fabric development for multi-national
- New contact lens for healthier eyes
- Safer aeroplane panels

Figure 3: Pattern of Outcomes and Outputs for Information Technology, Manufacturing and Services



Measuring atmospheric winds on Titan

On 14 January 2005, CSIRO telescopes and radio telescopes around the world tracked the European Space Agency's (ESA's) Huygens probe as it descended to the surface of Titan, Saturn's largest moon. The probe was designed to transmit signals only as far as its parent Cassini spacecraft, but the telescope network was able to directly detect its faint signals at a distance of 1.2 billion kilometres.

CSIRO's Parkes telescope and the Green Bank Telescope in the USA were able to give the ESA the first confirmation that the probe had landed safely, hours ahead of the signal relayed via Cassini. Using the special technique of VLBI (very long baseline interferometry), the telescope network was able to pinpoint where the probe entered Titan's clouds to within a kilometre, and measure tiny shifts in the signal frequency as the probe was buffeted by wind on its way down. The resulting data has been used to determine the speed and direction of the winds on Titan. The measurements were particularly important as they compensated for data that was not successfully sent from Cassini. The experiment confirmed that VLBI can be used to track distant spacecraft with very high precision.

An artist's impression of the Huygens probe about to plunge through the clouds of Titan. Photo: European Space Agency

Improved intelligence for security

CSIRO has successfully demonstrated a collaborative project to Boeing's R&D arm, Phantom Works. The project has delivered:

- automated detection of intelligence alarms and warnings from collections of documents containing free text
- productivity tools and technologies to support high-level integration of distributed data and software using web services and semantic web concepts
- authoring tools and technologies to enable tailored, context-specific reports to be generated intelligently, on demand, from multiple, diverse web sources.

The application represents an anti-terrorism and security scenario where advanced intelligence analysis simulates alerts based on detection of facts critical to the regional intelligence picture. Risk associated with the current shipping picture in the Malacca Straits, which link the Indian and Pacific Oceans, is analysed, and tailored reports are dynamically generated that deal with piracy, shipping movements and high-threat ships in the region. CSIRO's technologies have been installed and are running in Boeing's Network Centric Operations Integration Laboratory in Seattle.

Reducing salt in tannery effluent

A joint project between the Australian Centre for International Agricultural Research (ACIAR), CSIRO and Central Leather Research Institute (CLRI India) has developed systems to significantly reduce salt use in hide and skin preservation and processing. One of the four major developments of the project is continuous reuse of pickle liquors. Pickle liquor use for woolskins in Australia and for vegetable-tanned goatskins in India, has been successfully extended and implemented in two tanneries. For a small tannery processing 5 000 skins per week, continuous reuse of pickle liquors saves about 750 tonnes of salt per annum.

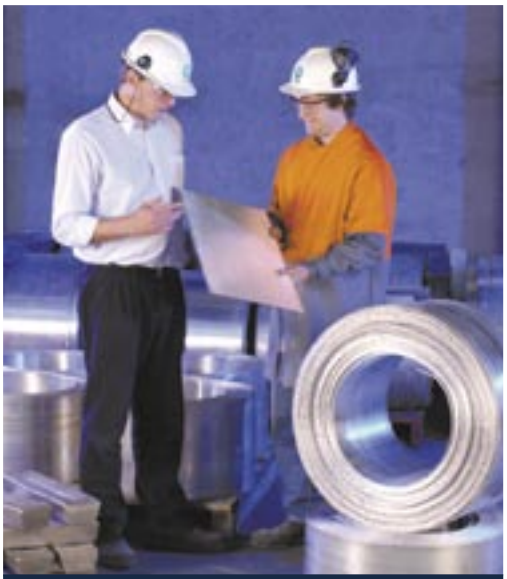
Tamil Nadu tanneries are threatened with closure for high salinity discharge and

such reductions in salt discharge to the environment will contribute to meeting regulations. Industry and local communities will be beneficiaries. A recent ACIAR Review has recommended extension of the project to enable industry implementation of the other project developments.

Magnesium manufacture opens new markets

CSIRO now joins less than a handful of companies around the world capable of producing magnesium sheet. The new technology is based on using a twin roll casting technique – used extensively in the aluminium industry – to the production of magnesium alloy sheet.

CSIRO has signed an exclusive option to licence the technology process with Magnesium International Ltd. Under the agreement, Magnesium International Ltd will now work with CSIRO on scaling-up the technology for full commercial production. The agreement also brings with it an imminent customer order from one of the world's leading manufacturers of personal communication devices.



CSIRO's Peter Kean and Daniel East with magnesium sheet samples. Photo: Mark Fergus

Software for faster drug discovery

CSIRO has found new ways of measuring the complexity of the branching of neurites (nerve cell outgrowths) for faster drug discovery. Nerve cells (neurons) have very complex branching structures (neurites), making it hard to measure cell shape changes necessary for neurological drug screening and toxicology testing, and for gene knockout studies.

CSIRO has licenced its neurite outgrowth image analysis software to Evotec Technologies, Axon Instruments (now Molecular Devices) and Atto Biosciences (now BD Bioscience). These major international biosciences companies have incorporated the software into their high throughput cellular imaging systems, used by pharmaceutical companies for drug discovery. Automating the analysis of cell images allows drug companies to use 'high content screening' to measure changes rapidly and accurately making it possible to develop safer drugs faster.

Enhancing satellite communications

Communications infrastructure is expensive and can involve large installations. Technologies which increase the capacity of existing infrastructure can extend the life of assets and improve their performance. CSIRO, in conjunction with the Defence Science and Technology Organisation (DSTO), has extended the Australian Defence Force's (ADF) satellite communications capability with the development of an advanced multiband feed system. This new system exploits the ability of the Optus C1 satellite to operate simultaneously at several bandwidths.

This enhanced capability has now been incorporated into the BAE Systems Parakeet Transportable Satellite Terminal which, until now, could only operate at one frequency band at a time. The new system allows the Parakeet terminals to operate at two bandwidths simultaneously – allowing faster and more reliable communications between defence personnel who may be operating in difficult and dangerous environments.

CSIRO is exploring further opportunities for employing the new multiband feed chain in other communications systems.

Stormwater project addresses water crisis

Traditional urban water sources are under threat from climate change and population growth with many communities actively looking for alternative water sources. Stormwater is an option that many communities would like to consider, but planning and implementation is inhibited due to a lack of knowledge on infrastructure requirements, technology performance, water needs and contaminant loads, lifecycle costs and community acceptance.

CSIRO scientists have developed a detailed guidance document that assists water authorities and local councils in identifying cost-effective, environmentally friendly and socially acceptable alternatives to conventional stormwater systems. The project has enabled the City of Geelong in Victoria and the Environment Protection Authority (EPA) Victoria to plan a more sustainable stormwater recycling scheme and has provided an integrated water management decision-making template for other communities. The outcome should be an increase in available water and a decrease in receiving water pollution through increased uptake of stormwater recycling.

Identifying mental illnesses earlier

CSIRO has developed an innovative technique for studying and visualising cortex tissue loss in patients with neurodegenerative diseases (see page 14).

Improved motors for domestic appliances

A new range of direct-drive washing machines manufactured in Australia using a CSIRO designed motor and controller has just been released for the domestic market. 'Switched reluctance' motors have significant advantages in terms of cost of manufacture and performance compared with more conventional designs.

The advent of cheaper power electronics and sophisticated control schemes means they can be the motor of choice for a number of applications. CSIRO has skills in the custom design and modelling of switched reluctance machines and has partnered with Electrolux the world's, and Australia's, largest domestic appliance manufacturer to radically increase the flexibility and capacity of its range of Australian manufactured washing machines. The company plans to export machines in the near future.

Monitoring water quality in the Douglas Shire

CSIRO has assisted the Douglas Shire Council and the Australian Government in the design of a water quality monitoring program to enable the reliable assessment of sediments and nutrients coming from rivers and streams in Queensland's Far North. Based on a one-year pilot study, strong hydrological knowledge and sophisticated statistical analysis the monitoring program makes informed choices of where, when and how often to sample to make these assessments both accurate and cost-effective.

The monitoring program provides resource managers with new and valuable information for managing the region's catchments and ensuring the protection of the Great Barrier Reef. This is critical given the Reef is one of the world's natural wonders and tourism in the region generates over $4 billion per annum.

P@noptic search engine

The P@noptic enterprise search engine, developed by CSIRO, has continued to increase its customer base this year (by 46 per cent) with sales growth up by 205 per cent to approximately $1.2 million. P@noptic customers are seeing the benefits of improved enterprise search through increased sales, increased customer satisfaction and more efficient operations.

Some of the major new customers in 2004–05 include Westpac, the Australian Government

Information Management Office and the Australian Stock Exchange. The Australian Government Information Management Office has implemented P@noptic to power its whole-of-government portal (Australia.gov.au) which offers comprehensive and integrated access to Australian Government information and services. P@noptic allows a search of all Australian federal government departments and agencies from a single location. This means that access to services and information is greatly facilitated both for Australian residents and international visitors and enquirers.

Progress toward corneal implants

Good vision is critical to the maintenance of a full and independent lifestyle. Ophthalmic devices such as corneal implants (inlays and onlays) offer accurate vision correction with great convenience to the wearer and without permanent damage to the eye.

CSIRO, in partnership with the Vision CRC, has developed polymers suitable for application as corneal implants. These provide a real alternative to spectacles, contact lenses and laser based refractive surgery for permanent vision correction. The polymers have previously shown good stability and biological responses in long-term animal trials. Over 2004–05, the polymer has been implanted into human eyes in a phase one clinical trial in humans with promising results which will accelerate product development. Plans are currently being made to progress this technology into a phase two clinical trial.

Spinning wool and wool blends faster

A major issue confronting wool is the low productivity in converting wool fibre into yarn. High-quality wool and wool-blend yarns can be spun on the Murata Vortex Spinning (MVS) machine, a new, high production system originally designed for spinning cotton. CSIRO worked closely with Murata, the Japanese manufacturer of MVS, and four Australian SMEs, to develop new settings and components for MVS of wool and wool-blend yarns.

The result is high-quality yarn spun at production rates twenty times faster than traditional methods. CSIRO and Australian Wool Innovation Ltd (AWI), the wool grower funded R&D body, see MVS as an opportunity to advance wool and wool-blend spinning. As well as productivity savings, MVS produces yarns that give smooth, soft fabric with better laundering and wear properties than fabrics constructed from traditional yarns.

New asset management technology saving money and water

The water industry has shown a need for asset management systems that provide acceptable levels of service at reasonable cost. To allow strategic asset management to occur within Australian water authorities, CSIRO has developed planning/prioritisation and risk models that assess the implications of management and operational strategies on short and long-term costs. CSIRO has developed these models into an overall Pipeline Asset Risk Management System to help utilities use these models to make decisions.

The system for water distribution networks is made up of three planning and prioritisation components and a pro-active risk-based module. The PLANNING module provides a water authority with an accurate means of determining the appropriate level of capital expenditure for the replacement of water mains. This has now been implemented by four Australian water authorities. The model has already demonstrated the ability to allow water authorities to meet their legislative customer service requirements, whilst reducing the level of expenditure needed for maintenance and rehabilitation.

New receiver systems for the Australia Telescope Compact Array

The Australia Telescope Compact Array has been equipped with sensitive receivers enabling it to detect radio waves as short as 3.5 millimetres. The new receivers were built as part of the Major National Research Facilities program to upgrade the Compact Array. They incorporate special chips, made of the high-performance material indium phosphide and designed by CSIRO.

The new receivers were installed in five of the Compact Array's antennas and successfully commissioned in September 2004. The new systems mean that the Compact Array will be the only set of telescopes in the Southern Hemisphere operating at these short wavelengths until the Atacama Large Millimetre Array telescope in Chile comes on-line at the end of this decade. CSIRO's expertise in designing specialised integrated chips opened up collaborations with European astronomical institutions under the European Union's Framework Programs.

Improving road safety

Safe-T-Cam was installed almost ten years ago to track the movement of trucks throughout New South Wales (NSW). CSIRO has recently completed a full upgrade of Safe-T-Cam on 19 Roads and Traffic Authority (RTA) sites. The upgraded system incorporates a powerful new CSIRO-developed parallel computing technology and software which allows the system to automatically read licence plates.

The system is designed to enforce regulations to lower driver fatigue and errant driver behaviour by monitoring rest breaks and point-to-point speed. Its social and economic benefits are derived from improved road safety. As the new system allows all vehicles, not just trucks, to be tracked, it provides the capability in NSW to extend large vehicle monitoring to all vehicles. An additional benefit of the smaller, lighter new system is reduced infrastructure costs in deployment of the system.

Antennas of CSIRO's Australia Telescope Compact Array. Photo: David Smyth

Luisa Pentland investigating new technologies for urban water treatment. Photo: Wendy Easton

Sustainable urban water management in Australia's capital

Future population growth within the Australian Capital Territory (ACT) will stress the current ACT water sources if traditional water planning and infrastructure investment is implemented. Integrated water, wastewater and stormwater management modelling and analysis was undertaken by CSIRO. The analysis estimated the water demands and environmental impacts from various water servicing scenarios including grey-water use, rain tanks, on-site detention, ponds and swales, and gross pollutant traps.

As a result of this work, Environment ACT set ambitious targets for potable water use reduction and amended planning controls to facilitate installation of raintanks and grey-water systems, and commenced a Government-funded scheme for raintank rebates.

Successful semiconductor spin-off

CSIRO has completed the successful spin-off of its unique compound semiconductor technologies to EpiTactix Pty Ltd. EpiTactix secured $5.2 million in start-up funding and support from a syndicate of investors, including CSIRO and an AusIndustry R&D START Grant. This funding will be used to develop new compound semiconductor production processes and wireless products

for the growing high-frequency segment of the broadband wireless market.

EpiTactix is developing products for defence and automotive radar, high bandwidth point-to-point systems and a number of high bandwidth consumer applications. High frequency wireless technologies have many specialised applications for position location, imaging and sensing. However, the components required for these systems are highly specialised and currently very expensive to produce. EpiTactix aims to develop production processes for large-scale economic production of specialised semiconductors that will enable a wide range of new and improved wireless applications to benefit consumers, businesses and the nation.

Sensitive detectors for mineral exploration

CSIRO developed the first geophysical exploration instrument, LandTEM, using high temperature superconducting quantum interference devices (SQUIDs). This instrument is being used for detecting highly conductive mineral deposits such as nickel, gold and silver. CSIRO has licensed this technology to an Australian small-to-medium enterprise (SME) that is building systems and leasing them for use by exploration companies.

The initial success of LandTEM encouraged a number of Canadian mining companies to use this system for survey work. In Australia, the SME promoted LandTEM to the point where regular surveys are being taken with the system in Western Australia (WA). Some sub-economic finds have been discovered buried under highly conductive salt lakes. The take up of the technology in WA may well result in the discovery of a significant new nickel deposit in Australia.

Machine washable wool blend suits in China and India

CSIRO has successfully delivered its machine-washable wool blend suit technology to a Chinese textile manufacturer. The company is planning a rapid increase in production as soon as suitable fabrics can be prepared. Agreements to deliver similar technologies to other manufacturers in China and India have been negotiated.

The immediate beneficiary from the project will be the initial wool production mill in China which has received a new product range to take to market. The company has been required to learn new fabric production skills and advanced quality control procedures. The longer-term beneficiary will be the Australian wool producer as this development will dramatically increase the adoption of formal wool business suits in China and India. China is now the largest market for Australian wool.

Innovative technologies enhance water resistance for paper packaging

CSIRO has developed a series of innovative technologies to enhance water resistant properties of recycled paper and paperboard for packaging applications.

These include cost-effective paper sizing agents leading to 20–30 per cent improvement in paper strength under high humidity conditions; water-resistance additives to starch based corrugation adhesives to enhance water resistant properties of paperboard; and new starch formulations that enhance the binding performance and achieve cost reductions in the paperboard corrugation process.

Visy have adopted all of the starch and renewable polymer innovations with cost savings estimated to be approximately $1 million per year.

Delivering integrated rangeland monitoring to the pastoral industry

VegMachine is a software system which uses long-term sequences of Landsat imagery and other data to produce maps and graphs of trends in land cover indices. It is the result of an integrated extension project funded by Meat and Livestock Australia (MLA). Partners in the project include the Northern Territory Department of Infrastructure Planning and Environment (NTDIPE), the Queensland Department of Primary Industries and Fisheries (QDPIF) and CSIRO. It is built on ten years of collaborative research and development by CSIRO and NTDIPE in rangeland monitoring technologies based on sequences of satellite imagery.

A key innovation component has been the design and development by CSIRO of the software package for display and use of the monitoring information to assist producers in the management of their properties. Software, data and training are delivered through NTDIPE and QDPIF. VegMachine software is a simple, flexible, producer-friendly product delivering data in scales and formats suitable for pastoral managers. Uptake has exceeded expectations, with the software and products now in use on 30 commercial grazing properties across the Northern Territory, Queensland and Western Australia, with numerous requests for coverage beyond the pilot area.

New software to manage operational risk

Over the past twelve months, CSIRO has collaborated with a major bank to develop prototype software to assist with the development and implementation of statistical methods for modelling operational risk.

This is required for the bank to achieve specialised accreditation from the national prudential regulatory body, Australian Prudential Regulation Authority, and to comply with the international Basel II Accord on banking practices. CSIRO is now engaged in a major software development project to build a sophisticated version of the prototype.

In addition, CSIRO is working with several major Australian banks to ensure that their risk management practices are of the very highest standard to comply with the Basel II Accord. Governments and the public expect exemplary standards of corporate governance. Bank customers and shareholders are beneficiaries of improved risk management practices through improved processes and increased shareholder returns respectively.

Searching for life beyond our solar system

CSIRO has completed fabrication of an optical device which will be an essential part of NASA's Space Interferometer Mission (see page 9).

New technology to assist aircraft of the future

Boeing had a need to develop an alternative technology to replace the existing hazardous, slow, and labour intensive sanding process for ensuing good adhesion between different layers of paints. CSIRO developed a simple and effective chemical reactivation technology which provides similar and/or better adhesion relative to sanding while meeting Boeing's operational, occupational health and safety and environmental requirements.

The new technology, protected by two joint CSIRO-Boeing patents, will enable Boeing to paint the existing and new 787 aircraft in an efficient and environmentally responsible manner by eliminating the hazards which cause the highest injury rate at Boeing.

Major new fabric development for multi-national

CSIRO has completed a major new fabric development for one of the world's leading performance apparel companies. The development enhances the wear performance properties of Australia's high-quality natural fibres, and will provide access to a new market when the company commercialises its new product ranges. The immediate beneficiary from the project will be the multi-national company that will take the new high performance products to market. However, the company has very strict environmental requirements and the development is expected to specifically favour Australian raw fibre producers who can supply the clean, green, high-quality fibre that the client demands.

New contact lens for healthier eyes

CSIRO researchers, as partners in the Vision CRC, contributed significantly to the development of the new O_2OPTIX™ lenses (see page 22).

Safer aeroplane panels

A modified form of a CSIRO acoustic sensing device (known as baNDIcoot) has been integrated with Boeing's scanner system – the MAUS (Mobile AUtomated Scanner) in St Louis, USA. The MAUS automatically scans aircraft panels looking for defects that could potentially result in in-service failure.

A preliminary report from Boeing indicated that baNDIcoot had been shown to discover particular defects in composite aircraft panels that could not be found using the current test regimes. If everything goes to plan, Boeing aims at developing baNDIcoot for in-service Non Destructive Inspection that will result in safer commercial and military aircraft.

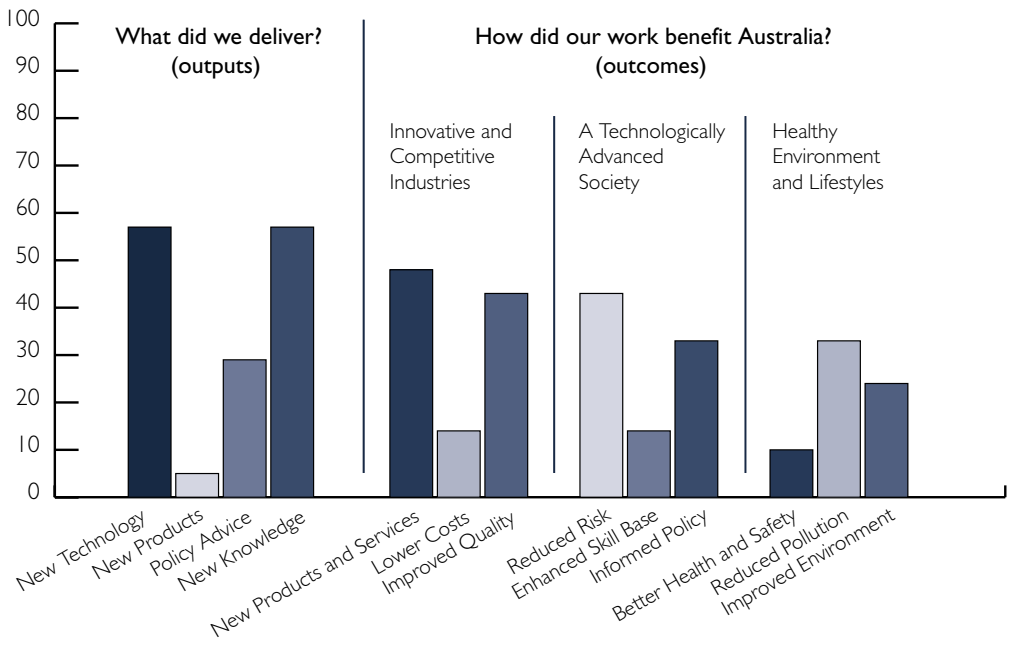
Sustainable Minerals and Energy

(The group includes the following Flagships and Divisions: Energy Transformed Flagship; Light Metals Flagship; Energy Technology; Exploration and Mining; Minerals; and Petroleum Resources).

Outcomes and outputs in this group include:

- Assessing coal performance for use in 'clean coal technologies'
- Solar thermal market development strategy
- Reducing saline groundwater in the Murray River
- Commercialisation of HIsmelt
- Improving environmental monitoring
- Improving the economic performance of gas processing
- New technologies for longwall coal mining automation
- Improving mineral processing
- Western Australian Energy Research Alliance (WA-ERA) continues to grow
- Centre for Low Emission Technology
- Development of drained cathode cells for aluminium smelting
- Multi-national study in Iran
- Survey of hydrogen research activities in Australia
- CSIRO's moisture analyser
- Optimum gas control strategies for underground coal mines
- Innovative process for nickel extraction
- Reducing greenhouse gas emissions
- Addressing the barriers to distributed energy deployment in Australia
- New method to find mine-derived sediment deposits
- International collaboration with the Chinese minerals industry
- New software to manage wellbore instability

Figure 4: Pattern of Outcomes and Outputs for Sustainable Minerals and Energy



Assessing coal performance for use in 'clean coal technologies'

The next generation of low-emission, coal-based power generation technologies will most likely be based on high pressure gasification processes. Performance criteria of coals for use in these technologies are much more complex than those used in conventional systems. CSIRO, with the CRC for Coal in Sustainable Development, has developed facilities and procedures to assess key coal and slag characteristics under high temperature and pressure conditions. These tools have been developed on a wide range of Australian coals and have been provided to industry for assessment at the pilot and industrial scale.

As part of the Centre for Low Emission Technology research program, industry, CSIRO and university collaborators are now embarking on an international $1 million pilot scale test program to provide first-of-a-kind data on the performance of Australian coals in practical gasification systems. This data will provide the basis for validation of models and more fundamental measurements made in the laboratory based program and their application to large-scale gasification technologies. Validated test procedures are required by the export coal industry to support marketing of Australian coals to this emerging market and by the Australian power industry to assist in the adoption of these technologies in the domestic energy industry.

Solar thermal market development strategy

CSIRO's global expertise in solar thermal technology was used to conduct a review for the World Bank and international stakeholders in the technology. The study was conducted under the auspices of the Global Research Alliance (GRA).

The consortium comprised CSIRO and two other members of the GRA – Fraunhofer Institute, Germany, and CSIR South Africa. The review provided a comprehensive assessment of the status of the technology, and included analyses of latest economics, cost reduction opportunities, barriers faced by projects in four countries, and a scenario risk analysis. The international workshops organised by the GRA team helped introduce the World Bank/Global Environment Facility to prominent individuals and key decision-makers in the solar thermal electricity industry and market.

The study is being used by the World Bank to make decisions concerning US$200 million set aside for four initial solar thermal power projects, and about its ongoing support for solar thermal power under its Operational Programme Number Seven (OP7) in future years. This will impact directly on local economies in developing countries (jobs, technology transfer), plus help meet the OP7 goal to support technologies that reduce greenhouse gas emissions but which are not yet cost-competitive.

High density solar tower field for the National Solar Energy Centre at the CSIRO Energy Centre, Newcastle (currently under construction). Photo: Cox Richardson Architects and Planners

Reducing saline groundwater in the Murray River

Salt interception schemes are one of the principal engineering options being developed to reduce the flow of saline groundwater into the River Murray. CSIRO, along with South Australian State agencies, Australian Water Environments and Geoscience Australia, have collaborated in the development of an innovative approach to interpret helicopter electromagnetic data and combine it with subsurface geological information to improve our understanding of the main aquifer systems targeted by these schemes.

The new hydrogeological model is being used to help inform where salt intervention scheme production bores are best sited for efficient and effective operation. The approach is being used to guide the development of the schemes at Loxton, Pike River and Murtho in the South Australian Riverland. Successful operation of these schemes will significantly reduce the salt load of the River Murray.

Commercialisation of HIsmelt

For over 15 years from the mid-1980s, CSIRO worked with Rio Tinto on the development of the HIsmelt technology – a bath-based direct smelting process heralded as a new approach to ironmaking. CSIRO's contribution involved mathematical modelling of processes, validating mathematical models and undertaking high temperature studies on aspects of the process chemistry. Most recently, CSIRO provided assistance with testing starting up a commercial HIsmelt plant from cold.

A joint venture consisting of Rio Tinto, Nucor, Mitsubishi and the Shougang Group this year completed construction of a commercial HIsmelt plant in Kwinnana, WA and is now commissioning it. HIsmelt offers significant economic and environmental benefits as it effectively eliminates the need for sinter/pellet plants and coke ovens, thereby reducing overall energy use and greenhouse emissions. It promises to expand the range of iron ore and coal feed materials used for steelmaking, including ores that are currently uneconomic to process, particularly those with high phosphorus content.

Improving environmental monitoring

BHP Billiton Iron Ore Pty Ltd (BHPBIO) is required to monitor dust impacting on the mangroves surrounding its iron ore handling facility at Port Hedland. The traditional method of dust depositional gauges did not give sufficient data to manage the issues. A new method developed for BHPBIO has won the Golden Gecko Award and the SGIO WA Environment Award in recognition of innovation for environmental monitoring (see page 103).

The new method has enhanced safety by removing staff from inhospitable and/or remote environments, has eliminated the need for

Cindy Ong examines leaves and rock samples from the Goldsworthy mine with a field spectrometer to help generate environmental measurements from the site. Photo: Kevin Scott, SKS Corporate Photographers

invasive monitoring in an environmentally and culturally sensitive ecosystem, and reduced costs by half compared to the traditional method.

Improving the economic performance of gas processing

As Australia's oil self sufficiency declines, developing and value adding to our large gas reserves is becoming an economic necessity. Research conducted in collaboration with the University of New South Wales aimed at developing new catalysts for the water gas shift reaction, which is used widely in industry to adjust the hydrogen yield from natural gas and coal conversion.

The new catalysts are significantly more efficient, decreasing the volume of catalyst required for industrial processing. An improved gas turbine that uses the energy from the reaction as well as simultaneously processing the gas has also been developed. The novel system improves the economic performance of gas processing, through the concurrent generation of electricity. Provisional patents have been granted and international application of the technology is under discussion.

New technologies for longwall coal mining automation

Sustained longwall coal mining automation in all conditions has been a coal industry goal for years. Currently, an operator controls the mining equipment while also observing and dealing with an aggressive, unstable and hazardous environment. In a project funded by the Australian Coal Association Research Program (ACARP), CSIRO has developed new technologies for the automation of longwall coal mining.

A guidance system has been developed to provide the world's first measurement of the three-dimensional position of a longwall shearer, a fundamental requirement for automation. Systems based on this technology have been trialled which will lead to automatic face alignment and horizon control of longwall mining operations. Winner of the 2004 ACARP Research Excellence Award (Underground) (see page 102–103), the project has made significant progress towards full automation and will ultimately remove humans from this environment. Pilot-scale demonstrations are in progress at two Australian mines. Major mining equipment manufacturers are adopting the technology.

Improving mineral processing

CSIRO has developed and patented a process for improving the recovery of fine nickel-sulfide minerals during flotation. Fine nickel-sulfides are difficult to float, and low overall nickel recoveries are often obtained.

Under a development agreement, WMC Resources has adapted the CSIRO process to its operational situation and is testing the process in one of its nickel plants. Results to date are encouraging. If the process proves economic, WMC and CSIRO have agreed to implement procedures to commercialise it. The benefits would include better utilisation of Australian mineral resources, lower production costs (per tonne of metal concentrate produced) and a new income stream for WMC and CSIRO.

Western Australian Energy Research Alliance (WA-ERA) continues to grow

WA-ERA is a Perth-based joint venture between CSIRO, Curtin University of Technology and the University of Western Australia. WA-ERA provides a vehicle for wider CSIRO engagement in oil and gas research.

In April 2005, Chevron signed a strategic research agreement with WA-ERA, joining Woodside Energy Ltd who are 18 months into a five year strategic alliance. Both alliances are underpinned by a $20 million Major Research Facilities Grant from the WA state government. WA-ERA provides a mechanism for the delivery of high-quality integrated research

solutions to the oil and gas industry combining the complementary skills and expertise of CSIRO and the university sector. WA-ERA is developing into the hub of an internationally competitive oil and gas knowledge cluster and WA-ERA is the centre piece.

Centre for Low Emission Technology

The Centre for Low Emission Technology was established in 2004 as an $18 million, four year joint venture between CSIRO and the Queensland Government to facilitate the development of key technologies to support Australia's pathway towards a zero emissions energy future while maintaining our competitively priced energy industry.

The Centre is targeting breakthrough technologies in gas processing and separation needed to facilitate the goal of near zero emission power generation from coal. A major expansion of the Centre's capabilities has been achieved through an additional $8 million expansion associated with investment in the Centre from leading industry (Australian Coal Association Research Program, Tarong Energy, Stanwell Corporation) and research groups (University of Queensland).

This $26 million initiative represents a major commitment from the Australian coal and power industries to create the necessary capabilities and know-how to position Australia to participate in key international efforts to develop and deploy low-emissions energy technologies necessary to address critical greenhouse gas emission targets.

Development of drained cathode cells for aluminium smelting

The drained cathode cell (DCC) is a revolutionary electrolytic cell technology for aluminium smelting that incorporates a composite cathode to reduce energy consumption. Through the Light Metals Flagship, CSIRO is developing a computational fluid dynamics model of the DCC and has demonstrated an advanced coating technology that offers superior protection of the refractory composites used in the DCC.

CSIRO is working with Comalco Aluminium to overcome the final impediments to commercial implementation of DCC technology, which aims to reduce the electrical energy required to produce aluminium by at least 15 per cent. This will result in significant economic and environmental benefits and help the Australian aluminium industry remain globally competitive. A full-scale DCC is currently in operation at a Comalco smelter in Australia.

Multi-national study in Iran

Understanding the structure of oil reservoirs helps oil companies optimise oil production and maximise recoveries while minimising the numbers of production wells. As oil reserves are being depleted, the ability to extract more oil from existing reservoirs has significant economic benefits. CSIRO researchers have been working at the Asmari Limestone oil reservoir in Iran as part of a major multi-national study. The international application and endorsement of CSIRO-developed methodologies also enhances CSIRO's profile in a globalised industry. The research has been carried out in collaboration with the Institut Français du Pétrole and has been supported by a consortium of major oil companies including the National Iranian Oil Company, BP, Total, Statoil, Norsk Hydro and Petronas.

Survey of hydrogen research activities in Australia

An intensive campaign was mounted to find all organisations and individuals engaged in the development of hydrogen-based technologies and their integration into Australia's energy system. One hundred and forty four candidates were identified. The resulting feedback, together with overviews of the various technologies for hydrogen generation, distribution and storage was presented in 'Australian Hydrogen

Activity' – an official Australian Government report published by the Department of Industry, Tourism and Resources.

Australia has become a member of the International Partnership for the Hydrogen Economy (IPHE) and is also joining the Hydrogen Implementing Agreement of the International Energy Agency (IEA). The CSIRO report provides the information that the Australian Government is using to open up networks of collaboration and technology transfer within these international organisations. It is also a unique and valuable record of the wide diversity of hydrogen research activities and of the associated infrastructure, life-cycle and safety issues.

CSIRO's moisture analyser

CSIRO's low frequency microwave moisture analyser provides continuous, accurate measurement of moisture in bulk materials on conveyor belts, such as iron ore, mineral concentrates and coal.

Low frequency microwaves are transmitted through the material from above and received below the belt. The system measures changes in the microwaves to determine the material's moisture content.

Moisture control is an important issue in bulk ore handling operations. Ore that is too dry causes dust emissions during loading and unloading. Ore that is too wet in the train leaving the mine may become difficult to unload and handle at shipping ports, causing costly delays. Australian iron ore companies have now installed CSIRO's moisture analysers to help ensure iron ore meets moisture specifications. CSIRO is commercialising the technology.

Optimum gas control strategies for underground coal mines

Mine gas control has become a major safety and productivity issue in most of the underground coal mines in Australia and is severely restricting the production capacity of the mines. CSIRO, in collaboration with the coal industry, has developed innovative designs, techniques and optimum strategies for goaf* gas control in highly gassy coalmines, through development and application of a combination of novel modelling techniques and tracer gas studies. These have improved the efficiency of goaf gas drainage systems by more than 50 per cent, helping to prevent heatings and potential fires.

Tarek Kazzaz commissioning the low frequency microwave moisture analyser at an iron ore operation in Western Australia. Photo: Daniel Bennett

The improved gas capture enabled coal production increases of more than 10 000 tonnes per week in the mines, representing a return to the coal industry of tens of millions of dollars per year. A number of other mines are also implementing the newly developed techniques and strategies.

* *That part of a mine from which the mineral has been partially or wholly removed.*

Innovative process for nickel extraction

Through the Parker CRC, CSIRO has developed, and is proceeding to patent, a novel process to recover nickel and cobalt from leach solutions. The direct solvent extraction (DSX) system reduces the number of processing steps, is highly selective, and uses commercially available reagents.

A Canadian company has entered into a license agreement enabling it to implement the technology to recover cobalt and zinc from its leach solutions. The company recently piloted the process with very promising results. CSIRO has developed different solvent extraction systems for other applications. Benefits include reduced capital and operating costs and improved processing operations for the minerals industry. CSIRO will directly benefit through licensing these processes and undertaking research related to their application.

Reducing greenhouse gas emissions

CSIRO participated in a successful international field project in Poland to investigate permanent subsurface storage of carbon dioxide in underground coal seams. The project identified strategies for maximising the carbon dioxide injection rate in deep, low permeability coals. While further work will be required to develop these strategies, the project has successfully demonstrated that coal does have potential for carbon dioxide storage. The important outcome for Australia is the demonstrated potential for storage of carbon dioxide in coal; in many parts of Australia with high greenhouse gas emissions, coal is the only practical geo-sequestration option.

Addressing the barriers to distributed energy deployment in Australia

Australian electricity distribution businesses collaborated with CSIRO to produce a report for the Centre for Distributed Energy and Power (CenDEP) that identified proposed solutions to many of the barriers for distributed energy deployment in Australia. The study helps to identify and focus on technical and regulatory issues inhibiting deployment and proposes practical solutions that can be adopted. It effectively creates an action agenda that can be used in the industry to catalyse change.

The report is being used by CenDEP members and proponents of distributed energy to widen the debate on its uptake within the Australian energy scene and to inform future government policy. It has already been submitted for consideration by the Ministerial Council for Energy, the Energy Retailers Association and the IEA Global Task dealing with Demand Response Resources.

New method to find mine-derived sediment deposits

A novel method has been developed for the Porgera gold mine, Papua New Guinea, to trace the fate of mine-derived sediments in a large river system. The method, using lead and silver tracers in sediment cores has been used to map mine-derived sediment deposition over the Strickland River floodplain.

Modelling of sediment deposition rates is being conducted in partnership with the University of California, Berkeley. This work has led to an improved understanding of the impacts of one of the world's largest gold mines on its surrounding environment. The studies allow the mine management to focus its environmental management activities. Presentation of the data to the

Papua New Guinea Government and local stakeholders has led to improved confidence in the mine's activities and ability to manage difficult environmental issues. The technique also has significant application in Australia.

International collaboration with the Chinese minerals industry

The Chinese minerals industry is a major market for Australian minerals and minerals-related technologies and services. CSIRO has significantly increased interactions with relevant Chinese organisations through mutual visits and ongoing contacts. CSIRO has established formal, non-binding agreements with key universities, R&D organisations and minerals companies to encourage research cooperation and collaboration.

A CSIRO team undertook a significant research project to identify and broadly characterise Australian magnetite resources for a Chinese steel producer. As a result of increased minerals-related R&D engagement with China, CSIRO is better positioned to assist Australian mineral producers on maximising the value of Australia's minerals exports. Opportunities to export Australian minerals technologies and services have, and will continue to be, identified. Cooperative agreements with Chinese universities also enhance Australian access to scientists and engineers that may help address the critical shortage of these skills in the industry.

New software to manage wellbore instability

State-of-the-art software that can be used for the evaluation of wellbore instability and drilling fluid design has been developed by CSIRO. The software integrates a range of independently-developed stand-alone software packages. It is aimed at providing drilling engineers, who may have limited specialist knowledge in the areas of geomechanics and drilling fluid design, with a tool to address potentially costly wellbore instability problems encountered during drilling oil and gas wells.

The Driller's Wellbore Stability Tool has been applied to solve a number of wellbore instability problems of high angle and extended reach wells in both local and overseas fields. It has also provided input data for modelling wellbore instability during production. In the last year alone, the tool was used to assist major international companies in solving the wellbore instability problems in four fields located in Malaysia, India and Turkmenistan.

A thick-walled hollow cylinder sample is being setup in the high pressure triaxial cell to study wellbore instability mechanisms and drilling fluid and shale interaction. Photo: CSIRO

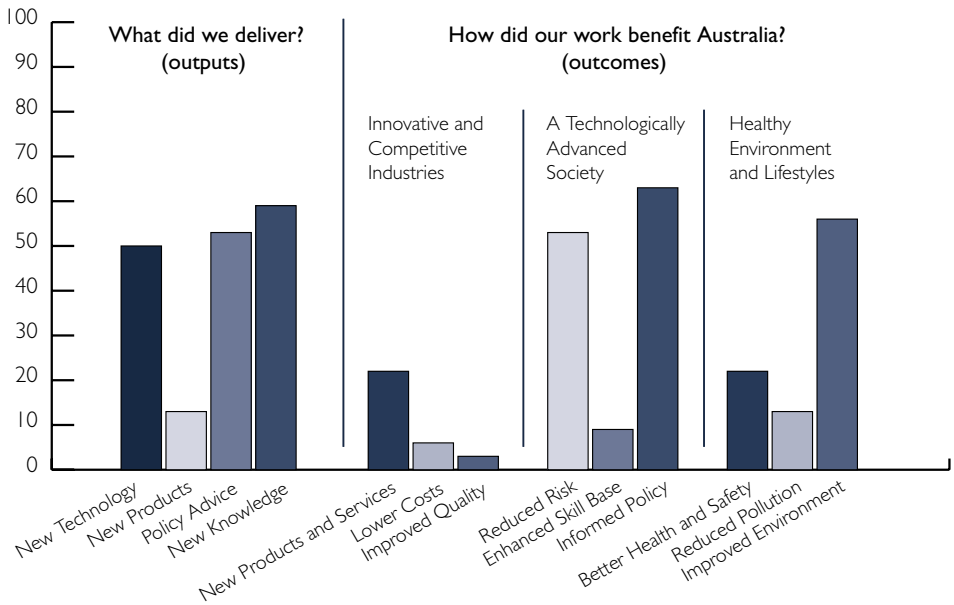
Environment and Natural Resources

(The group includes the following Flagships and Divisions: Water for a Healthy Country Flagship; Wealth from Oceans Flagship; Atmospheric Research and Marine Research – now Marine and Atmospheric Research; Entomology; Land and Water; and Sustainable Ecosystems).

Outcomes and outputs in this group include:

- Studying emissions from forest fires
- Analysing the Australian economy
- Revising international risk assessment processes
- Management strategies for the southern bluefin tuna (SBT)
- New software for regional catchment management
- Climate sensitivity of the Australian water cycle
- Plan for Russian wheat aphid incursion
- Assessing biodiversity in the Coral and Tasman Seas
- Indigenous capacity building for exotic ant management
- Measuring growth in carbon dioxide levels
- New software to manage pesticide use
- Controlling the environmental weed – bridal creeper
- Improving our habitat
- Monitoring Australia's ocean currents
- National Landcare Award for Saltshaker project
- New methods for smart conservation management
- Improving air quality
- Managing drainage in Western Australia's wheat belt
- Sustainable aquaculture of Atlantic salmon
- Resistant chickpeas reduce the use of insecticides
- Innovative model for the Australian sugar industry
- Assessing climate change and extreme rainfall
- Rock lobster fishery assessment
- Systematic regional planning
- Revolutionary new solutions for protecting Australia's marine biodiversity
- New technology for the northern beef industry
- Climate change assessments for Melbourne's water resources
- Victorian sustainability strategy
- Monitoring biodiversity in the rangelands of Australia
- Resistance management for Bt-Cotton
- Managing invasive species
- Rodent control in Vietnam

Figure 5: Pattern of Outcomes and Outputs for Environment and Natural Resources



Studying emissions from forest fires

The first comprehensive field study of emissions from fires in forests, savanna and agricultural crops has demonstrated that Australian forest fires are lower emitters of highly toxic dioxins than previously thought. Previous studies have been based on laboratory simulations in combustion chambers, which the field studies proved have emissions that are qualitatively and quantitatively different to the real thing.

CSIRO developed new instrumentation for the study which involved collaborators at the National Research Centre for Environmental Toxicology, the Western Australia Department of Conservation and Land Management, and the University of Melbourne. The results contribute to understanding about dioxins in Australia as part of the Department of Environment and Heritage National Dioxin Program, and to meeting Australia's obligations under the Stockholm Convention on Persistent Organic Pesticides. Emission rates from all classes of fires were at the lower limit of ranges previously estimated by the United States and European Union environment agencies. The results have led to a downward revision of Australia's estimated emissions of dioxins from bushfires to a third of their previous estimate.

CSIRO scientists have completed the first comprehensive field study of emissions from fires in forests, savanna and agricultural crops to establish the first substantial set of direct field measurements of fire emissions in the world. Photo: CSIRO

Analysing the Australian economy

In collaboration with the University of Sydney, CSIRO produced a major report for the Department of Environment and Heritage which quantifies the environmental, economic and social impacts of Australia's 135 industry sectors throughout their supply chain. The report 'Balancing Act' provides an overview of the Australian economy using a set of ten social, environmental and financial indicators, expressed in terms comparable with the consumption dollar we spend in everyday life.

The report is a resource for government and corporate decision-makers, as well as individual consumers, as it reveals some of the social and environmental implications of financial flows in the economy. It also provides an indication of the volume of resources needed to produce different goods and services, facilitates more informed decision-making and provides direction for further research.

Revising international risk assessment processes

Research by CSIRO, supported by the international metals industries (forming part of an international research partnership team from Europe and North America), has helped explain differences between toxicity of metals in laboratory versus field conditions. This information has been used to revise environmental investigation limits for metals in soils, leading to a radically different assessment of risks posed by diffuse emissions of metals right across Europe.

CSIRO has made a major contribution to the European Union's Existing Substances Risk Assessment Process for metals, (specifically, copper, lead and zinc) through peer reviewed scientific publications that have changed our view of the risks posed by metals in the environment.

Management strategies for the southern bluefin tuna (SBT)

In 2000, the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) accepted CSIRO's research approach on simulation evaluation of management procedures for setting of catch limits and agreed to formally embark on a four year work program to evaluate such procedures. CSIRO participated in an intensive international process to evaluate alternative management procedures, culminating in the short-listing of four management procedures, at an international workshop in 2005, including one developed by CSIRO.

CSIRO's procedure out-performs other candidates in terms of minimising the short-term risk to the SBT stock while meeting long-term catch objectives. The International Commission for Conservation of SBT will consider which of the four candidate procedures to adopt at its next meeting in October 2005. CSIRO's evaluation of management procedures has been used to advise the Department of Agriculture, Fisheries and Forestry (DAFF) and the Australian Fisheries Management Authority on the current and future risks to the SBT fishery, feasible rebuilding targets and likely outcomes in terms of short and medium-term catches under a management procedure. Australia, through the DAFF, will support the adoption of the CSIRO procedure at the 2005 Commission meeting.

New software for regional catchment management

The National Land and Water Resources Audit assessed that sediment loads in Australian rivers are typically 10-50 times pre-European levels, stressing riverine, estuarine and coastal ecosystems. CSIRO has developed the SedNet model to predict erosion hotspots and sediment delivery in regional catchments, including the ability to forecast sediment loads under different management scenarios.

Delivery of SedNet software and training has been accompanied by demonstrations in three focus catchments. SedNet can help provide an improved technical basis for catchment management. More than ten regional catchment management agencies are using SedNet to assist in planning management actions to reduce sediment loads. Examples include a $1 million river restoration project in the Murrumbidgee catchment, and the setting of preliminary targets for sediment export from Great Barrier Reef catchments.

Sandbars choke the Murrumbidgee River near Jugiong, New South Wales. Photo: Gregory Heath, CSIRO

Climate sensitivity of the Australian water cycle

CSIRO researchers have produced an analysis of the climate sensitivity of the Australian water cycle for the Bureau of Rural Sciences, which required such an analysis as a lead-in for their Water 2010 project. The results quantify how changes in Australian rainfall impact on runoff and consequently water availability and hence the vulnerability of Australian water resources to rainfall shifts. For example, the results show that a decrease in rainfall by ten per cent results in runoff decreasing by 25 per cent (more in dry areas). The Bureau of Rural Sciences is now seeking to have the results extended for wider applications.

Plan for Russian wheat aphid incursion

A contingency response plan was provided to Plant Health Australia by CSIRO, outlining the actions that should be undertaken if an incursion of the exotic pest species, the Russian wheat aphid, *Diuraphis noxia*, is discovered in Australia. This report from a CSIRO/GRDC joint venture, Grain Protection Genes, shows variation among worldwide populations of this pest in their ability to overcome resistance genes in wheat.

This report has resulted in improved preparedness for possible Russian wheat aphid incursions in Australia. This is not only through changes in policy, but also by influencing the strategies used by Australian cereal breeders to protect the industry from the risks posed by this serious exotic pest.

Assessing biodiversity in the Coral and Tasman Seas

Data on the biodiversity of the Coral and Tasman Seas – seabed maps, seabed images and samples, taxonomic inventories, and the photographic catalogue of fauna – collected by an international team including CSIRO have been collated by CSIRO into a single final report for the National Oceans Office. Biodiversity identifications for several faunal groups have also been upgraded, published in scientific literature by international museum experts, and uploaded to the web-enabled national database 'Codes for Australian Aquatic Biota'.

Survey data have been provided to Australia/New Zealand bilateral talks on high seas biodiversity protection in the Tasman Sea, and incorporated into an assessment that recommends biodiversity protection in the area of the Coral/Tasman Sea under Australian jurisdiction as part of Australia's National Representative System of Marine Protected Areas. The recommendations have been adopted by the National Bioregionalisation Working Group and are being considered by the Department of Environment and Heritage.

Indigenous capacity building for exotic ant management

CSIRO, in collaboration with numerous indigenous organisations and communities, has continued to implement world-class eradication and management programs throughout the Top End of the Northern Territory for some of the world's worst invasive ant species. Work has been conducted by local non-ant specialists in collaboration with CSIRO staff. These programs have resulted in economic benefits to communities through the elimination of infrastructure repairs required due to damage caused by ants, social benefits in the form of reduced health risks, and increased capacity to deal with such outbreaks, environmental benefits from the elimination of major environmental threats, and finally a much higher community awareness of the issues associated with exotic ant species.

Measuring growth in carbon dioxide levels

CSIRO has measured above-average growth in carbon dioxide levels in the global atmosphere. Carbon cycle models, pioneered by CSIRO, have been used to locate and quantify global surface emissions of carbon dioxide relating to these

global observations. The model incorporates specified fossil fuel emissions and initial estimates of the magnitude and location of carbon dioxide uptake and release from plants and the oceans.

A new conclusion from this research is that the recent record global carbon dioxide growth rates observed in 1998 and since 2001 are due to the ever-growing use of fossil fuels, but also driven by the massive wildfires in tropical Indonesia (1998, 2002) and boreal Siberia (2003). The results support independent findings by the National Oceanic and Atmospheric Administration (NOAA) in the United States. The Cape Grim program to monitor and study global atmospheric composition is a joint responsibility of the Bureau of Meteorology and CSIRO, while the CSIRO network is operated in cooperation with the Bureau of Meteorology, the Australian Antarctic Division, Australian Institute of Marine Science, NOAA and other international research agencies.

New software to manage pesticide use

A risk-based decision support tool for pesticides (named Pesticide Impact Rating Index – PIRI) was developed by CSIRO with support from Land and Water Australia and other agencies to minimise the off-site impacts of pesticides on ecosystem health. The tool has been adopted by several agencies in Australia, including water utilities, irrigation companies, natural resource managers and regulatory agencies. In addition, UN agencies have facilitated its uptake in developing countries.

PIRI helps pesticide users and regulators select the best product for their circumstances, taking into account the impact of pesticides in the environment. According to a cost:benefit analysis conducted by Land and Water Australia on PIRI, the benefits from the application of the technology are considered to be in the order of several million of dollars over a period of five years when looking at the full costs and benefits to the ecosystem.

Controlling the environmental weed – bridal creeper

A successful biological control program has been established for bridal creeper, *Asparagus asparagoides,* which is an environmental weed of national significance. Its most damaging natural enemy, a rust fungus, *Puccinia myrsiphylli,* was

CSIRO technician, Sharon Zrna, works with a local farmer to analyse pesticide residues from irrigated rice, near Griffith, New South Wales. Photo: Gregory Heath, CSIRO

introduced from South Africa in 2000. With the help of community groups and funding from the Weed CRC and Natural Heritage Trust, the fungus has now been released at more than 1 670 locations across southern Australia.

Within five years of its introduction to Australia, the rust fungus has already demonstrated its ability to reduce populations of this invasive species that infests and threatens natural ecosystems. The involvement of community groups with the program has been extremely successful and they continue to redistribute and monitor the agent with minimal supervision.

Improving our habitat

As part of a collaborative project with the South Australian Government, researchers from CSIRO and Charles Sturt University have undertaken a study of South Australians' willingness to pay for improved quality and quantity of habitat. The study used a technique known as choice modelling. Through some sophisticated choice experiments and econometric analyses, the value of different habitat types to society has been compiled.

The information is already being used by governments in natural resource management decisions. It supports public decision-making by helping compare the costs and benefits of landscape change in the same unit – dollars. Public awareness also has been raised concerning the difficult trade-offs involved in protecting habitat areas, as the results have been carefully communicated back to the community through newspaper articles, interviews, webpage summaries and seminars.

Monitoring Australia's ocean currents

CSIRO has implemented an ocean 'nowcasting' system that publishes daily updates on the present state of Australia's regional seas. Data from many satellites, robotic buoys that plumb the ocean depths, surface drifting buoys and coastal tide gauges are assembled by an automatic system. Updates are published graphically at: www.marine.csiro.au/remotesensing/oceancurrents/ and distributed to the Bureau of Meteorology, the Royal Australian Navy (RAN) and the Australian Maritime Safety Authority (AMSA).

The AMSA use the information when responding to incidents at sea, including search and rescue, oil-spills, drift of disabled vessels and prosecution of marine polluters. AMSA have credited the information as essential in saving human lives. The RAN use the information for safeguarding their fleet and optimising their operations. Recreational users include the winner of the 2004 Sydney to Hobart yacht race.

National Landcare Award for Saltshaker project

CSIRO in partnership with Greening Australia, the Boorowa Landcare Network and Shire Council, and the NSW Department of Land and Water Conservation, won a 2004 National Landcare Award for innovation in implementing off-reserve nature conservation activities.

The Saltshaker project partners worked with 78 landholders on 80 different properties in the Shire, with over 930 hectares being revegetated through the planting of over 110 000 trees and shrubs and 900 kilometres of tree seeding. Saltshaker tackled the issues of dryland salinity, reduced water quality and biodiversity management in the Boorowa shire in southern NSW. It not only achieved outstanding on-ground results, but is adding significantly to our knowledge of the complex relationships between vegetation, salinity and biodiversity.

New methods for smart conservation management

CSIRO has developed novel statistical analytical methods to predict livestock grazing impacts on birds. Ecologists now have available a method of eliciting expert information and incorporating this knowledge into statistical models. Using

Bayesian methods increases our ability to make smart conservation management decisions.

These advances in the use of expert knowledge in ecological models to predict bird response to habitat alteration are now being applied to questions ranging from predicting suitability of habitat for endangered species, to understanding the changes in fish population dynamics as a result of commercial and recreational fishing.

Improving air quality

CSIRO has completed a review of disparate information collected by different parties in the Wagerup region of Western Australia over the past six years, concerning air quality in the region around the Alcoa alumina refinery. Very little was previously known anywhere in the world about emissions from alumina refineries. As a result of the review, funded by Alcoa, recommendations have been made regarding new approaches to help understand and clarify the relationship between refinery emissions and community complaints.

CSIRO has decades of experience in air quality research – including gas and particle measurements, computer modelling, and risk assessment – placing the Organisation in a unique position to bring together policy-relevant science within a risk assessment framework that integrates scientific and medical concerns. Photo: North Sullivan

New approaches will provide information that could form the basis for targeted interventions to reduce any relevant emissions. The Review resulted in the West Australian Minister for the Environment making the Review recommendations part of the current licence conditions for the refinery. In addition, the West Australian Parliament Environment and Public Affairs Committee recommended the proposed CSIRO Air Quality research Program be undertaken as a priority.

Managing drainage in Western Australia's wheat belt

Research into the effectiveness of the deep open drains used to treat dryland salinity in the wheat belt continued this year with field trials, modelling and analyses, conducted in collaboration with our partners in research, government and the farming community. Some 12 000 kilometres of deep open drains have been installed to date. As a core party in the CRC for Landscape Environments and Mineral Exploration, CSIRO has also found acid waters occur in over half of the drains, with elevated concentrations of heavy metals, uranium and rare earths carrying the potential for negative off-site environmental impacts. Our guidelines for the improved design and effectiveness of deep open drains have been most welcome.

Guidelines for the improved design and effectiveness of deep open drains are helping land managers, drainage consultants, and farmers to design better deep drainage systems and return land to cropping, minimising social conflict over drainage effectiveness, and reducing maintenance costs. The evaluation of

drain geochemistry has been integrated into regional drainage risk assessment models by WA state natural resource management agencies. Acid drainage water management options will now focus on technologies appropriate to regional land managers. Community-based schemes will be incorporated into regional drainage management policy.

Sustainable aquaculture of Atlantic salmon

Collaborative studies between CSIRO and the Tasmanian Aquaculture and Fisheries Institute, through the Aquafin CRC, have provided a detailed understanding of possible environmental effects arising from the aquaculture of Atlantic salmon in Tasmanian coastal waters. A package of advanced hydrodynamic and biogeochemical models, an adaptive management framework, handbook on benthic effects and interim monitoring program have been provided to State Government managers and fish farmers to assess environmental performance.

The research has confirmed the need to control nutrient inputs and provided modelling and monitoring tools to assess likely environmental effects under different fish stocking regimes. This has ensured that salmon farming will not negatively impact on the environmental health of the waters in which they operate and has allowed the industry to expand in an orderly and sustainable fashion. Farmers can now monitor the sediment quality under their farms allowing fallowing practices to be optimised.

Resistant chickpeas reduce the use of insecticides

Moths in the genus *Helicoverpa* are major pests of several important crops worldwide, including chickpeas in the subcontinent and Australia. CSIRO, in a joint venture with the Grains Research and Development Corporation (GRDC), has identified two wild species of chickpea as potential new sources of resistance to this serious pest.

Breeders at the International Crops Research Institute for the Semi-Arid Tropics in India have already initiated breeding efforts to introduce this resistance into cultivated chickpeas, and Australian breeders are expected to follow suit. The level of *Helicoverpa* resistance found in wild relatives is greater than has ever been observed in cultivated chickpeas. This research has provided chickpea breeders with a new alternative for achieving *Helicoverpa* resistance, and if successful, should result in significantly reduced insecticide use in this crop.

A larva of Helicoverpa. These moths are major pests of many crops world wide. One focus of research is the search for Helicoverpa resistance in wild chickpeas. Photo: David McClenaghan, CSIRO

Innovative model for the Australian sugar industry

CSIRO has developed a supply chain model to address complexities in the sugar industry by linking existing industry models through a multi-agent approach. The model allows sugar producing regions to assess the economic benefits of product diversification. It combines bio-physical modelling of the complex supply chain – sugarcane growing, harvesting, transport and processing. Traditional supply chain models are generally based on over-simplifications of the bio-physical system.

The supply chain model, developed in collaboration with the Sugar Research Institute, Bureau of Sugar Experimental Stations and industry partners in Maryborough and Burdekin in Queensland, was used to assess

opportunities in co-generation of electricity. The model identified previously unknown potential financial losses in a local Maryborough sugar industry's original co-generation plan. As a consequence industry losses of over $5 million per year were prevented.

Assessing climate change and extreme rainfall

Results from a computer model focusing on regional Australia suggest small areas of southern Queensland and northern New South Wales can be expected to receive much more extreme rainfall than the global average. While climatologists have suggested for some time that climate change would lead to more intense rainfall globally, extreme rainfall over small areas is much more variable than that found over large areas where results are averaged out.

The results identify a need to provide extreme rainfall scenarios at regional scales so that projected climate change can be factored into major infrastructure projects that are being designed to last for decades to come. Researchers also assessed the likely costs of severe weather events on cities. The researchers are now working with local governments such as the Gold Coast City Council to understand climate change risks.

Rock lobster fishery assessment

A novel population model was developed for the Torres Strait rock lobster fishery to make best use of qualitative information together with quantitative survey data. The model produced estimates of annual natural and fishing mortality rates and quantified uncertainties in the relationship between sustainable yield and fishing effort. The outputs also included comprehensive evaluation of a broad range of management strategies for the lobster fishery.

The model's results were used to guide management of the fishery and played a critical role in persuading industry and stakeholders to implement a strict control of fishing effort.

In response to information from the model, fishing effort in the industrial sector was cut by 20 per cent and 30 per cent in 2004 and 2005 respectively, and the number of islanders' licenses was capped in 2004. In addition, an extended seasonal closure was implemented. These management regulations have reduced the probability of overfishing, ensured the long-term sustainability, and improved efficiency of the fishery.

The Torres Strait Tropical Rock Lobster Fishery is based on a single species, the ornate or tropical rock lobster. Photo: CSIRO

Systematic regional planning

CSIRO and the South Australian Department of Water, Land and Biodiversity Conservation have developed a concept for systematic regional planning using a case study of the South Australian River Murray Corridor. Systematic regional planning combines geographic information systems, multi-criteria analysis, and integer programing to identify the most desirable locations for revegetation activities and vegetation management that most cost-effectively meet regional biodiversity, salinity, and wind erosion targets.

The maps of optimal locations for revegetation and vegetation management are being used by Local Action Planning groups to help target on-ground actions in the Corridor. The wind power company, Wind Prospects, has also adopted the research, using the results to investigate biomass electricity production in the Corridor.

Revolutionary new solutions for protecting Australia's marine biodiversity

CSIRO has developed innovative world-first solutions to rapidly assess the accuracy and quality of hundreds of thousands of data records, many biological specimens and the referencing of scientific papers about marine biodiversity. CSIRO has provided reports that collate, analyse and display oceanographic data, demersal habitat data and pelagic species data for the physical and fauna-based bioregionalisation of the Australian Exclusive Economic Zone.

This has been a key input to the Australian Government's design and management of a comprehensive, adequate and representative system of marine protected areas – which are important elements in protecting Australia's unique marine biological biodiversity. CSIRO's results were commissioned and adopted by the National Oceans Office and the Department of Environment and Heritage to underpin the Australian Government's regional marine plans and other marine management activities.

New technology for the northern beef industry

A reliable means of measuring diet quality in free-grazing cattle is critical to the cost-effective nutritional management of northern beef herds for improved production efficiency. CSIRO, in collaboration with the Department of Primary Industries and Fisheries (Qld), the Department of Business, Industry and Resource Development (NT), and the University of Queensland, has developed an innovative, rapid and inexpensive application of near infrared reflectance spectroscopy (NIRS) for measuring diet quality by analysing cattle dung. The technology provides simultaneous measurements of important dietary attributes. It is used by beef producers, consultants and stock feed merchants as a decision-support and educational tool for improved herd management decisions, especially regarding supplementary feeding.

Economic benefits from improved targeting of feed supplementation amount to millions of dollars annually. The technology is presently being commercialised to cater for the growing number of clients, currently numbering over 800. Faecal NIRS is also being used extensively by scientists as a powerful research tool.

Climate change assessments for Melbourne's water resources

A CSIRO study, in collaboration with Melbourne Water, is one of the first globally that looks at the impact of climate change on water, wastewater and stormwater infrastructure as well as natural systems. The study concluded that Melbourne is likely to experience increased average and summer temperatures, reduced rainfall, and more extreme events. Such changes would result in risks to Melbourne's water supply, sewerage system and drainage.

The study's mid-range prediction was that Melbourne's water supplies could be reduced by eight per cent by 2020 and 20 per cent by 2050. The study also identified a range of initiatives to adapt to these changes. The report's launch received front-page media coverage and contributed to a decision by the Victorian State Government to reopen the Tarago Reservoir to supply an extra 21 000 megalitres of water each year, and build a $50 million treatment plant to make the water drinkable by 2011.

Victorian sustainability strategy

Victoria's Department of Sustainability and Environment commissioned CSIRO to review six important resource and environmental issues that influence the Victorian economy and are of concern to Victoria. A report was developed that provided critical scientific input to Victoria's Environmental Sustainability Framework. The report provided new directions for government, business and the community on how to build environmental considerations into the way Victorians work and live. The Framework outlines Victoria's key environmental challenges, explains what 'environmental sustainability' is and why it is important, identifies strategic directions, sets out objectives and interim targets, and identifies important steps for putting the Framework into action.

Monitoring biodiversity in the rangelands of Australia

CSIRO, at the request of the Australian Government's Department of Environment and Heritage, provided a comprehensive set of indicators and measurement techniques, plus a prototype monitoring framework for monitoring biodiversity in the rangelands of Australia. The research is the first national assessment of its kind and was achieved through a unique process, encompassing stakeholder and expert opinions and incorporating historical and unpublished research into a special thematic issue of *Austral Ecology*.

The framework will assist the Government and natural resource management planners to target future funding to areas identified as most critical. Requests for the report have far exceeded expectations and directly generated external business and commissioned research. Other researchers have already adopted the framework and it has led to multiple invitations to facilitate biodiversity workshops and deliver keynote papers.

Resistance management for Bt-Cotton

Cotton expressing insecticidal toxins is proving highly effective against the bollworm *Helicoverpa armigera*. The benefits will be forfeited if resistance to the toxins evolves. Field resistance has not been detected, although resistant genotypes have been isolated. CSIRO delivers to the Australian cotton industry information on the frequency and genetic features of Bt resistance to optimise the resistance management strategy and maintain the efficacy of transgenic cotton.

Bt-cotton is providing great financial, environmental and occupational health and safety benefits through a major reduction in the use of insecticides. A recent report (http://www.cotton.crc.org.au/Assets/PDFfiles/CRC/BDARpt.pdf) suggests that Ingard, the initial Bt-cotton, provided a profit increase of $228 per hectare. It is anticipated that next season up to 80 per cent of the 300 000 hectares of cotton crop is likely to be Bt varieties representing a profit increase of $54 million to the Australian cotton industry.

Managing invasive species

Mimosa, or *Mimosa pigra*, is one of the world's worst invasive species. Originally from the American Tropics, it now threatens wetlands such as Kakadu National Park, Zambia's Kafue Flats and bird migration refuges in the Mekong Delta in Vietnam.

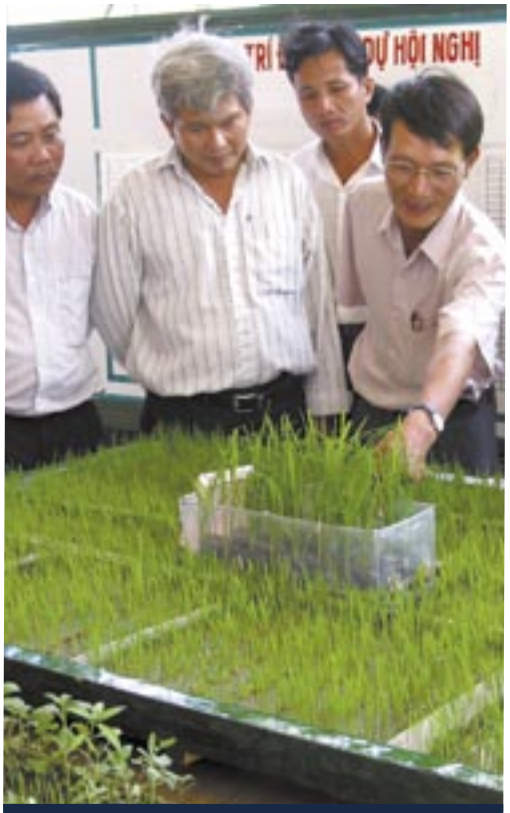
CSIRO research has led to the release of a suite of safe and effective biological control agents including the most recent, *Leuciris fimbriaria*, a looper caterpillar from Mexico in December 2004. The biological control agents attack their target reducing seed production and competitive ability. Of the 14 agents released, seven have been established and two are effective in controlling mimosa. Biological control integrates well with mechanical, fire and chemical techniques. The integrated strategy has significantly reduced the cost of mimosa management.

Rodent control in Vietnam

In Asia, rats eat five to ten per cent of the growing rice crops – enough rice to feed more than 200 million people for 12 months. Current control methods are ineffective, relying heavily on chemicals that are often misused creating important health and environmental risks.

A CSIRO project, funded by the Australian Centre for International Agricultural Research (ACIAR), has developed an ecologically-based integrated management method for poor farmers in Indonesia and Vietnam to control rodents. An independent 'impact assessment' commissioned by ACIAR concluded that poor Vietnamese farmers using the rodent control method obtained increased yields, had 66 per cent reduction in the use of toxic rodenticides, decreased use of plastic fences to physically protect crops, and decreased rodent control costs. The benefit cost ratio was 22:1.

Trials were conducted in two provinces and the methodology is now used in six provinces in the Mekong Delta and three in the Red River Delta in Vietnam. In Indonesia, a parallel three-year study was conducted at two villages with a reduction in rodenticide use of 50 per cent and a benefit-to-cost ratio for all years averaging 25:1.



Demonstration of a community trap-barrier system during a farmer workshop in the Mekong Delta, Vietnam. Photo: Grant Singleton

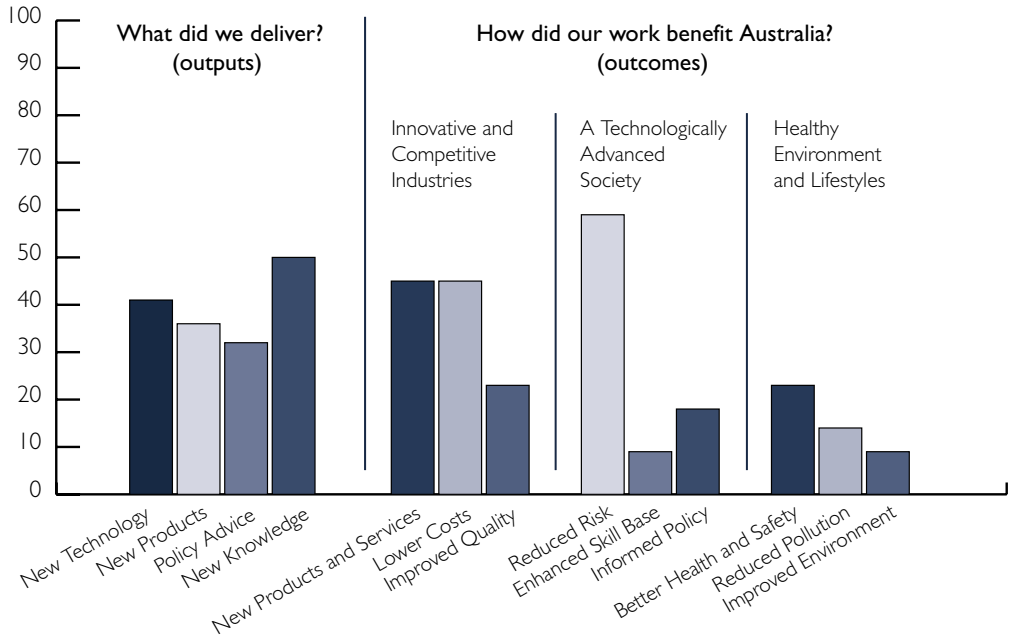
Agribusiness and Health

(The group includes the following Flagships and Divisions: Food Futures Flagship; Preventative Health Flagship; Food Science Australia (a joint venture between CSIRO and the Victorian Government); Forestry and Forest Products and Ensis; Health Sciences and Nutrition; Livestock Industries; and Plant Industry).

Outcomes and outputs in this group include:

- New device for forest assessment
- Helping reduce obesity
- Tasty new table grape variety
- Disease resistance in cattle
- Improving health with bioactive ingredients
- National Carbon Accounting Toolbox for the land sector
- CSIRO's total wellbeing diet
- CSIRO vaccine protects Australia's cattle
- Tastier macadamia nuts
- New understanding of fungal infection in vines
- Groundwater management
- Summer studentships
- New process may benefit arthritis sufferers
- Eradicating insect pests in pine plantations
- New rootstocks for the wine industry
- Exceeding consumer expectations
- New cotton varieties released
- Improved quality and efficiency in cheese making
- Higher wheat yields for WA high rainfall zone
- Breeding radiata pine for end-product profits
- Golden opportunity for mungbean farmers
- Hairpin RNAi licensing deal

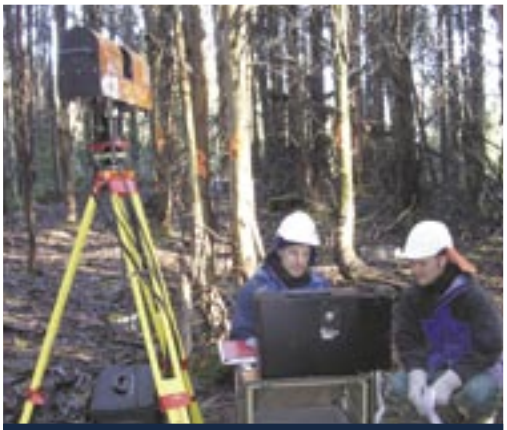
Figure 6: Pattern of Outcomes and Outputs for Agribusiness and Health



New device for forest assessment

CSIRO scientists have developed a prototype forest measurement device – the ECHIDNA® Validation Instrument – to improve the accuracy and efficiency of forestry operations. Supported by the FWPRDC, the ECHIDNA® concept uses scanning laser rangefinding (lidar) technology to capture details of forest structure such as canopy height, the number and location of trees and their basal area, up to a radius of 100 metres from its survey point.

CSIRO's Canopy Lidar Initiative has significantly advanced the awareness of the capability of lidar technology for forest assessment within the Australian forest industry. Validation of the ECHIDNA® concept has led to unique lidar engineering experience with Australian SMEs and an investigation of next generation forest measurement tools in an operational context.



CSIRO scientists, Dr Darius Culvenor and Petr Otahal reviewing data gathered by the ECHIDNA®. Photo: Maria Ottenschlaeger, Ensis

Helping reduce obesity

In a study partly funded by the National Centre for Excellence in Functional Foods, CSIRO has demonstrated that protein is more satiating than high glycemic index carbohydrates and that all proteins appear to be equal whether dairy (whey and casein) or plant derived (gluten and soy). The social benefit is a potential reduction in obesity by increasing the protein content of various manufactured foods by utilising whatever form of protein is technically and economically most suitable for the product.

Tasty new table grape variety

A new CSIRO-bred grape is the first to be released by the Table Grapes for the New Millennium project, a collaboration between CSIRO, Horticulture Australia, and the Western Australia, Queensland and Northern Territory state agricultural departments. The project links researchers, breeders and the horticulture industry to develop varieties with grower benefits and consumer appeal. The variety has been proving itself in semi-commercial trials in Western Australia, Queensland and Victoria since 2003.

The golden, seeded, early maturing table grape with a distinctive aromatic muscat flavour is highly fruitful, producing two bunches per shoot, and its early maturity gives growers a distinct marketing advantage. The variety's good performance has led to high demand from growers in the Carnarvon region of Western Australia with demand expected to grow when the first significant crop reaches markets in November 2005.

Disease resistance in cattle

CSIRO is a partner in the $US53 million international effort to sequence the genome of the cow (Bos taurus). The first draft of the bovine genome sequence has been released free to biomedical and agricultural researchers around the world and will assist in the development of tools to advance selection of desirable production traits, identify genes involved in pest and disease resistance in cattle and enable better matching of products to market specifications.

The bovine genome is similar in size to the genomes of humans and other mammals, containing approximately three billion DNA base pairs. The sequencing of the bovine genome will also help medical researchers learn more

about the human genome and thereby develop better ways of treating and preventing disease.

Improving health with bioactive ingredients

Increased stability of probiotics (live microbial food supplements, for example *L. acidophilus* in yoghurt) has been achieved by Food Science Australia that allows these healthy ingredients to be included in a wide range of shelf-stable foods, including infant milk formulae. Additional findings and resultant patents have enhanced MicroMax technology, enabling the Australia New Zealand Food Authority to provide lower costs and enhanced activity to the food supplement and neutraceutical industries.

Health benefits arise from the ability to protect the viability of the probiotics and control their release at any stage of the gastrointestinal track – stomach, small intestine or large intestine – to maximise efficacy. Cost savings to manufacturers have been achieved through ingredient stability/activity (requiring less to be used in formulations), reduced processing costs, by using spray-drying technology rather than higher cost freeze-drying, and the ability to store and transport products without refrigeration.

National Carbon Accounting Toolbox for the land sector

CSIRO, in collaboration with the Australian Greenhouse Office and the Australian National University, has developed the National Carbon Accounting Toolbox. The Toolbox provides land managers, investors, and policy makers with tools for tracking greenhouse gas emissions and carbon stock changes from land use and management.

Through the Toolbox, users may identify changes in emissions resulting from soil cultivation, fire management, fertiliser application, climate variability and reliability. The Toolbox is being used by land managers to help them balance production and environmental objectives (such as minimising greenhouse gas emissions, and protection of remnant native vegetation).

The FullCAM model that underpins the Toolbox is used by the Australian Government to track continental greenhouse gas emissions and sinks for the land sector. Businesses interested in the creation and trading of carbon credits are using the Toolbox to support investment decisions.

CSIRO's total wellbeing diet

In response to overwhelming public demand for more information after the initial publicity around the total wellbeing diet, CSIRO has produced a book which was published by Penguin on 30 May 2005. The public benefits by having balanced and trustworthy dietary knowledge available in a readily accessible form, and companies specialising in the production and sale of protein-rich or low glycemic index foods, may also benefit from increased demand for these foods (see page 11).

CSIRO vaccine protects Australia's cattle

CSIRO scientists have developed a vaccine for bovine respiratory disease, a severe and often fatal form of pneumonia estimated to cost the Australian feedlot industry $60 million a year in production losses (see page 15).

Tastier macadamia nuts

CSIRO research has led to recommendations for the production of macadamias that are tastier and more appealing for consumers, and potential for expansion of the Australian macadamia production and processing industries. Consumer preferences were measured and related to the source and treatment of nuts with the goal of providing the Australian macadamia industry with information to help it produce nuts that are more appealing to consumers.

Results of the research showed the 'ideal' macadamia chosen by consumers was large and fresh with a stronger roasted flavour but still with a light coloured kernel. A report of the research findings prepared for The Australian Macadamia Society is being used to establish

guidelines for its breeding program with plans to use the information in future marketing efforts.

CSIRO has identified the 'ideal' macadamia preferred by consumers. Photo: CSIRO

New understanding of fungal infection in vines

New in-depth understanding of the ecology of black fungal infection and Ochratoxin A (OA) production in Australian vineyards has enabled management strategies to minimise infection of grapes by black fungus. A new rapid analysis for OA has been developed by Food Science Australia, and new protocols that demonstrate the compliance of OA levels in Australian wines to recently imposed European Union (EU) standards have been delivered to the CRC for Viticulture and Grape and the Wine Research and Development Corporation.

Australia crushes about 1.9 million tonnes of grapes annually and produces 1 170 million litres of wine, of which 584 million litres is exported, earning Australia $2.5 billion per year. Application of the new knowledge, and the ability to demonstrate compliance to EU standards, sustains regional communities by averting the prospect of curtailed exports and the potential for reduced export income, reduced wine prices and reduced grape prices.

Groundwater management

Southeast South Australia (SA) and southwest Victoria depend on an extensive groundwater system for their domestic, industrial, and agricultural water supply. CSIRO has quantified the source and amount of water used by radiata pine, Tasmanian blue gum, and pasture across a range of locations in southeast SA, to provide a scientific basis for refinement of regional groundwater management plans.

The work has been in collaboration with plantation growers, water resources managers, the Natural Heritage Trust and the Forest and Wood Products R&D Corporation (FWPRDC). This work has greatly improved quantitative understanding of the amount and source of water used by plantations and how this varies in space and time in response to a range of site, management, and climatic factors. The work is contributing to development of water resource policy in SA. Water resource managers are currently considering the implications of recent results for regional water allocation plans.

Summer studentships

A generous endowment by the Trustees of the Australian Pastoral Research Trust has led to the inauguration of CSIRO Plant Industry's Summer Studentship Program. The ten week program is aimed at encouraging young people to consider a career in science, build closer links with universities and raise awareness of CSIRO's role in developing the careers of young scientists. Twenty four undergraduate students from across Australia took part in early 2005.

CSIRO received 107 applications for the 24 places, and successful students completed projects contributing to research programs

underway at CSIRO, presenting their findings at a forum held on 9 February 2005. Since completing the first year of the program, 23 of the students have indicated they wish to pursue a career in science, with two already starting their honours year with CSIRO Plant Industry. The Program will continue for at least another five years.

New process may benefit arthritis sufferers

Food Science Australia's new process to isolate chondroitin sulphate (a nutraceutical with anti-arthritic properties) from shark cartilage has been patented and licensed to a new Australian biotechnology start-up company. The process has been based on strategic research findings into membrane separation, in a process that eliminates the need for toxic solvents.

Trial samples prepared using this novel process have been shown to have high purity for the targeted marketplace applications. The new company has assessed the technical and financial viability of this novel extraction technology and, through the licensing arrangement, is currently designing and planning the production facility for manufacture of the chondroitin sulphate nutraceutical. In addition to economic and product quality advantages of the new process, environmental benefits accrue from eliminating the use of solvents. Bench-scale tests, animal studies and clinical data support the anti-arthritic efficacy of chondroitin sulphate, and such efficacy will provide social benefit in the form of improved mobility and pain reduction in arthritis sufferers.

Eradicating insect pests in pine plantations

CSIRO scientists have produced conclusive evidence that a new insect pest is responsible for the widespread loss of foliage of radiata pine plantations. Researchers have quantified that the leaf loss is responsible for lost wood production equivalent to at least $21 million a year, and established important relationships between the severity of outbreaks and climatic variables that will allow an assessment of risk. A cost-benefit analysis of different control options has been completed.

The study was supported by the FWPRDC and a consortium of plantation growers. Of the control options investigated, biological control offered the best prospects for cost-effective control of the pest. As a result, the forest industry, through the FWPRDC, is mounting a major national initiative to identify and deploy an effective biological control agent.

New rootstocks for the wine industry

Four new wine grapevine rootstock varieties have been released by CSIRO's rootstock breeding program. Grapevine varieties are often grafted on to rootstocks to protect against the insect pest *phylloxera* and to provide other benefits, such as nematode tolerance and salt tolerance. The rootstocks impart low-to-medium vigour to a variety and maintain competitive yields. Trials with the wine grape variety Shiraz demonstrate the need for less acid adjustment in winemaking and show enhanced fruit and wine quality compared with industry standard rootstocks.

Four new wine grapevine rootstock varieties have been released by CSIRO's rootstock breeding program. Photo: CSIRO

A number of wine companies have expressed an interest in conducting trials of the new rootstocks under commercial conditions in various Australian regions. A licensed distributor has been appointed with the first vines expected to be planted in 2006. The release is being coordinated to enable viticultural and winemaking data to be gathered from regions around Australia, using a range of wine varieties. The data will be used to support the expanding release of the new rootstocks and in the ongoing breeding program.

Exceeding consumer expectations

An ability to rapidly determine optimum harvest maturities and quality assessment of product delivery systems has been provided by Food Science Australia to a globally innovative plant breeding and produce supplier. Through novel and objective approaches to flavour, sensory assessment, odour re-creation and sensory validation, new understandings about the company's product, provided strategic market understanding and quality assessment and assurance tools.

Immediate economic advantage has been achieved by the company, and the industry of which it is a part, by price premiums and reduced downgrades. This has been achieved through optimising maturity at harvest time and post-harvest treatment to meet (or exceed) market expectations of product quality. Profitability has increased for the company and the growers. The strategic knowledge will provide further economic outcomes for the company as it guides their long-term plant breeding programs and assure it, and its grower communities, of continued competitive advantage in the global market.

New cotton varieties released

CSIRO continues to build on its contribution to Australia's $1.7 billion cotton industry releasing 16 new cotton varieties for the 2004–05 season. The new varieties were distributed by Cotton Seed Distributors Ltd through a long-standing commercial agreement with CSIRO. The large release was in response to the change over from INGARD® to Bollgard®II cotton. INGARD® is no longer commercially available.

The new varieties were developed for a range of environmental conditions with 13 genetically modified (GM) to be insect resistant, herbicide tolerant or both. The number of GM varieties reflects growing demand by the industry for GM cotton since the introduction of Bollgard®II, a two gene Bt-cotton first released in 2002 incorporating Monsanto's Bollgard® gene into CSIRO's elite cotton varieties. Having two Bt genes means the likelihood of insect resistance developing is low, enabling wide scale introduction of Bollgard®II. Of the 300 000 hectares of cotton planted in Australia in the 2004–05 season, 250 000 hectares were GM.

Improved quality and efficiency in cheese making

Food Science Australia has developed a set of practical physical and chemical tests and an index scale that enables cheese manufacturing companies to predict the most cost and quality effective end use of recently manufactured cheese – be it to shredding, processing, short-term maturation or long-hold vintaging. Industry collaborators have included Dairy Australia, Murray Goulburn Cooperative Ltd, Bega, Bonlac, Dairy Farmers and Warrnambool Cheese and Butter Company, through the Australian Cheese Technology Program research consortium.

The Australian cheese industry, a major regional manufacturing industry that exports 240 thousand tonnes annually with a value of $740 million and has domestic sales of 186 thousand tonnes, has benefited by increased production efficiency. Now, companies have a tool for inventory control to direct cheese to the most appropriate and highest value use. Improved efficiency flows through the food value-chain benefiting the industry's 10 000 farms and farmers.

Higher wheat yields for WA high rainfall zone

In conjunction with the WA Department of Agriculture, CSIRO has prepared a manual for cropping in WA's high rainfall zone. The manual, which will go to over 500 growers, addresses the potential and constraints in annual cropping, agronomic management practices to achieve high yield, and the economic analysis of annual cropping in the high rainfall zone. As a prelude to the release of the manual, three years of field days with about 200–300 farmers attending have been held in conjunction with Department of Agriculture and Landmark. Increased wheat yields of up to 40 per cent can be achieved in Western Australia's high rainfall zones by adopting management strategies outlined in the manual.

Breeding radiata pine for end-product profits

Ensis (the joint forces of CSIRO and Scion) scientists, in collaboration with the Southern Tree Breeding Association, have developed a model that can provide data on how selecting particular traits in radiata pine breeding programs can affect Australian timber companies' profits. From the model, Ensis scientists can calculate profits through the improvement of each breeding trait. The model has verified for the first time, that improvements in quality traits such as wood stiffness are likely to have a bigger impact on the profitability than further gains in tree growth rates.

The economic weights have been adopted by the Australian radiata pine national tree breeding program. For integrated plantation and sawmill companies, wood stiffness turned out to be particularly important; a ten per cent improvement would increase the net present value return, (that is the value of the dollar today versus the value of that same dollar in the future, after taking inflation and return into account), from a one-hectare plantation by about $1 100. This compares with around $900 for a ten per cent gain in growth rate and about $350 and $200 respectively for equivalent improvements in maximum branch size and stem straightness.

Golden opportunity for mungbean farmers

A new mungbean variety 'White Gold' was released for the 2004–05 season by the Australian Mungbean Association and seed is available through Association members or local seed suppliers. The new variety was developed by CSIRO in collaboration with the Queensland Department of Primary Industries and the NSW Department of Primary Industries with the support of the GRDC. It has consistently outperformed all existing varieties at nine field sites across the prime mungbean yields stretching from NSW to Queensland.

White Gold is expected to increase mungbean yields in the region by 16 to 32 per cent and the industry is hopeful of exporting to high-value markets as the seed is 15 per cent larger. White Gold has also improved resistance to both tan spot and powdery mildew – both serious diseases of mungbean and is demonstrating the best resistance to silver leaf white fly.

Hairpin RNAi licensing deal

CSIRO-developed hairpin RNAi technology has been used under license by Florigene Ltd, a Melbourne-based biotechnology company and part of the Japanese Suntory group of companies, to develop the world's first and only blue rose, a goal previously unachievable through conventional plant improvement technology.

The CSIRO hairpin RNAi technology was used to remove the gene encoding the enzyme *dihydroflavonol reductase* (DFR) in roses. DFR works to create intermediates that are subsequently made into red or blue pigments, but rose DFR does not appear optimal for production of blue pigments. CSIRO's hairpin RNAi technology was used to knock out the activity of the rose DFR gene, and then a DFR gene from an iris, which makes a lot of blue pigment, replaced it to produce the blue rose.

The year in review: Performance against strategic objectives

Consistent with the Government's Outcomes and Outputs framework and CSIRO's Triennium Funding Agreement, this section provides a comprehensive report on CSIRO's performance against the Strategic Goals and Objectives as articulated in CSIRO's Strategic Plan 2003–07 and the specific success measures identified in CSIRO's Operational Plan for 2004–05.

Goal 1 – Focusing our science investment

CSIRO contributes to the National Innovation System in a unique way in that we deliver integrated science solutions that help drive national innovation. CSIRO's National Research Flagships are our key delivery mechanism for Australia's most important and complex challenges and opportunities in the areas of energy, water, health, and in growing new industries based on our rich mineral and agricultural resources, and in developing sustainable wealth from our oceans. Flagships ensure Australia can seize opportunities only attainable through large-scale partnerships and investment. Flagships focus CSIRO's and Australia's research efforts in areas of national significance and priority.

1.1 Play a significant role in delivering on Australia's National Research Priorities (NRPs)

Success measures:

- *Government acceptance of CSIRO's NRP Implementation Plan*
- *Share of science investment on NRPs*
- *Evidence of impact on NRPs*

Writing in response to CSIRO's report on its implementation of NRPs (August 2004), the then Chief Scientist, Dr Robin Batterham, on behalf of the National Research Priorities Standing Committee, strongly commended CSIRO for its achievements. He made particular mention of CSIRO's alignment to the NRPs via its Flagship Program and noted its extensive participation in the CRC program.

Each of our 21 research Divisions contributed to at least three of the 21 NRP goals and, as indicated above, Flagships also remain a key component of CSIRO's response to the NRPs. Each of our six Flagship Programs address two or more of the 21 NRP goals as a major objective.

In 2004–05, 84 per cent of CSIRO's overall science investment aligned with NRP goals, against a target of 'at least 66 per cent'. The pattern of investment across the 21 NRP goals in 2004–05 is illustrated in Figure 1. The forecast for 2005–06 exceeds 80 per cent.

A similar pattern of contribution to National Research Priorities may be seen in Figure 2, which maps the alignment of the specific outcomes and outputs described on pages 30–66 of this report against the priority areas and associated priority goals.

Figure 2 shows, for example, that eight of the achievements described in the text are assessed as making a major contribution to Goal A6 (Developing deep earth resources) and five are assessed as making a significant contribution to Goal B3 (Preventive healthcare). Each achievement may contribute to more than one NRP Goal.

To assist in interpreting Figures 1 and 2, the NRPs and their associated priority goals are listed on page 219.

Figure 1: Pattern of CSIRO Investment on National Research Priority Goals

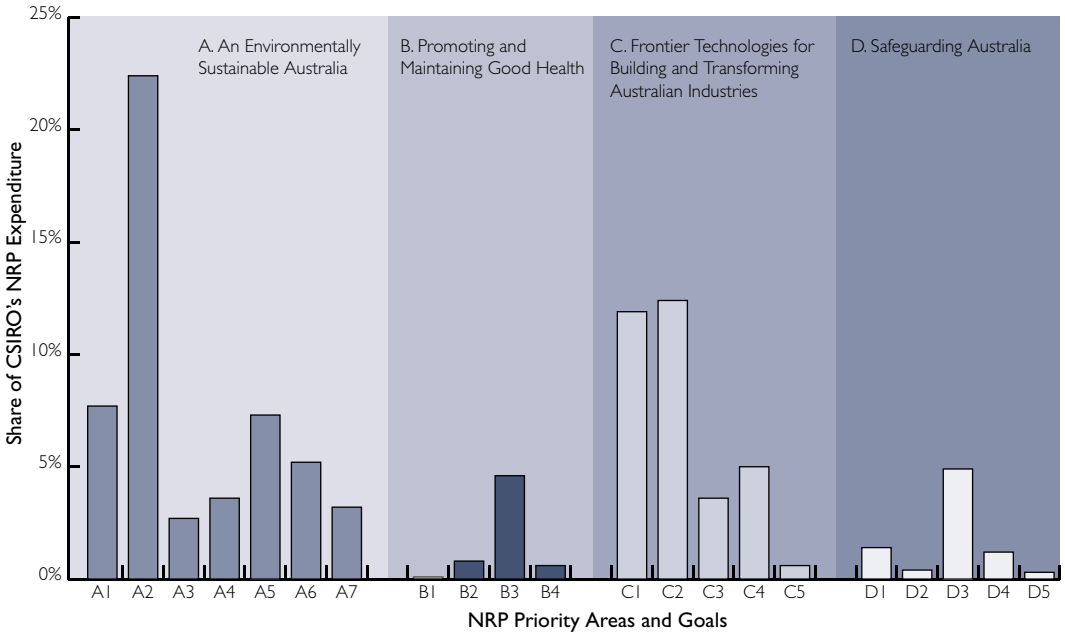
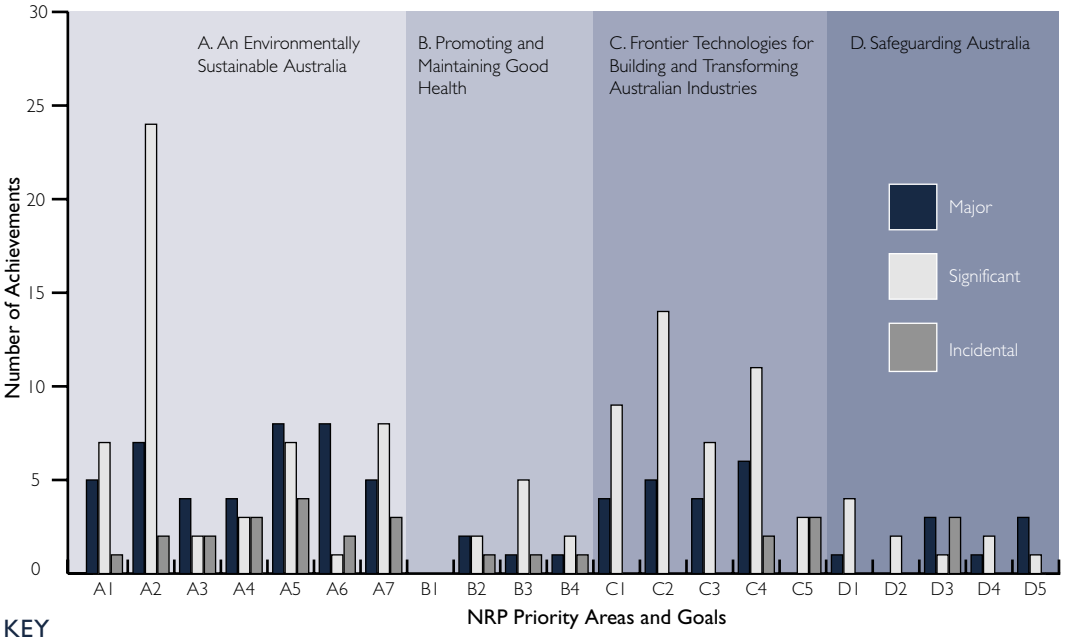


Figure 2: Pattern of Contribution by CSIRO Outcomes/Outputs to National Research Priority Goals



KEY

Major – indicates strong alignment with, and a major contribution to, the achievement of a particular NRP goal.

Significant – indicates a lesser but still significant degree of alignment and contribution to a particular NRP goal.

Incidental – indicates an incidental contribution to a particular NRP goal (the primary contribution is to other goals).

The National Research Priorities and their associated priority goals

(See Appendix 4 for a more detailed description of the NRP goals)

A. An environmentally sustainable Australia
1. Water – a critical resource
2. Transforming existing industries
3. Overcoming soil loss, salinity and acidity
4. Reducing and capturing emissions in transport and energy generation
5. Sustainable use of Australia's biodiversity
6. Developing deep earth resources
7. Responding to climate change and variability

B. Promoting and maintaining good health
1. A healthy start to life
2. Ageing well, ageing productively
3. Preventive healthcare
4. Strengthening Australia's social and economic fabric

C. Frontier technologies for building and transforming Australian industries
1. Breakthrough science
2. Frontier technologies
3. Advanced materials
4. Smart information use
5. Promoting an innovation culture and economy

D. Safeguarding Australia
1. Critical infrastructure
2. Understanding our region and the world
3. Protecting Australia from invasive diseases and pests
4. Protecting Australia from terrorism and crime
5. Transformational defence technologies

1.2 Build critical mass and ensure quality in our core research programs

Success measures:

- *Implement the Program Performance Framework for core research*
- *Share of programs with critical mass*
- *Science assessment process*
- *Recommendations of Divisional and other science reviews implemented as appropriate (specifically reviews of Petroleum Resources and of Hydrogen related R&D across Divisions)*

CSIRO's Program Performance Framework (PPF) is now being applied across the Organisation in both research and support areas. It serves two complementary purposes. Its *strategic planning elements* (themes; streams; research and engagement goals; and roadmaps) provide a common language for describing and organising research activities, reinforces goal-oriented planning and assists us in prioritising decisions at a range of levels across the Organisation. Its *performance assessment elements* (scoring of annual performance goals; assessment of theme/stream progress; and management response) promote increased focus on progress against clearly articulated goals and objectives. The PPF is structured to ensure parallel emphasis on delivering excellent science and on developing an effective 'path to market'.

During 2004–05, workshops were conducted with the six Flagship Programs to assist the process of setting improved annual performance goals. Several Divisions have now restructured their research into 'Themes and Streams' that better reflect the major outcomes they are striving to achieve. The Information and Communication Technologies (ICT) Centre, for example, has moved from six themes to four and has also consolidated its presence from nine sites to three major ones in Sydney, Canberra and Brisbane with a fourth possible site in Adelaide under discussion. Similarly, in Manufacturing and Infrastructure Technology two Themes were merged, two Themes dramatically realigned to new markets, six Streams discontinued and a number of frontier science projects developed – often at the nexus of nanotechnology, biotechnology and information technology.

In February 2005, CSIRO announced that a number of major organisational restructures will formally come into effect on 1 July 2005. The merger of CSIRO Marine Research and CSIRO Atmospheric Research creates a powerful new Division (CSIRO Marine and Atmospheric Research) to boost Australian climate and earth systems science.

To help better focus our research on food, nutrition and health – areas of great importance for the wellbeing of Australians – the nutrition component of our Health Sciences and Nutrition (HSN) Division, largely based in Adelaide, has been linked with Food Science Australia (FSA), and HSN's Protein and Structural Biology Research Groups have joined with CSIRO Molecular Science to form a new Division called CSIRO Molecular and Health Technologies.

At the same time, a new three group structure for CSIRO's Divisions, Joint Ventures and Flagships, will replace the current four Group structure. The new groups are:

- Sustainable Energy and Environment (SE&E, led by Dr Steve Morton)
- Information, Manufacturing and Minerals (IM&M led by Dr Rod Hill)
- Agribusiness (led by Dr Michael Eyles and, from August 2005, Dr Alastair Robertson).

These new groupings seek to better anticipate changing national priorities and build research synergies. The SE&E group will, for example, bring together our expertise in the production and processing of energy resources, in energy systems and in environmental management. The IM&M group will facilitate the capture of science synergies and enhanced market value through closer integration of upstream

minerals discovery, extraction and metal production with end use applications. Leadership transition commenced on 4 April 2005, with full implementation on 1 July 2005.

The groups are proactively identifying areas of unnecessary duplication, and/or increased opportunities for synergy; for example, the move to concentrate environmental biotechnology in Entomology. Enhanced collaboration with other research providers (see Section 3.1) has also contributed to the development of critical mass in a number of areas of research and its application.

As foreshadowed in last year's Annual Report, Ensis, the unincorporated Joint Venture between CSIRO and New Zealand's Scion (formerly Forest Research) came into being on 1 July 2004. Ensis was created to enhance the breadth, depth and scale of New Zealand's and Australia's forestry research capabilities in the region. As of 1 July 2005, when three new Strategic Business Units (SBUs) join the four existing Ensis SBUs to complete the Ensis expansion process, all the forestry-facing research activities of both parent organisations will be delivered through Ensis.

Over the triennium all Divisions will be reviewed as part of a formal program of Science Assessment Reviews to assess the quality of research. This program is a condition of the Triennium Funding Agreement and is being implemented in line with the emerging objectives of the Australian Government's Research Quality Framework. The Reviews include external scientific experts. During 2004–05, we reviewed Industrial Physics; Minerals; Entomology; Food Science Australia; Molecular Science; Health Sciences and Nutrition; and Marine and Atmospheric Research. The reports of Entomology and Industrial Physics together with formal Divisional responses, have been considered by the Executive Team (ET) and the Board. Reports from the remaining reviews are currently being considered by the Division and the responsible Group Executive. For each of these Divisional reviews, reports detailing actions taken to implement the recommendations are due to be presented to the Board within twelve months.

The review of CSIRO Industrial Physics, completed in March 2005, was a more comprehensive and strategic review that addressed questions of the viability and organisation of physics-related research in CSIRO. The recommendations have been approved by ET and the Board. The Division is already realigning its research program for the new Science Investment Process based on input from the review. Cross-divisional hydrogen-related issues were considered as part of this review and other cross-divisional issues will be addressed as the reviews progress.

In response to the review of CSIRO Petroleum Resources, undertaken in 2003–04, all but one of the recommendations have been accepted and implemented. The result has been a considerable strengthening of the strategic alignment of the Division's research portfolio, particularly with regard to major new alliance opportunities such as the WA Energy Research Alliance.

The Divisional Science Assessment Reviews are continuing to confirm that CSIRO's research capabilities, as a mission-driven organisation, are appropriately aligned against the two dimensions of research community impact and industry/community impact brought together to undertake what has been an effective and rigorous assessment of the quality of Divisional scientific outputs. In particular, we are extremely encouraged by internal feedback whereby our Divisions have viewed the process as constructive and an opportunity to assist Divisional strategies and including, in particular, the encouragement of an increased focus on the publication of quality scientific papers. The information from the Divisional reviews also will inform the new Science Investment Process which, in turn, will further encourage building of critical mass in key areas.

1.3 Champion Flagships to improve the lives of Australians and advance Australia's key industries

Success measures:

- *Flagship Programs operating successfully*
- *Proportion of Flagship Annual Performance Goals achieved*
- *Share of CSIRO science budget (appropriation funding) in Flagships*
- *Total external revenue for Flagships*
- *Adoption and impact of Flagship Program outputs*
- *Active Flagship partnerships (new and developing partnerships with external parties)*

Flagships' goals are strong, sustained economic growth, new industries, competitive enterprises and quality jobs; healthier, more productive lives for Australians; clean, cost-efficient energy; more productive and sustainable use of water; sustainable wealth from our oceans; and growth and prosperity for regional Australia.

Some examples illustrating successful delivery on Flagship goals are included in the 2004–05 'Year in summary – and looking ahead' (page 23).

The sixth National Flagship Program – Wealth from Oceans – was officially launched in August 2004 by the Hon Dr Brendan Nelson, Minister for Education, Science and Training. In February 2005, Dr Raj Rajakumar was appointed Director of the Light Metals Flagship as Dr Tony Filmer left to take up an opportunity in the Middle East. The Flagship Oversight Committee continues to be alert to opportunities to extend the Flagships Program into new areas where the Flagship model could bring scale and focus to issues of major national importance.

The Flagship Collaboration Fund was announced by the Minister in May 2005. CSIRO hosted an information day which was attended by 70 people including Chief Executives, scientists, Deputy Vice Chancellors (Research), and by representatives from around 30 Universities, 20 CRCs and ten other research organisations. Over seven years the Fund will allocate over $97 million to develop collaborative partnerships to enhance the overall research effort in the Flagships Program, either by increasing scale and focus or by bringing together complementary expertise. Response to opening of the fund has been very positive. Despite the relatively short lead time, seven applications for fellowships, 13 cluster applications and four project applications were submitted by 30 June. The parties to the cluster applications included 19 universities, one CRC, one Centre of Excellence and five other publicly funded research agencies. Most university applicants were party to more than one application.

In 2004–05, the Flagship Programs accounted for expenditure of 19.8 per cent of CSIRO's total appropriation funds, meeting our target for the year. It remains our longer-term goal to have 30 to 40 per cent of resources devoted to Flagship Programs.

The enhanced scale of the Flagships Program in 2004–05 is reflected in the growth of total revenue to $145.0 million from $82.8 million in 2003–04. Total revenue comprised $62.3 million in Flagship appropriation, $52.0 million of redirected CSIRO funding and $15.9 million in external funds. External revenue more than doubled from $6.4 million the previous year but was short of our budgeted target of $27.1 million, which proved to be an over-ambitious target at this early stage of Flagship development. We recognise that Flagships are a bold new initiative and that these endeavours take time to build. The shortfall in direct external revenue was offset to a significant extent by external in-kind contributions (direct in-kind research and works program contributions) which were of a similar magnitude to the external revenue for the year. There is considerable evidence of new and developing partnerships with external parties that augur well for the future. For example:

- A partnership between CSIRO, the Australian Bureau of Agricultural and Resource

Economics (ABARE) and the Department of Industry, Tourism and Resources (DITR) has resulted in the development of the high profile Energy Futures Forum. The Forum is a $2 million (over 18 months) energy futures scenario development process. It involves 22 participants from industry, environmental and public interest groups.

- The Wealth from Oceans Flagship has strong links with the Bureau of Meteorology and the Royal Australian Navy around the BlueLink Program. BlueLink is a three and a half year project to develop the ocean model and analysis systems required to provide ocean forecasts. The project is valued at approximately $15 million, with the Navy contributing approximately $5 million in cash.
- The **e-Health Research Centre** (e-HRC) is a $15 million joint venture between CSIRO and the Queensland Government. It was set up in 2003 to develop and pilot ICT-related innovations in the health sector. One of the core projects within the e-HRC is an initiative known as the Health Data Integration (HDI) project, which was conceived in the Preventative Health Flagship and is targeting prevention and early detection of disease. The project is aimed at allowing health professionals to share data which could be used to uncover valuable trends and clinical insights while maintaining patient privacy.

In 2004–05, 69 per cent of the annual performance goals (APGs) set in the Flagships' performance plans were achieved, just short of our target of 70 per cent set in recognition of the inherent challenge and risk in these activities. In response to a commissioned review of quality and consistency of APGs, CSIRO held a series of workshops focused on developing APGs for 2005–06 that are more outcome-focused and better defined. CSIRO has also instituted a formal process to provide assurance of the quality of science being conducted in Flagships. Beginning in 2005, the Executive Director Science Planning will report annually to the Flagship Oversight Committee on science quality issues.

1.4 Increase the impact of major cross-Divisional activities through a focused strategic investment process

Success measures:

- ***Major cross-Divisional programs (MXDPs) operating successfully***
- ***Adoption and impact of outputs from MXDPs***
- ***Tender to become operator/manager of the Australian Synchrotron***
- ***Prepare a case for a new MXDP in 'Instrumentation'***

CSIRO will move to the next stage of the enterprise-wide Science Investment Process (SIP) with broad direction setting to be completed by September 2005 in preparation for the theme based research investment in 2006–07. SIP will progressively bring a stronger 'managed portfolio' approach to CSIRO's science investment decisions. In 2004–05, cross-Divisional initiatives to gain inaugural SIP funding included: Counter Terrorism, Synchrotron Science, Minerals Down Under, Coasts and Sustainable Agriculture.

Existing MXDPs in Climate Science and Secure Australia are operating successfully. CSIRO Climate has focused its effort on several major science and business developments during the year, particularly in applications of climate variability R&D. It also organised major internal and external meetings to help communicate the principal elements of CSIRO's research. Two examples of outcomes and outputs from the climate program are:

- Climate change assessments for Melbourne's water resources (page 57)
- Assessing climate change and extreme rainfall (page 56).

The Secure Australia program has been refocused to coordinate a One-CSIRO collaboration with the Defence Science and Technology Organisation (DSTO) and the Australian Nuclear Science and Technology Organisation (ANSTO) in

Counter Terrorism. This joint program was launched on 10 March 2005. CSIRO has allocated $1.8 million in 2005–06 and four projects have been selected for funding.

CSIRO's MXDP on Synchrotron Science has been approved for 2005–06 with a budget of $370 000. As part of the MXDP, recruitment has begun for four new post-doctoral positions. Collaborations with the University of Melbourne and Monash University have been established, and CSIRO is continuing to engage with the Australian Synchrotron Project Team with a view to making a possible bid for the role of Operator/Manager in the third quarter of 2005.

Seed funding for a new 'Minerals Down Under' initiative has been provided to implement early research programs in drilling and geoinformatics, and for the development of a full business case for a program to integrate research along the whole of the minerals industry value chain. The Minerals Resources Sector Advisory Council is actively engaged in developing the strategy for this initiative.

A major coastal sciences initiative – 'A Vital Coastal Australia' (AVCA) – is currently being developed to meet demand from policy makers, planners, management agencies and the community for information and tools that will allow them to predict, and subsequently to monitor, how different coastal zone development scenarios will impact on a spectrum of environmental, social and economic values.

Similarly, the focus of a scoping study for the Sustainable Agriculture initiative is the integration of production agriculture, conservation ecology and social science to address issues of long-term agricultural sustainability. The ultimate goal is to maintain agriculture's contribution to Australia's wealth by ensuring continued access to national and international markets that are increasingly focused on the environmental and social impact of production systems.

CSIRO's Operational Plan for 2004–05 foreshadowed development of an MXDP in Instrumentation. A workshop in March 2005 saw the development of a Business Development and Commercialisation (BD&C) strategy and a cross-disciplinary science plan. Further workshops are being planned with the immediate outcome being a focus on product development (through the appointment of a Product Development Manager) rather than capability building.

Goal 2 – Delivering world-class science

CSIRO's focus is on delivering world-class science solutions that create value for Australian industry and communities. In an increasingly competitive world, this requires CSIRO to be internationally well-connected and respected for its scientific leadership. We recognise that our people are the key to our international reputation for world-class science and that disciplined project management is vital to successful delivery.

2.1 Concentrate people processes on developing, attracting, exciting and retaining talent

Success measures:

- *Staff satisfaction index (Insight survey)*
- *Staff commitment and engagement (Insight survey)*
- *Number of postgraduate students supervised*
- *Number of post-doctoral fellows*
- *New Federation Fellows in CSIRO*

In March 2005, we conducted our annual 'Insight' survey to solicit staff feedback on the Organisation. Staff participation increased significantly to 74 per cent, compared to 66 per cent in September 2003.

CSIRO's overall Staff Satisfaction Index has remained stable, increasing slightly this year to 67 points, which is significantly above the global benchmark for R&D organisations (Table 1) and

other organisations going through considerable change. The result for the 'bottom line' question *'taking everything into account how satisfied are you with CSIRO as a place to work?'* remained stable at 67 per cent, two points above the norm for R&D organisations globally. There was a two-point fall in the result for the combined categories of 'staff commitment' and 'staff engagement'. In future, a revised and expanded engagement category that incorporates commitment, and is based on the latest research, will replace these combined categories.

Table 1: CSIRO Staff Satisfaction

Insight Survey*	2002	2003	2005
Staff Satisfaction Index Target (global R&D norm) = 63	69	66	67
Staff Commitment and Engagement: aggregate result Target = 2002 result	156	154	152

**Survey timing changed from September in 2002 and 2003 to March in 2005.*

Staff support for CSIRO's strategic direction has also improved significantly with greater confidence about the future of the Organisation. Compared to other R&D organisations, key strengths for us continue to include leadership provided by immediate managers and Divisional/Business unit leaders, and opportunities for learning and development.

This year's Insight survey has highlighted that we must focus on continuously improving our internal communication, particularly around Flagships, change management and performance management. These are challenges that we are taking seriously.

One critical factor underpinning the implementation of strategy more generally has been the variability of understanding of the Organisation's strategy below the executive management level. In response, a rolling program of 'strategy in action' workshops has commenced. The workshops are designed to better engage and deepen the understanding of the Organisation's strategy and supporting objectives amongst all staff.

CSIRO continues to make a significant contribution to the development of Australia's science base through the provision of full and partial scholarships and through the supervision of students enrolled in higher degrees. Table 2 shows that the number of postgraduate students sponsored by CSIRO grew to 245, a four per cent increase on the previous year, while the number of students supervised fell by five per cent to 538.

The CSIRO Postgraduate Scholarship Program awarded 23 additional top-up scholarships to students to commence PhD studies in 2005 and 20 additional scholarships to students whose projects align with a Flagship. The students are spread across 18 Divisions and five Flagships, with 19 universities involved in these collaborative research-training projects.

CSIRO also appointed 15 new post-doctoral fellows across 12 Divisions under the CSIRO Post-doctoral Fellowship Program. CSIRO currently employs 288 post-doctoral fellows across the Organisation, an increase of nine per cent over the previous year.

While CSIRO was, sadly, unsuccessful in securing new Federation Fellows in 2005, our commitment to attracting high-performing staff around whom successful teams can be built is demonstrated by the establishment of a new $2 million per annum 'talent fund', one of the initiatives funded through our new Science Investment Process. The CEO Science Leader Scheme, which commenced in June 2005, aims to attract up to 25 of the best young scientists from across the globe over the next five years and to provide them with resources and flexibility of research direction to allow them to deliver outstanding scientific impacts. It is envisaged that they will help generate a science-based cultural change amongst their peers.

The Science Leader Scheme is directed towards high-performing scientists with between five and ten years post-doctoral

Table 2: Number of Students Supervised and Sponsored, and number of Post-Doctoral Fellows employed by CSIRO

Supervision	2000–01	2001–02	2002–03	2003–04	2004–05
PhD	475	433	425	464	463
Masters	57	53	48	46	32
Honours	77	71	62	56	43
Total	**609**	**557**	**535**	**566**	**538**
With CRC	23%	26%	21%	22%	23%

Sponsorship	2000–01	2001–02	2002–03	2003–04	2004–05
Full	42	49	52	70	48
Partial	86	112	142	165	197
Total	**128**	**161**	**194**	**235**	**245**
PhD	110	144	179	219	232
Masters	8	9	4	3	11
Honours	10	8	11	13	2
Total	**128**	**161**	**194**	**235**	**245**

Post-Doctoral Fellows	2001–02	2002–03	2003–04	2004–05
Post-Doctoral Fellows	183	207	259	288

experience. The scheme is talent driven, but research areas would need to complement or extend core research priority areas within CSIRO. The scheme is differentiated from the CSIRO Post-Doctoral Fellowship Program and other Australian Research Council Fellowships as it offers significantly more operating funding to facilitate the development of a world-class research team.

2.2 Optimise delivery of all research activities by improving project management

Success measures:

- *External/internal audit findings on project management practice*
- *Customer assessment of CSIRO 'Process and People'*
- *Proportion of projects completed on time, on brief and on budget*
- *Number and proportion of projects discontinued*

The Australian National Audit Office (ANAO) follow-up review in October 2004 noted significant progress by CSIRO in addressing project management issues. The Board Audit Committee actively monitored the improvement program during 2004–05 and subsequently determined to remove project management from its list of issues.

A new *CSIRO Management of Projects and Other Work Policy* was announced in November 2004. To support and enable implementation of the policy, a new Project Management Manual was released in April 2005, and Project Workflow has been implemented as an online tool that covers all aspects of project management, from initiation and planning through to delivery, project review and closure.

The implementation of these initiatives will further enhance the provision, over time, of more consistent and meaningful data to support project management. In the interim, a new set of measures has been developed

to assist in monitoring project management performance. These measures are reviewed quarterly by Group Executives and senior Divisional managers. The results indicate that there is some room for improvement in the financial management of projects, with approximately 23 per cent of projects showing unfavourable variance from budget at the end of the financial year.

Customer Value Survey scores provide an external assessment of attributes relevant to project management from the perspective of customers. The most recent results (Table 3) show that CSIRO achieved comparative value scores of 104 and 105 respectively for 'products and services' (on brief) and 'people and processes' (on time and budget) respectively. These scores indicate that customers who responded to the survey rated CSIRO more highly on these attributes than alternative providers. However, the results are not as strong as those achieved in previous years. A detailed analysis of these results and comments provided by respondents will provide important input to a broad ranging examination, during 2005–06, of how we might improve our client engagement and impact.

Table 3: Customer Assessment of CSIRO's Performance: Quality Attributes

Attribute	Year to June 2003	Year to June 2004	Year to June 2005
Product and Service			
CSIRO Score	7.4	7.7	7.1
Comparative Score	113	109	104
Process and People			
CSIRO Score	7.2	7.5	7.1
Comparative Score	110	108	105

See glossary for a guide to the interpretation of CVS scores.

With changes to project management policy and support systems, it has not been possible to produce reliable quantitative data on the number and proportion of projects discontinued. However, as noted in Section 1.2, the implementation of CSIRO's Program Performance Framework (PPF) provides a mechanism for the active assessment of project performance in the light of both annual and longer-term goals. These regular internal PPF reports provide evidence of a significant level of resource reallocation including the 'fast-failing' of projects where warranted on the basis of past performance and future prospects.

2.3 Build our global recognition for leadership in our chosen science domains

Success measures:

- ***Number of publications by type***
- ***Citations of publications***
- ***Citations of patents (current impact index)***
- ***Number of publications, excluding client reports, per research scientist/engineer***

Trend data for CSIRO's publication and patenting activity are shown in Tables 4 and 5. Overall publication and patenting rates remain on a par with the previous year's performance. CSIRO remains a significant contributor to the international scientific literature across a wide range of research fields – in both quantity and quality.

Based on the Institute for Scientific Information's (ISI) Essential Science Indicators for 2004–05, (monitored across 3 400 institutions), CSIRO ranked in the top one per cent of institutions worldwide in 12 of ISI's 22 subject categories (based on the total number of citations over a rolling 10 year period). The average citation rate for all CSIRO publications included in the ISI database increased from 9.18 to 9.87. This is above the ISI average of 8.27 and the Australian average of 8.61. It is second only to the Australian National University amongst Australian institutions.

Table 4: CSIRO Publications and Reports (number in each calendar year)

Type of publication	2000	2001	2002	2003	2004
Journal articles	1 619	1 631	1 686	1 836	1 858
Conference papers	1 035	1 096	1 142	1 428	1 713
Technical reports	175	153	240	442	280
Books and chapters	178	128	223	240	270
Total	**3 007**	**3 008**	**3 291**	**3 946**	**4 121**
Average per research scientist/engineer			2.11	2.49	2.59
Client reports	8 936	9 324	10 486	8 451	8 251

Table 5: CSIRO Intellectual Property (number as at 30 June each year)

Patent category	2001	2002	2003	2004	2005
Inventions (patent families)	751	733	779	754	745
New inventions	93	80	92	89	79
Current PCT[1] applications	82	104	90	92	95
Granted patents	1 774	1 801	2 002	2 079	2 048
Live patent cases	3 475	3 537	3 965	3 961	3 919
Australian trade marks		262	287	290	306
Foreign trade marks		84	93	92	100
Australian plant breeders rights		65	62	77	80
Foreign plant breeders rights		17	17	17	21
Australian registered designs		8	5	3	3
Foreign registered designs		9	12	12	12
Current Impact Index[2]	**0.60**	**0.53**	**0.56**	**0.65**	**n/a**

[1] Patent Cooperation Treaty

[2] The Current Impact Index for the calendar year indicated. See glossary on page 250 for definition. These data were sourced from CHI Research Inc. Later data not available due to change in provider.

A recent evaluation of CSIRO's performance in ISI indexed publications, commissioned from the Research Evaluation and Policy Project (REPP) at the ANU, has confirmed CSIRO's position as a high-impact contributor (where 'impact' is based on the number of times a paper is cited in other published papers). In Figure 3 a position in the top right quadrant indicates that CSIRO papers are published in high-impact journals and that CSIRO papers receive more than the average number of citations for papers in the field.

The REPP analysis also investigated the proportion of CSIRO's publications that are published in each of four equal groups

of journals determined on the basis of their average citation per publication rates for 1999 to 2003. Using the full SCI journal set, excluding medical and health sciences journals, it was found that 33 per cent of CSIRO publications in the period of the analysis appeared in journals in the top impact quartile and a further 36 per cent in the second impact quartile, which compares favourably with previous periods of analysis.

During the year, CSIRO scientists received a range of international awards acknowledging outstanding contributions to science. These are detailed in the 'Awards and Honours' section of this Report (page 101).

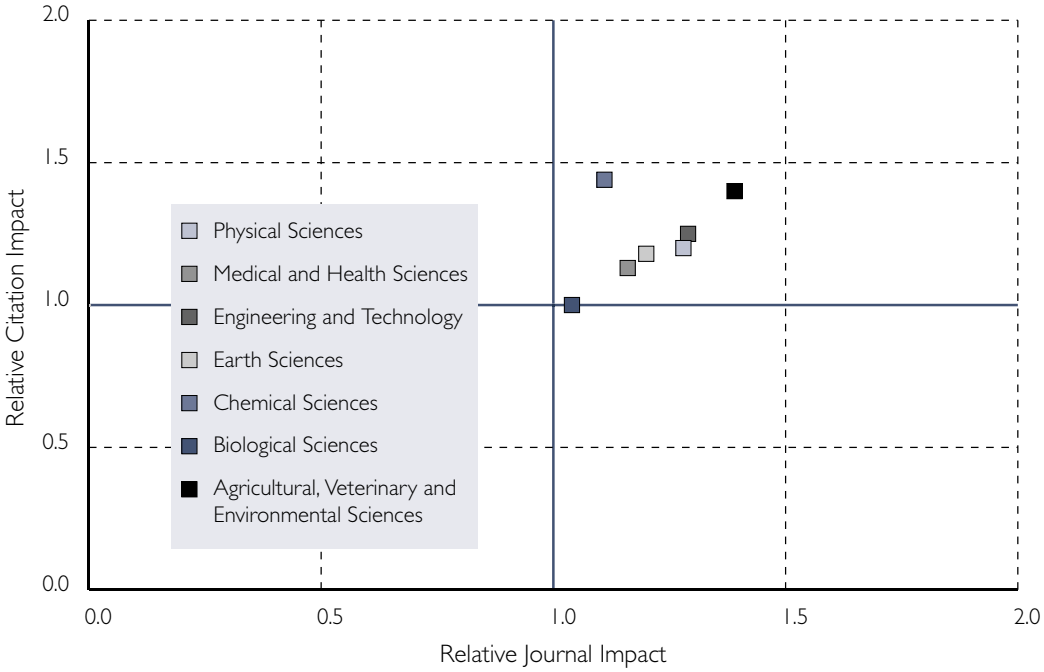
2.4 Help Australia play a leadership role in major international science facilities such as the Square Kilometre Array

Success measures:

- *Australian engagement in the Square Kilometre Array (SKA)*
- *Initiatives to establish international science facilities*

CSIRO's goal in 2004–05 was to establish sources of funding and develop a resourced project plan for siting of a new technology demonstrator site for the SKA in WA. In progress to date, the proposal to build the extended New Technology Demonstrator (xNTD) radio telescope in WA was enthusiastically endorsed by the Executive Team as vital in maintaining Australia's pre-eminent

Figure 3: CSIRO's Impact in Research Fields*



* *The figure includes Research Fields (as defined in the Australian Standard Research Classification) in which CSIRO published more than 100 publications in ISI indexed journals in the five year period 1999-2003.*

position in the international SKA project. Final funding is to be subject to review as part of the capital budget process. The Western Australian Government also committed, during the recent state election, to provide up to $4 million in infrastructure support for the xNTD. The Australian Communications Authority has provided initial regulatory protection of the radio-frequency environment on the site, and WA State and National regulatory measures are being considered to provide further protection for the site to create an internationally valuable radio-quiet zone for astronomy. Support for the xNTD and the route to the SKA are amongst the highest priorities in the Australian Astronomy Decadal Plan 2006–15.

Goal 3 – Partnering for community impact

Partnerships allow us to have impact where our efforts alone are insufficient. They allow us to tailor research outcomes specifically to the broadest possible community needs and aspirations.

3.1 Focus and intensify collaboration with universities, CRCs and other agencies

Success measures:

- *Partnerships focused on clear strategic goals*
- *Partner feedback from collaboration with universities, CRCs and other agencies*
- *Co-location of new facilities*
- *Quality of CRC commercial engagement*

CSIRO continues to actively investigate opportunities for the co-location of facilities with other research providers. Phase two of the Property Capital Investment Plan was approved by the CSIRO Board in 2004–05 and included significant investment in co-location of facilities. Major developments include the Minerals and Chemistry Precinct at Waterford in Perth with Curtin University of Technology, the Boggo Road development with Griffith University and the University of Queensland, and the ongoing development of the Clayton site adjacent to Monash University. At present we are having discussions with regard to the choice of location for the consolidation of CSIRO sites in the Sydney region.

A report on CSIRO's collaboration with universities was provided to the Hon Dr Brendan Nelson, Minister for Education, Science and Training in February 2005. The report noted extensive links with many universities across the breadth of CSIRO's research portfolio, and it highlighted collaborative activities which were initiated or substantially advanced during 2004 at the institutional level, focusing on co-location and enhanced research capacity, recent outcomes of the CRC scheme and CSIRO's contribution to talent development.

Developing meaningful, long-term collaborative partnerships with industry, government and semi-government agencies, as well as with Australian and international universities remains a priority for CSIRO. During 2004–05, we established a formal process to provide regular quantitative and qualitative feedback on our collaboration with our research partners. That information will be reported on in the 2005–06 Annual Report.

Recent developments include:

- Implementation of the Flagship Collaboration Fund described in Goal 1.3.
- Appointment of Dr Brett Bateup, former Chief of CSIRO Textile and Fibre Technology, as State Relationship Manager for Victoria.
- Commencement, in February 2005, of a collaborative project between CSIRO Petroleum and German-based research centre Laser Zentrum Hannover eV (LZH) that could save millions of dollars in oil exploration costs and introduce new Australian geochemical and petroleum analysis techniques to Europe.

- The South Australian Government has allocated $9.5 million towards a new Wine Innovation Cluster. The funding will be used to link the Australian Wine Research institute building on the Adelaide University's Waite campus with CSIRO Plant Industry's research facilities.
- A new Collaborative Research Support Scheme with Monash University at $300 000 per year (jointly funded) to encourage the development of collaborative research between the two organisations with preference given to early career researchers. We are also developing a 20-year strategic plan to increase the impact of collaboration between the University and CSIRO by capturing the opportunities and advantages that emerge from co-location at Clayton.
- Food Science Australia and the Queensland Department of Primary Industries and Fisheries have signed a Memorandum of Understanding that creates a framework to explore how their capability and research platforms may yield greater benefit by working together more closely.
- CSIRO and ANSTO are investigating the potential for increased collaboration, building on significant work for the minerals industry.

The ANU and CSIRO recently completed a review of their relationship as requested by the Minister for Education, Science and Training, involving a Steering Committee under the independent chairmanship of Sir Graeme Davies (Vice Chancellor, University of London). During discussions with a broad range of CSIRO and ANU staff, as well as external stakeholders, the committee found a breadth and depth of existing collaborative activities (in Canberra and nationally); a unanimous willingness by staff to partner; a number of potential new research initiatives; and some common administrative obstacles that could be easily rectified. Furthermore, the review process has identified opportunities and processes for enhancing partnerships with the many other universities and organisations we currently work with.

CSIRO's continuing commitment to the CRC Program is demonstrated through our participation in 49 of the 69 current CRCs. All Round 9 CRCs (announced in December 2004) have adopted the standard contract model, paving the way for sound commercial arrangements in these new CRCs. CSIRO's commitment over the next seven years to the ten new (Round 9) collaborative ventures will amount to $195 million involving 720 full-time equivalent staff. Further details on CSIRO's involvement with CRCs can be found at Appendix 6.

The Outcomes and Outputs section of this report includes examples of successful research conducted with CRCs including:

- Innovative process for nickel extraction (page 46)
- Managing drainage in WA's wheat belt (page 54)
- Progress toward corneal implants (page 34)
- Assessing coal performance for use in 'clean coal technologies' (page 41)
- Sustainable aquaculture of Atlantic salmon (page 55)
- New understanding of fungal infection in vines (page 63)

Examples of collaborative research outcomes with Universities include:

- National Carbon accounting tool box for the land sector (page 62)
- New technology for the northern beef industry (page 57)
- Improving our habitat (page 53)
- Studying emissions from forest fires (page 49)

3.2 Service the needs of government for informed policy setting

Success measures:

- *Engagement with the federal and state/territory governments (including Parliament and administration)*
- *Government satisfaction with CSIRO*

In 2004–05, CSIRO established a formal process to provide regular quantitative and qualitative feedback concerning our engagement with Government stakeholders. That information will be reported on in the 2005–06 Annual Report.

The Executive Director of Science Planning has played an extremely active role via membership of the various advisory committees for both the Research Quality Framework (RQF) and National Collaborative Research Infrastructure Strategy (NCRIS). For the RQF the Executive Director is a member of the Expert Advisory Group and is providing critical input to the development of the framework including regular reporting against CSIRO's experience with the new Science Assessment Reviews (a condition of the Triennium Funding Agreement). For the NCRIS process, CSIRO has also provided considerable input via membership of the Advisory Committee as well as coordination of a survey of possible infrastructure requirements.

CSIRO's Government Relations unit prepared information sheets about CSIRO's work at electorate, state, national and international levels, which were distributed in kits to the Minister for Education, Science and Training, the Department of Education, Science and Training, all Senators and Members of Parliament, relevant Parliamentary Committees and the Parliamentary Library. The information kit was recommended by the Minister as a model for other publicly funded research organisations. CSIRO also received favourable engagement and feedback from other parliamentarians, including valuable information about what material they would like to receive from CSIRO and how to best communicate with them.

Our interactions with government are also enhanced through a variety of other means:

- Regular high-level meetings are held with Ministers, Departmental Secretaries and other Agency Heads, and with Ministerial and Departmental staff.
- Our Government Relations team provides continued support to our scientists to effectively engage with Government.
- CSIRO was a Gold Sponsor of the Federation of Australian Scientific and Technological Societies (FASTS) *Science Meets Parliament 2005*, which involved 46 CSIRO scientists, comprising almost 25 per cent of all participants.
- CSIRO State Relationship Managers (in Victoria and Queensland) work closely with their respective State Innovation Departments.

During the year, CSIRO made submissions to Commonwealth and State Government inquiries covering such areas as innovation, the development of the uranium industry, salinity and rural skills training and research. We also provided a parliamentary briefing on new domains in astronomy and collaborated with the Parliamentary Library in a workshop on nanotechnology. CSIRO also provided a briefing to the House of Representatives Standing Committee on Science and Innovation at their request.

The Outcomes and Outputs section of this report includes examples of the impact of CSIRO research on policy development including:

- Victorian sustainability strategy (page 58)
- Improving air quality (page 54)
- New asset management technology saving money and water (page 34)
- Survey of hydrogen research activities in Australia (page 44)

- Measuring growth in carbon dioxide levels (page 51)
- Plan for Russian wheat aphid incursion (page 51)

3.3 Enhance communication to raise public and stakeholder excitement and trust in science

Success measures:

- *'The importance of the CSIRO brand name' (from the Customer Value Survey)*
- *Trust and excitement in science amongst target audiences*
- *Recognition of CSIRO's brand*
- *Establish benchmarks of brand acceptance and strength*

In 2004–05, we established our Corporate Brand and Marketing Unit to advise on the CSIRO Brand applications prior to the finalisation of the Brand Positioning and Performance Study. The study will provide benchmarks and organisational health measures relative to our stakeholder audiences. These measures will be reported in the 2005–06 Annual Report.

While we acknowledge that there has been some negative media around CSIRO's leadership and research direction, overall media coverage has been positive. CARMA reports for the 2004–05 period indicate that approximately one per cent of print media was 'unfavorable', with the remainder being either 'favourable' or 'neutral'.

The latest results from our Customer Value Survey again demonstrate how important the CSIRO brand name is when choosing an R&D provider (see Table 6).

Table 6: Customer Value Survey Results: CSIRO Brand Preference*

Customer Value Survey	Year to June 2003	Year to June 2004	Year to June 2005
CSIRO Score (target)	6.6	6.8	6.6 (6.8)
Comparative Score (target)	123	119	121 (125)

* *'The importance of the CSIRO brand name in choosing an R&D provider'. See glossary for a guide to the interpretation of CVS scores.*

To enhance CSIRO's accessibility to potential and current clients, partners and stakeholders through the internet, a new unified web presence for CSIRO is in the advanced stages of development. The CSIRO.au website and content management system were released internally on 1 June 2005 and show a preview of the design, content and performance of the new site. The external launch will occur later in 2005. Once fully populated, CSIRO.au will provide users with one CSIRO site in place of the 250 that currently exist. By emphasising science and strategy over organisational structure, the new site will strengthen commercial engagement and provide a powerful tool to meet our customer and stakeholder needs.

Internal communication is also of critical importance to us, especially given we are undergoing significant strategic change. To raise the priority of internal communication, a senior divisional officer was appointed in early 2005 to help facilitate improved communications with staff.

CSIRO Alumni was launched in September 2004 under Honorary President Dr Jim Cullen, former Chief of CSIRO Entomology, and has a membership of more than 1 800 former-CSIRO employees. Activities and benefits include providing voluntary services to CSIRO, attending divisional scientific seminars and being kept abreast of developments at CSIRO through regular newsletters and a

dedicated website. During 2004–05, Alumni events were held in Hobart, Perth, Canberra, Sydney, Melbourne and Newcastle.

The Education and Outreach section on pages 97 highlights the continued success of CSIRO's education programs. Other initiatives through which CSIRO has been actively involved in promoting science to key target audiences include:

- playing a key role in the Innovation Festival with the *Scientist in the Marketplace* program – which will now become an annual component of the Festival
- publishing of '*CSIRO Solve*' as an insert in the Financial Review three times this year. *Solve* is designed to inform business and industry of the emerging science and technology that is coming through the pipeline from CSIRO
- science careers forums with CSIRO scientists making a number of presentations
- developing a maths careers website.

3.4 Partner with other agencies to advance Australia's global development contributions

Success measures:

- ***Partnerships with other agencies to advance global development***
- ***Level of global aid funding (including from Australia)***
- ***More focused and effective international effort***
- ***Evidence of impacts on global development***

CSIRO continues to bring multidisciplinary expertise to problems of international humanitarian concern. CSIRO acted swiftly in response to the Boxing Day Tsunami. CSIRO, the Australian Institute of Marine Science (AIMS) and the Great Barrier Reef Marine Park Authority (GBRMPA) coordinated a 'team-Australia' response to the Prime Minister's commitment to the Republic of the Maldives. We provided ecological expertise on the coral reef, coral reef fish communities, lagoonal fish (particularly baitfish), ground water contamination, erosion, litter and the use of corals in any rebuilding exercise.

In January 2005, Rwanda's Cabinet ratified the National Integrated Innovation Framework developed by our Director of Global Development. This framework forms the basis of Rwanda's Science, Education, Innovation and Technology Policy.

In 2004–05, **CSIRO** PUBLISHING, in collaboration with the United Nation's Food and Agriculture Organisation's *Access to Global Online Research in Agriculture* initiative, made CSIRO's online journal content available to teaching and research institutions in some of the poorest nations. This initiative shares CSIRO's published research outcomes dating back to 1950 and our agricultural research, in particular, will make a real difference in the developing world nations.

Unfortunately, our two proposals that were short-listed with the Bill and Melinda Gates Foundation 'Challenges in Health Initiative' (as reported last year), were not successful in the final round.

In February 2005, CSIRO hosted the 4th Annual Principals' Meeting of the Global Research Alliance (GRA) comprised of CSIRO and eight other 'sister' organisations around the world. Dr Geoff Garrett, Chief Executive, CSIRO has been elected to the four-person Executive Committee of the GRA. An example of the GRA's success in 2004–05 was winning the World Bank project to assess the strategy being followed by the World Bank/Global Environment Facility (GEF) for solar thermal power technology in four countries.

A number of initiatives throughout the year will contribute to a more focused and effective international effort:

- CSIRO has signed a Memorandum of Understanding (MOU) with the Korean Institute of Geoscience and Mineral Resources.
- The SME group is actively engaging One-CSIRO prospects in Iran.

- There are case-by-case interactions in Canada, South Africa and Chile and an emerging strategy for China. In November 2004, for example, CSIRO Group Executive Michael Eyles led a high-level delegation to China. This was by invitation and with the view to establishing an ongoing collaborative S&T arrangement focusing on agricultural and environmental issues. A MOU between CSIRO and the Chinese Ministry of Education has been signed and a second MOU, with the Chinese Ministry of Science, is being negotiated.
- Standard form agreements used by The Australian Centre for International Agricultural Research (ACIAR) for work with CSIRO have been renegotiated (total project value $4.65 million).
- A CSIRO delegation visited Vietnam in May/June 2005 to participate in an Australia–Vietnam High-level Science and Technology Dialogue. The meetings established the basis for further growth in our existing relationships and simultaneously established that CSIRO will act in concert with Department of Education, Science and Training (DEST), the Australian Centre for International Agricultural Research (ACIAR) and AusAID in further initiatives.

CSIRO has been engaged in 746 international activities in 84 countries over the past two years. At the request of the CSIRO Board, the Organisation is currently reviewing its strategy in regard to international engagement, and a senior Executive Management Council (EMC) member, Dr Tony Haymet, is being seconded to drive this review. The aim is to provide more guidance for CSIRO Business Units in relation to the commercial, community, and industry development consequences and opportunities of CSIRO's international work.

The Outcomes and Outputs section of this report includes examples of research with impact on global development including, among others:

- Rodent control in Vietnam (page 59)
- Reducing salt in tannery effluent (page 31)
- Managing invasive species (page 58)
- New method to find mine-derived sediment deposits (page 46)
- Solar thermal market development strategy (page 41)

Goal 4 – Serving as a catalyst for industry innovation

By focusing on the current and future needs of our industry customers and stakeholders, we are making contributions to science and to Australia's economic prospects. Working closely with industry, we see considerable opportunities to deliver enhanced commercial impact for Australian industry, boosting gross domestic product growth.

Over the past year, CSIRO has increasingly executed on its strategic objective of eliminating subsidisation in consulting services. At the same time, we have responded to a September 2003 Department of Finance and Administration regulation in relation to indemnities and warranties by negotiating out any indemnities that would conflict with that policy. Over the year, CSIRO has also been more selective about what co-investment activity it enters into, seeking larger-scale and more strategic impact from its partnerships. The side effects of these developments are apparent in the client engagement results which follow. CSIRO remains committed to pursuing growth in client impact and engagement, maintaining the direction we have taken during the past year.

4.1 Intensify engagement with rural research and development corporations to grow regional and new industries

Success measures:

- *Value of significant commercial relationships with research and development corporations (RDCs) and States: $10 million threshold*

- *Revenue from RDCs*
- *Customer Value Survey results – RDCs*
- *Growth of targeted regional industries*
- *Impact of research cofunded with RDCs*

CSIRO's State and Regional Partnership team continue to forge closer ties with our key partners in the regional development area, including our larger Rural R&D Corporation partnerships and targeted State Governments. The latest Customer Value Survey showed mixed results for RDCs, a market segment where CSIRO's response to indemnity and warranty requirements was considered to be particularly problematic by some clients, and where the policy response initially caused a backlog of transactions. As a result, CSIRO's own score fell back from the result achieved the previous year, however, CSIRO's 'overall value' rating continues to trend upward toward parity with alternative R&D providers (Table 7).

Table 7: Customer Value Survey Results for RDCs

Overall Value	Year to June 2003	Year to June 2004	Year to June 2005
CSIRO Score	6.1	6.7	5.9
Comparative Score	91	96	99

See glossary for a guide to the interpretation of CVS scores.

New contracts with Research and Development Corporations (RDCs) during the year amounted to $44.3 million and included the Crop Biofactories Initiative with the Grains RDC (GRDC) (a 50:50 co-investment involving three Divisions with a value of $13.5 million). Crop Biofactories is a long-term strategic initiative which repositions the grains industry in the chemicals value chain through sustainable value adding.

RDC revenues for 2004–05 were $48.0 million, including revenues from Meat and Livestock Australia (MLA) and Australian Wool Innovation (AWI). In 2003–04, RDC revenues were $49.5 million. Our top three RDC clients (GRDC including Graingene, AWI, and the Cotton RDC) generated $32.2 million in 2004–05 revenue, or 67 per cent of the total RDC segment. Revenue for these top three accounts grew by 6 per cent from $30.4 million in 2004–05. Over the coming year, CSIRO will build traction with these and other RDC clients by addressing the impediments to continued growth in partnership impact.

The Outcomes and Outputs section of this report includes examples of the impact of research co-funded with RDCs, and contributing to the growth of regional industries, including, among others:

- Improved quality and efficiency in cheese making (page 65)
- Resistant chickpeas reduce the use of insecticides (page 55)
- New software to manage pesticide use (page 52)
- Delivering integrated rangeland monitoring to the pastoral industry (page 38)
- Eradicating insect pests in pine plantations (page 64)
- Tasty new table grape variety (page 61)

CSIRO's government business segment has grown from $83.8 million in 2003–04 to $89.7 million in 2004–05. We have invested in managing relationships with State and Commonwealth Agencies directly, with significant participation by CSIRO's Executive Team, Flagship Directors, and Division Chiefs. Over the next twelve months CSIRO intends to act as a catalyst for aligning State and Commonwealth innovation programs, particularly in relation to Flagship activity.

Significant State transactions during the year included:

- Queensland – $8 million co-investment into the Centre for Low Emission Technology and $11.6 million on infrastructure transactions

- Victoria – $7.5 million in science, technology and innovation (STI) grants
- Western Australia – $20 million, a Western Australian Government infrastructure grant for the Western Australian Energy Research Alliance (WA-ERA) Joint Venture, with a contribution to CSIRO exceeding $10 million.

The Outcomes and Outputs section of this report includes examples of the impact of research conducted in collaboration with State and local governments including:

- Monitoring water quality in the Douglas Shire (page 33)
- Reducing saline groundwater in the Murray River (page 42)
- Studying emissions from forest fires (page 49)
- Systematic regional planning (page 56)
- Golden opportunity for mungbean farmers (page 66)

4.2 Structure deeper and more meaningful relationships with large corporations

Success measures:

- ***Value of significant commercial relationships with large corporations: $2 million threshold***
- ***Revenue from large companies***
- ***Customer Value Survey results – large companies***
- ***Impact of research for large companies***
- ***Lifetime value for contracts with large corporations***
- ***Review/overhaul the Customer Value Survey instrument and its application***

Co-investment, consulting and services revenue received from the Australian private sector in 2004–05 was $63.9 million, (down from $66.5 million in 2003–04). Of this, revenue from larger companies delivered $39.3 million in 2004–05 compared to $44.6 million in 2003–04. The reduction occurred in smaller value contracts and in consulting services, with growth in larger contracts. We have not yet 'broken through' to significant increases in revenue with larger corporations, despite significant effort during the year, but there is growing traction. Substantial new agreements were struck with the Commonwealth Bank, BHP Billiton, Woodside Energy, and Chevron Corporation. In total, over $15 million (lifetime value) was achieved from new collaborative and contract R&D services deals with major corporations, with the potential to double this under new corporate grant facilities.

The Customer Value Survey results (Table 8) demonstrate that we need to make a greater effort to build productive relationships with large corporations. To this end, a program of senior corporate engagements has commenced to enable CSIRO to address major business opportunities at the enterprise level. This program will be continued through 2005–06, with a focus on companies in the natural resources, financial services, chemicals and manufacturing sectors.

Table 8: Customer Value Survey Results for Large Corporations

Customer Value Survey	Year to June 2003	Year to June 2004	Year to June 2005
CSIRO Score	6.9	6.8	6.4
Comparative Score	107	106	101

See glossary for a guide to the interpretation of CVS scores.

The planned review of the Customer Value Survey instrument and its application has been initiated and will be concluded by December 2005. The aim is to deliver both trendline customer value feedback and more intensive feedback systems for our key accounts.

The Outcomes and Outputs section of this report includes examples of the impact of research for large companies including:

- Development of drained cathode cells for aluminium smelting (page 44)
- Safer aeroplane panels (page 39)
- Improving air quality (page 54)
- New software to manage wellbore instability (page 47)
- Improving mineral processing (page 43)
- Improved motors for domestic appliances (page 33)
- Improving environmental monitoring (page 42)

4.3 Accelerate the growth of promising technology-based Small and Medium-sized Enterprises (SMEs)

Success measures:

- *Number of significant commercial relationships with SME growth stars: $0.1 million threshold*
- *Revenue from SMEs*
- *Customer Value Survey results – Small enterprises and Medium enterprises*
- *Impact of research for SMEs*
- *Australian Growth Partnerships*
- *FastTrack contract simplification process*

During 2004–05, CSIRO had relationships with 40 SMEs that generated over $100 000 each in revenue for CSIRO. Total co-investment, consulting and services revenue received from these SMEs was $10.9 million. By way of comparison, in the previous year 24 SME's generated over $100 000 each in revenue for CSIRO for a total of $8.6 million. Significant clients in this category include Geelong Textiles, Hatch Associates, Ceramic Fuel Cells, and Vectogen.

Overall co-investment, consulting and services revenue received by CSIRO from all SMEs in 2004–05 was $24.6 million, compared with $21.9 million in 2003–04. The number of CSIRO interactions with SMEs using the simplified *FastTrack* contracts (see below) has significantly increased during the year. However, the total number of SMEs that we have had interactions with during the year has declined by around ten per cent, in particular in smaller transactions. This may reflect the move to eliminate subsidisation of consulting and testing services and to offer these services at market prices.

In 2005–06, CSIRO will reposition its value proposition to SMEs in recognition of the vital role they play in the Australian economy. While we will continue to expect full cost recovery for contract work undertaken, we recognise that different engagement models are required for large and small organisations and will address increasing our impact with SMEs as a priority.

Customer Value Survey results for small and medium enterprises are shown in Table 9. The reduction in subsidisation of contract work is clearly reflected in the comparative score for small enterprises, with CSIRO now on par for value with other research providers.

Table 9: Customer Value Survey Results for Small and Medium Enterprises

Overall Value	Year to June 2003	Year to June 2004	Year to June 2005
Small Enterprises			
CSIRO Score	6.9	7.0	6.8
Comparative Score	124	104	99
Medium Enterprises			
CSIRO Score	6.7	6.9	6.5
Comparative Score	93	102	103

See glossary for a guide to the interpretation of CVS scores.

The *Australian Growth Partnerships* (AGP) proposal (highlighted in last year's Annual Report) was discussed with a number of State and Commonwealth Agencies, but to date this initiative targeting SMEs with growth potential has not been funded.

FastTrack contract simplification continues to gain support across CSIRO and with our collaborators and clients. During 2004–05,

the implementation was completed and *FastTrack* is now operating as part of normal business practices in all Divisions. Since its launch more than 2 700 approved proposals have been generated with *FastTrack*, allowing faster turnaround for routine contracts and freeing up legal staff to focus on more complex, higher value agreements.

The Outcomes and Outputs section of this report includes examples of research with impact on SMEs including:

- Spinning wool and wool blends faster (page 34)
- Sensitive detectors for mineral exploration (page 37)
- Innovative model for the Australian sugar industry (page 55)
- Improved quality and efficiency in cheese making (page 65)
- New device for forest assessment (page 61)
- Successful semiconductor spin-off (page 36)

4.4 Reinvent our ICT capabilities to strengthen Australia's knowledge-based industries

Success measures:

- ***Demonstrated impact in ICT research***
- ***ICT Centre collaboration across CSIRO***

CSIRO has adopted the goal of becoming a niche global player in ICT. As a leading and integral component of Australia's ICT research infrastructure we drive national productivity, deliver public good outcomes and create wealth. This goal will be achieved by a strategy of industry engagement leveraging CSIRO's broad domain expertise. We are focusing on application domains where Australia has international leadership and those that are critical to Australia's future. Our chosen domains are mining, agriculture, energy, health, counter-terrorism and the environment. We are partnering with the relevant CSIRO Divisions and Flagships to deliver our outcomes.

In working towards our goal, we have focused our capability into four areas: wireless technologies, networking technologies, information engineering and autonomous systems. These capabilities are underpinned by a Chief Scientist and Science Leaders, who are ensuring that our science and its outcomes are of the highest quality.

Our achievements in 2004–05 include:

- completion of the successful spin-off of compound semiconductor technologies to EpiTactix Pty Ltd with $5.2 million in start-up funding
- commencement of CeNTIE-2, a three-year $23 million co-investment between CSIRO and the Department of Communications, Information Technology and the Arts (DCITA) in advanced networking applications
- CSIRO's world-leading enterprise search technology – P@noptic – secured over $1.2 million in licensing fees including servicing the whole of Australian Government website: www.australia.gov.au. A commercial spin-off of P@noptic into a company is planned
- progress towards commercialisation of ViCCU – Virtual Critical Care Unit – which delivers specialist health care to remote hospitals via advanced networking and telecommunications
- a signed agreement with Danish Radio to purchase two CSIRO ICT Centre designed Multibeam antenna systems for installation in their new multimedia house in Copenhagen
- commencement of a partnership with the Massachusetts Institute of Technology (MIT) on a NASA contract (valued at $1.5 million to CSIRO) to build a robotic excavator as part of their return to the moon program.

Examples of collaboration across CSIRO in 2004–05 include:

- Wireless sensor networks for monitoring cattle in livestock applications
- Robotic handling of hot materials
- Health data integration

- Distributed demand side energy management
- New technology demonstrator (NTD) and the Square Kilometre Array (SKA)
- NASA Ageless Aircraft Vehicles project

Goal 5 – Building One-CSIRO capability and commitment

To address major national challenges and opportunities more effectively, CSIRO must leverage its scale and scope through effective multidisciplinary and cross-boundary teamwork. This teamwork enables CSIRO to identify and exploit new opportunities across conventional boundaries. We call this 'One-CSIRO'.

5.1 Stimulate future breakthroughs by promoting cross-pollination, especially in frontier research

Success measures:

- ***Establish an Emerging Science Initiative (ESI) including implementation of the Program Performance Framework (PPF)***

CSIRO's collaborative and multidisciplinary culture makes solving major national challenges a critical role for us. Paradigm-shifting science aimed at advancing fundamental scientific understanding takes place within all of CSIRO's core roles. Indeed, some of CSIRO's biggest scientific breakthroughs have come from work being driven through other roles.

The Emerging Science Oversight Committee (ESOC) has reviewed Divisional Emerging Science Plans and has also selected ten topics for planning and development under the new Emerging Science Corporate Scheme. This scheme aims to build new research capabilities which span Divisional interests and boundaries. The ten topics are:

- Environmental nanovectors
- Genomic and metabolomic modelling for controlled biological change
- Hierarchical material structures: novel 3-D porous particulate systems
- New materials for renewable energy
- Representing human decision-making in complex system modelling
- Selective transport of small molecules
- Sentient structures
- Small regulatory RNAs: the key agents in controlling gene activity
- Synchrotron science
- Synthetic enzymes for synthetic chemistries.

Each topic was provided with funding of $50 000 – $100 000 for planning purposes which included workshops open to all CSIRO staff and visits from international experts. For example, a Small Molecule Transport workshop in Perth was co-sponsored by the West Australian government and was a great success. CSIRO participants from eight Divisions plus CSIRO Corporate joined potential collaborators from universities, South Africa and the United States to discuss how this technology could revolutionise water desalination and natural gas extraction.

Some other highlights from the Emerging Science program include:

- Nanophotonics – Advanced techniques have been developed to fabricate high precision nanoscale structures for various applications (for example sensors, meta-materials, advanced optical coatings and molecular electronics circuits).
- Complex Adaptive Systems – A prototype electricity demand model has been developed for the National Energy Market SIMulator. This model is designed to generate realistic scenarios of electricity demand based on climate data.
- Social and Economic Integration – In the Northern Territory's Daly Basin, new methods being developed for indigenous engagement and incorporation of cultural values into ecosystem services theory have exceeded expectations.
- Complex Systems Science – A series of case studies have demonstrated the value of

applying complex systems approaches to the analysis of terrestrial ecosystems and associated human systems.

5.2 Be among the best in governance, OHS&E and performance management processes

Success measures:

- *Improved OH&S injury indicators and positive performance indicators*
- *Improved safety culture*
- *Management of performance and Annual Performance Agreement (APA) completion rates (Insight Survey results)*
- *Implementation of the Performance Measurement Framework*
- *Develop and implement a Business Continuity Plan*
- *Develop and roll out Corporate Governance Guide*
- *Improve governance processes in commercial area*

There have been significant improvements in CSIRO's Occupational Health Safety and the Environment (OHS&E) performance during the reporting year. Details of CSIRO's OHS&E performance are provided on pages 128–134.

CSIRO's Performance Measurement Framework was revised during the year to make the framework more intuitive for managers and staff, and to remove duplication in reporting processes. A Performance Measurement Manual describing the framework has been developed and made available to all staff.

To help maintain our focus on delivery and execution, and to underpin accountability for performance, the Executive Team (ET) and CSIRO Board regularly consider an Organisational Performance Report. Progress reports are compiled at the end of October and February, and whole-of-year performance is detailed in an annual report.

Each report consists of five components:

- Strategy implementation
- Organisational health
- Program performance
- Science highlights
- Outcomes

Our Governance Framework has been updated and brings together all of the elements that contribute to the governance of CSIRO. The Framework will be used for improved communication with people both within and outside the Organisation about the importance of good governance in delivering excellent science.

We have also introduced a new Policy Framework which sets out how all CSIRO policy will be updated and standardised using a new One-CSIRO template. Considerable progress was made in this area during 2004–05, with policies in a number of key areas being reviewed, updated and made available to staff.

The Board completed its annual review of its Charter, Committee Charters and directions to the Chief Executive, and issued updated versions of these documents.

We have developed our Business Continuity Plan and will put in place a program of staff education and ongoing training.

In the commercial area, ComEx and the Board Commercial Committee (BCC) processes are fully operational. BD&C operational policies have been reviewed and revised and will be implemented from July 2005. Risk Assessment and Audit conducted a review of compliance with Commercial Policies in Divisions.

Two key programs have formed the foundation of enhancing CSIRO's leadership skills over the past year. The Australian Institute of Company Directors accredited workshop provides training in strategic direction and governance responsibilities for CSIRO staff that are directors or who may be asked to take on a directorship. The internal executive

development program, Leading the Research Enterprise, was launched early in 2004 and continues to build greater understanding of individual strengths and opportunities, and to provide our senior managers with key insights into CSIRO's current and future business needs and strategic challenges.

CSIRO has an ongoing commitment to enhancing staff performance through a comprehensive coaching framework that was introduced last year. The outcome for staff is an increased level of awareness and commitment to CSIRO processes in relation to performance management.

The impact of these programs is not yet reflected in results from CSIRO's Staff Insight survey (Table 10). Consequently, we need to maintain our focus on improving the skills of managers at all levels. A new Project Leadership Initiative has been launched to address some of the challenges faced directly by our research teams and leaders.

Table 10: Management of Performance: Insight Survey Results

Per cent favourable response	Sept 2003	March 2005
Performance management	59	56
APA completion rates*	84	77

* Annual Performance Agreement

5.3 Adopt a unified approach to improve service dramatically and grow top accounts

Success measures:

- *Number of active customer service teams*
- *Increased amount and share of research and services revenue from top five accounts*

Revenue from our top five accounts in 2004–05 was $46.4 million (16.5 per cent of total research and services revenue) up from $41.7 million (14.1 per cent) in 2003–04.

A number of customer service teams are in place to serve key clients (for example, RDCs, Boeing, State Governments). However, a uniform process for handling top accounts is not presently in place and strategies for expanding customer service teams are under review.

5.4 Implement standard processes and IT systems to enhance collaboration and efficiency

Success measures:

- *Inter-Divisional collaboration in CSIRO-wide support*
- *Aggregated Insight Survey score for Working Relationships and Work Organisation and Efficiency*

CSIRO's current suite of business support systems are based on a range of new and old technologies with increasingly complex and costly integration requirements. The lack of capacity to take an 'enterprise' view of business data can lead to multiple requests for information, and this can hinder collaboration and cause frustration. In March 2004, CSIRO commenced a project – Business Processes and Enabling Technologies Review (BETR) – to review our business support systems. The main focus of the project was to evaluate the potential to adopt enterprise-wide, standard business processes that are supported by an enabling business systems platform. Following a tender process, CSIRO selected SAP as a preferred software supplier, subject to the successful completion of a further tender for supply of managed services to implement and provide ongoing support for the SAP platform.

Based on current planning, CSIRO will implement the new business systems platform in late 2006, providing standard, contemporary business processes and practices to support the full range of CSIRO's business activities including financial management, human resource management, project management, customer relationship management and business information. This integrated business

systems suite will replace over 100 disparate business systems currently in use with benefits including improved efficiency, more integrated processes and systems, improved support for Flagships and other cross-organisational initiatives, and enhanced management reporting.

Through our Research Support Services (RSS) project we will migrate our current divisional and corporate based models for the delivery of research support services to an enterprise-wide shared services model. The RSS project is designed to support the delivery of research across our Divisional boundaries (particularly to support Flagships and cross-Divisional programs), to enhance our service levels supporting our 'core business' of science, to provide flexibility of support into the future, and to reduce our overhead costs. This model has already been implemented across the Organisation for CSIRO IT. All non-research-based IT staff are now managed at the enterprise level. Despite some initial transitional and teething problems, we have achieved improved coordination of services, improved security and reduced costs.

The overall assessment by staff of *working relationships* and of *work organisation and efficiency* in the March 2005 Insight Survey, returned a result of 124, compared with a result of 129 in the 2003 Survey. This in part reflects an adjustment to the revised IT support arrangements and continuing frustration with the lack of integrated support systems. Despite the decline, the 2005 result remains equivalent to the world norm for R&D organisations and very significantly above the world norm for organisations experiencing rapid change.

Goal 6 – Securing a financial foundation for growth

As CSIRO succeeds and grows, the nation will benefit and the enterprise's impact and business will grow. So will CSIRO's people – as individuals and as teams – in capability and contribution.

Our overall financial performance during 2004–05 is summarised in Table 11.

Overall it was a challenging year for CSIRO. While government appropriation resources increased in line with earlier triennium and Flagship funding decisions and external co-investment, revenue increased by more than $15 million over the last financial year to $209 million, the level of consulting and research services revenue fell by $18 million to $61 million[1]. This was driven in part by the successful implementation of the Organisation's decision to move to eliminate subsidisation of these services. Intellectual property revenues remained strong at just over $20 million but slightly down on the 2003–04 outcome. This was partly because of the delay in execution of a number of planned end of year transactions. During 2004–05, greater efficiencies were achieved across a range of research support services which saw a further decrease in the Organisation's overhead ratio.

6.1 Secure greater federally funded support for CSIRO science investment

Success measures:

- *Appropriation Revenue*

In 2003, CSIRO secured Triennium Funding for 2004–07 with an additional $305 million for Flagships over seven years.

6.2 Proactively manage patent and equity portfolios to multiply IP-based revenue streams

Success measures:

- *Intellectual Property Revenue*
- *Performance of 'RIPPERS' (Reclaimed Intellectual Property Promising Extraordinary Revenues)*

The intellectual property and equity income value achieved in 2004–05 was $20.4 million. These revenues include running royalties of

[1] Prior to adjustment for work in progress and deferred revenue.

Table 11: Financial Summary

Revenue by Source	2000–01	2001–02	2002–03	2003–04	Restated 2003–04[6]	2004–05	2004–05 CSIRO Group[7]	CSIRO Strategic Plan 2003–07 Budget for 2004–05
	$m	$m	$m	$m	$m	$m	$m	$m
Co-investment, Consulting and Services								
Australian Private Sector[1]	68.6	68.6	77.8	79.6	66.5	63.9	69.8	
Australian Government	66.8	75.6	76.8	87.0	83.8	89.7	92.6	
Research and Development Corporations[1]	40.8	41.6	42.6	40.0	49.5	48.0	53.3	
Cooperative Research Centres	27.6	26.7	32.0	33.1	36.1	35.2	36.5	
Overseas Entities	31.0	35.3	34.3	33.0	36.8	33.5	35.1	
Not classified by source	5.2	0.2	0.0	0.0	0.0	0.0	0.0	
Work in Progress/Deferred Revenue Adjustment	-7.0	2.1	-1.9	1.4	1.4	-9.7	-9.7	
Total co-investment, Consulting and Services[2]	**233.0**	**250.1**	**261.6**	**274.1**	**274.1**	**260.5**	**277.7**	**318.0**
Intellectual Property, Royalties, etc	9.3	16.9	13.8	22.0	22.0	20.4	20.5	29.0
Total Research and Services Revenue	**242.3**	**267.0**	**275.4**	**296.1**	**296.1**	**280.9**	**298.1**	**347.0**
Other External Revenue (including interest)[3]	21.7	58.5	37.0	23.8	23.8	33.7	34.3	9.0
Total External Revenue	**264.0**	**325.5**	**312.4**	**319.9**	**319.9**	**314.6**	**332.4**	**356.0[8]**
Appropriation Revenue[4]	**497.0**	**509.5**	**532.3**	**568.6**	**568.6**	**577.1**	**577.1**	**591.0**
Total Revenue (excluding revenue related to assets)	**761.0**	**835.0**	**844.7**	**888.5**	**888.5**	**891.7**	**909.5**	**947.0**
Gain/(Loss) on sale of assets[5]	10.2	21.6	-2.0	5.0	5.0	14.2	14.2	0.0
Reversals of previous asset write-downs	0.0	0.0	0.0	0.0	0.0	3.1[10]	3.1[10]	0.0
Less: Expenses (excluding value of assets sold)	784.3	809.6	864.4	898.9	898.9	918.2	936.0	947.0[9]
Operating Result[4]	**-13.1**	**47.0**	**-21.7**	**-5.3**	**-5.3**	**-9.2**	**-9.2**	**0.0**

Notes:

1. The revenue shifts between 2003–04 and 2004–05 are largely attributable to customer category reclassification during 2004–05 of MLA and AWI from Australian Private Sector to R&D Corporation.
2. The decline in revenues in 2004–05 was impacted by transfer of the National Measurement Laboratory (NML) to the Department of Industry, Tourism and Resources (DITR) ($3 million) and partial transfer of Forestry and Forest Products (FFP) Division's research activities into the Ensis joint venture ($6 million)
3. The significant increase in Other External Revenue recorded in 2001–02 includes the one-off reinstatement of the $25 million receivable from Australian Magnesium Corporation.
4. All figures are net of Capital Use Charge (CUC), which was abolished from 1 July 2003.
5. The table shows net gain/loss on sale of assets. The gain on sale of assets recorded in 2004–05 includes the sale of Lindfield property in Sydney.
6. For comparative purposes, 2003–04 data has been reproduced to be consistent with current customer classifications as per 2004–05.
7. 'CSIRO Group' includes CSIRO and its interest in the external revenues (excluding partner contributions) of the Food Science Australia joint venture (85 per cent, $11.9 million) and Ensis joint venture (50 per cent, $5.9 million). CSIRO's share of the FSA joint venture changed from 50 per cent to 85 per cent in 2004–05. The Ensis joint venture commenced operation on 1 July 2004.
8. The Strategic Plan includes external revenues of $3 million for NML, $15 million for FSA and $6 million for the component of FFP transferred to the Ensis joint venture.
9. The Strategic Plan records total expenses of $962 million minus $15 million in overhead savings = $947 million.
10. Figure has been rounded.

$15.1 million (which was significantly above the previous year), and revenues from sales of equity investment and IP through spin-offs of $5.3 million. The total intellectual property and equity income revenues were below the target for 2004–05, due primarily to several equity transactions that were at term sheet stage not being closed by 30 June (these transactions are expected to close early in 2005–06). During the year, three contracts containing licences or options were executed for gene silencing technology, three other licences are currently under negotiation and two collaborative R&D contracts executed. For the Air Cargo Scanner, business and deal structure options have been determined and a request-for-proposal completed. Prospective partners have been short-listed and are in negotiations.

During the year, CSIRO formed a spin-off company, EpiTactix Pty Ltd, to develop and commercialise novel semi-conductor and transistor devices. In addition, CSIRO exited from a number of its equity holdings during the year with sale proceeds redeployed into research activities.

6.3 Deliver customer value for money and eliminate subsidisation in consulting services

Success measures:

- *Aggregate CSIRO Customer Value Score*
- *Subsidy in consulting services activity*
- *External revenue and total expenditure by investment domain*
- *External revenue by source/market segment*

CSIRO has achieved a turnaround in the subsidisation of our consulting and specialised services activities. In 2004–05, these activities achieved a surplus of $2.7 million (5 per cent) compared with a deficit the previous year of $8.9 million (13 per cent).

The Customer Value Survey results for CSIRO as a whole, aggregated across all market segments, are shown in Table 12.

While not discounting the message apparent in the slippage in customer ratings, it should be noted that a comparative value score of 102 or greater is regarded as 'above average' on world benchmarks. As noted previously, a significant element of CSIRO's strategic agenda for 2005–06 is to evaluate and improve on how we build relationships with, and deliver maximum benefit to, our many customers and diverse stakeholders.

Table 12: Customer Value Survey Results: Overall Value

Overall Value – CSIRO	Year to June 2003	Year to June 2004	Year to June 2005
CSIRO Score (target = 8.0)*	7.0	7.0	6.5
Comparative Score (target = 110)	110	107	102

** The target scores correspond to the 'world class' benchmark for overall value. See glossary for a guide to the interpretation of CVS scores.*

External revenue by source is summarised in Table 11 (located just after 6.2), and the results with regard to specific market segments have been discussed in Goal 4.

6.4 Reduce overhead and purchasing costs and manage balance sheet for reinvestment

Success measures:

- *Overhead and support costs (overhead ratio)*
- *Purchasing costs*
- *Overall financial result*

A further modest reduction in CSIRO's support cost ratio was achieved in 2004–05 from 36.2 per cent to 36 per cent (both figures based on a new method of calculation). As detailed in section 5.4, a comprehensive new Research Support Services strategy is in the process of being implemented, with a view to achieving major savings in support costs within the next three years.

We continue to make progress in relation to achieving a reduction in purchasing costs as a number of major national contracts were established during the year. However, as these occurred later than planned, the cost reductions achieved so far have been lower than budgeted. Consistent with CSIRO's Procurement Strategy, a professional centralised Procurement Unit for the implementation of national contracts was formed in July 2004. Five product categories defined for implementation and either signed or under current negotiation include: office machines, stationery, bulk and non-bulk chemicals, electronic components, and laboratory consumables.

While our 2004–05 Operating Result missed the break-even target by $9.2 million, due to impact of lower than budgeted savings, deferred intellectual property revenue and the bringing forward of salary accruals, it should be noted that over the past four years CSIRO has exceeded its budgeted target by over $10 million.

In conclusion

The reporting year 2004–05 was, for CSIRO, something of a 'mixed bag'. On the very positive side, we have continued to deliver quality science-based outcomes of meaningful impact, across our wide range of activities. Our strategic re-positioning, with a heavy emphasis on Flagship implementation, is really beginning to 'bite'. Our science reviews have also clearly indicated that our scientific standards remain high, and indeed we have – over the last four years – correspondingly increased, by some 35 per cent, our scientific outputs through refereed journals, books/chapters in books and conference proceedings. We have initiated some exciting new partnerships, locally and internationally, and invigorated existing ones. We have successfully reinvented our ICT related business, and enhanced our governance processes.

But in focusing quite significantly on necessary internal change in delivering on our Strategic Plan 2003–07 – with the understandable turbulence this generally creates in organisations of CSIRO's size and complexity – we have not achieved the financial targets we set ourselves and customer feedback suggests we may be neglecting some of them. Further, while we are committed around the necessity to partner in new innovative ways, we are still regarded by some as difficult to work with.

The messages from this going forward are clear, and indeed well incorporated in our forward planning: we must push through, but with greater attention to co-ordination and communication of our various change programs, to get them embedded as part of the normal way we do business, as soon as possible. We must deliver on the scientific outcomes which we have planned and to which we are committed. We must continue to work even harder at our various stakeholder, customer and partnering relationships, seeking simplicity and clarity where currently there, may be some complexity and ambiguity. And we must enhance our discipline, for example, in the management of our projects, and the management of our performance.

But we are now increasingly well positioned for the future.

Education and outreach

CSIRO Education

New projects introduced in 2004–05

A series of *Cutting Edge Lectures* for science teachers and senior secondary students was introduced in 2004. The lectures update teachers' knowledge, helping them inspire and inform students about the valuable and exciting research being undertaken in Australia. Twenty-three lectures were organised by CSIRO Science Education Centres and were well attended. Support was provided for some lectures by the National Innovation Awareness Strategy administered by the Department of Industry, Tourism and Resources.

The Teacher Research Scheme links teachers with scientists to work on projects related to the scientists' research. Twenty teachers completed the Scheme which was offered nationally for the first time in 2004. The equivalent Student Research Scheme for Year 11 and 12 students has been operating since 1982, with 423 students completing projects in 2004.

Collaboration activities

CREativity in Science and Technology (CREST) is a CSIRO program for teachers, enabling them to provide open-ended research experience for primary and secondary students. Six thousand and forty-six students achieved CREST Awards in 2004 – many more completed CREST projects, but did not register.

CREST students gained first, third and fourth prizes in the 2004 Eureka Prize Macquarie University Schools Prize for Earth, Environmental and Planetary Sciences category.

Three CREST students also represented Australia at the inaugural International Exhibition for Young Inventors held in Japan in 2004 while sixteen CREST students were recruited for the 2004 Questacon Smart Moves Invention Convention – more than half of the 28 students attending.

The Queensland government extended its support for CSIRO to operate the successful *Science on Saturday* program beyond its first year of operation for a further three years. In 2004–05, the program operated at 24 sites for 4 803 students and approximately 1 000 parents, providing six Saturday sessions at each site. The program operated in a diverse range of Queensland towns and cities including Camooweal, Millmerran, Emerald and Weipa. Feedback from students and their families for this program of hands-on science activities was extremely positive.

This year marks the 25th Anniversary of the BHP Billiton Science Awards, jointly organised by CSIRO.

Visitor numbers

The CSIRO Science Education Centres (CSIROSECs) reached a record 261 936 students in 2004. The nine CSIROSECs offered both hands-on sessions at the Centres and an extensive travelling *Lab on Legs* program that visited schools across every part of Australia. CSIROSECs are located in each capital city plus Townsville and also offer a range of other programs, including strong support for CREST, Double Helix Science Club events, and the Student and Teacher Research Schemes. The total number of people serviced directly by CSIROSECs was 332 458.

The number of subscribers to the successful weekly *Science by Email* service increased over the last 12 months from 7 960 to 13 725. Members and Education Credit Union (**mecu**) continue to provide support and have been joined by the Australian Greenhouse Office, part of the Department of the Environment and Heritage.

Continuing Education projects

CSIRO Education operates 13 projects and reaches over 380 000 students, teachers and family members each year – excluding the viewing audience for CSIRO's science TV program.

CSIRO Education sparks the imagination of tomorrow's scientists. Photo: David McClenaghan, CSIRO

CSIRO has worked with Network Ten television to develop, SCOPE, a new science TV program. CSIRO currently supports Network Ten's top-rating national science program – the Tuesday edition of *Totally Wild*, and this support will now be moved to assist with SCOPE. The current program reaches an average of over 400 000 viewers, providing a positive and entertaining approach to science. Each of the new programs will use humour, be more clearly science-related and based on a theme. The first edition of the new program will be aired on 19 September 2005.

CSIRO's Double Helix Science Club continued to offer a choice of two magazines, *The Helix* and *Scientriffic*, as well as member events at various locations across Australia. Marketing of the Club continues to develop.

CSIRO Media Liaison Unit

CSIRO's Media Liaison Unit works in close consultation with the Organisation's scientists, communicators and managers to promote CSIRO's accomplishments nationally and internationally.

In the past year, CSIRO's Media Liaison Unit distributed around 240 media releases as well as providing a wide range of communication services including: media liaison; strategy development; event planning and support; issues management; marketing and branding; and editorial.

The Unit will continue to develop strategies designed to increase community awareness of the important role CSIRO plays in everyday Australian life.

CSIRO PUBLISHING

Journal papers published by CSIRO in partnership with the Australian community continue to grow in an increasing online environment. A particular highlight for the year has been the digitising of print archives dating from 1950, some of which have been used extensively by readers around the world.

CSIRO PUBLISHING was also pleased to join the UN-sponsored *Access to Global Online Research in Agriculture* program to provide open access to agricultural research via the internet to over 100 developing nations.

ECOS magazine undertook a major shift in its editorial policy to focus on how research is contributing to a sustainable future for Australia. The book publishing program continued to grow, with co-operative arrangements with overseas publishers such as Cornell University Press, Commonwealth Agricultural Bureau International (CABI) and James and James.

Web-based content for primary and secondary schools continues to grow through contracts with The Learning Federation to produce national curriculum material.

CSIRO's Discovery centre

The CSIRO Discovery centre, located in Canberra, continued throughout the year to attract general visitors as well as school children from every state and territory in Australia. The school program currently running at Discovery (Discovering Science in Society) has become very popular with interstate schools at middle primary and secondary level. Discovery received

The new Energy Futures exhibit in CSIRO Discovery provides visitors with information about renewable energy and the hydrogen future. Photo: CSIRO

17 680 school visitors during the reporting year. The program promotes an understanding of the work of CSIRO and its diverse range of science research of benefit to Australia.

Since becoming a part of CSIRO Corporate Communications, CSIRO Discovery has directly aligned its programs with the Organisation's strategic objectives and communication aims, especially in its efforts to expand its outreach activities.

CSIRO Discovery continues to attract domestic and international visitors, with adults a large and important percentage of total visitation of 58 400. As a showcase for One-CSIRO, the Discovery centre provides a tangible snapshot of the whole Organisation and continues to attract praise from visitors interested in its unique objectives and purpose.

CSIRO Enquiries

Located at the Clayton site, CSIRO Enquiries operates a ten seat contact centre responding to telephone and e-mail enquiries. Since the consolidation of several Divisional information services in 1995, Enquiries has provided a valuable single point of contact for external and internal customers. Working closely with Divisional and corporate communicators, Enquiries personnel keep up-to-date with CSIRO research, activities, structure and people.

Enquiries' twofold central mission is to respond to the requests of external and internal clients for information about CSIRO research and services and to provide a range of contact services to CSIRO Divisions – all within the context of supporting the One-CSIRO vision.

In 2004–05, CSIRO Enquiries has continued to develop its activities in four key areas:

- **Responding to information enquiries**
  Providing information about CSIRO research, assisting access to electronic and printed resources, and guiding enquirers to external advice and service where appropriate.
- **Professional contact and outreach services for Divisions**
  Outreach services include inbound and outbound contact campaigns, contact management for CSIRO Alumni, the Business Development and Commercialisation Customer Value Survey and assisting at events.
- **Identify commercial opportunities**
  Identifying and correctly directing enquiries which may lead to business opportunities, professional consulting and provision of income services.
- **Directory service**
  Advising, directing and connecting callers to CSIRO personnel and services.

Contact volumes

The following table[1] illustrates the number of contacts handled by Enquiries in the last three financial years. Of interest is the 23 per cent to 25 per cent year-on-year increase in enquiries received by e-mail.

	2002–03	2003–04	2004–05
Inbound phone enquiries	30 696	31 217	28 981
Inbound e-mail enquiries	3 905	4 920	6 054
Total inbound contacts	**34 601**	**36 137**	**35 035**
Outbound follow-up or Divisional campaign	21 445	23 501	21 325
Combined inbound and outbound	**56 046**	**59 638**	**56 360**

[1] Figures derived from telephone statistics, Call Centre Manager and daily record of inbound e-mails.

Performance

The performance of the Enquiries team is evaluated by various success measures, such as the percentage of calls answered within 30 seconds, and email response time.

	2002–03	2003–04	2004–05
Calls answered within 30 Seconds: (Target: ≥ 95%)	87.0%	91.0%	92.7%[2]
Emails answered within two working days (Target: 100%)	N/A	N/A	99.2%

[2] 96.97% of calls were answered within 30 seconds from April to June 2005.

Awards and honours

In 2004–05, CSIRO scientists won international and national acclaim for the excellence of their work. These awards are further demonstration of our effectiveness in research and its application in industry and the community.

Australian Honours

Member in the Order of Australia (AM)

Dr Chris Margules (Sustainable Ecosystems) for service to conservation and the environment, particularly through innovation in the fields of biodiversity assessment and conservation planning, and through collaborating on projects at both local and international levels.

Dr Denis Saunders (retired, Sustainable Ecosystems) for service to nature conservation, particularly through the study of Australian birds and the development of landscape ecology in Australia.

Public Service Medal (PSM)

Ms Rona Sakko (Education) for outstanding public service as a coordinator, and as a volunteer of CSIRO's Double Helix Science Club in South Australia, and her contribution to science education of young people.

Australian Awards

Dr Bob Anderssen (Mathematical and Information Sciences) has been awarded the *George Szekeres Medal* for his outstanding research achievements in developing many mathematical modelling solutions, including a breakthrough in modelling the way Stuart and Sons pianos radiate sound.

Mrs Mary Barnes and **Dr Ray Correll** (Mathematical and Information Sciences) received *Excellence Awards* from Australian Pork Ltd in recognition of excellence in enhancing the unique competitive attributes of Australia's pork for Import Risk Assessment work.

Dr Joy Bear (Minerals) was inducted into the *Victorian Honour Roll of Women* in 2005, an honour which recognises the significant contributions that women have made to their communities and to the lives of other women. In addition to a distinguished research career with CSIRO over a 56-year period, which includes publishing more than 70 research papers and completing a senior doctoral degree, Dr Bear has shown a passion for encouraging young women to pursue careers in science.

Ms Sally Chiu (Food Science Australia) was awarded the *National Meat Industry Training Advisory Council Scholarship* for her microbiological research on *Listeria.*

CSIRO PUBLISHING won the *2004 Whitley Medal* for *Australian Mammals: Biology and Captive Management* by Stephen Jackson. The awards, presented by the Royal Zoological Society of New South Wales, are for outstanding publications that contain a significant amount of information relating to the fauna of the Australasian region.

Dr Peter Daniels and the **Diagnostic testing team** (Livestock Industries) were awarded *Quarantine Certificates of Commendation* from the Australian Quarantine and Inspection Service, the certificates were in recognition for the work done in supporting the Northern Australia Quarantine Strategy.

Dr Narendra Dave, Dr Greg Duffy and **Mr Paul Graham** (Energy Technology) and **Mr Peter Coombes** and **Mr Doug Vincent** (Delta Electricity) won the *Cooperative Research Centre for Coal in Sustainable Development Chief Executive Office's Award 2004* for Technology Assessment Report 31 'Options for Electricity Generation in Australia'. This is awarded each year for the best report judged on its contribution to sustainability, industry impact, scientific integrity and excellence, collaboration and innovation.

Mr Vince Dowling and **Ms Lee Russell** (Manufacturing and Infrastructure Technology) as part of the CRC Polymers won the *CRC Association Award for Excellence in Innovation*

for their work in ceramifying polymers (plastics that transform into ceramics under heat and act as fire barriers). They also received a *Business/Higher Education Round Table Award for Best Collaboration* involving a CRC. CSIRO's Manufacturing and Infrastructure Technology Fire Science team won the award for the Ceramifying Polymers project for Outstanding Achievement in Collaboration in Research and Development and Education and Training.

Dr Calum Drummond (Molecular Science) was awarded the *R K Murphy Medal* from the Royal Australian Chemical Institute for his work during the past 15 years combining leading-edge fundamental science and engineering with the development of new industrial processes and products.

Ensis – the joint forces of CSIRO and Scion (formerly Forest Research) won an inaugural *Trans-Tasman Business Award*. Ensis was presented with the Environmental, Social, Government and Community Award for bringing together the two agencies to enhance the scale and depth of forestry research for both countries.

Dr Ron Ekers (Federation Fellow, Australia Telescope National Facility) was awarded the *Australian Academy of Science's Flinders Medal for Research in Physical Sciences,* for his research in radio astronomy.

Dr Meg Evans, Dr Tim Hughes, Mr Graham Johnson, Mr Warren Knower, Ms Gail McFarland, Dr Keith McLean, and **Mr John Wilkie** (Molecular Science) won a *Royal Society of Australia Eureka Prize for Interdisciplinary Scientific Research* for the implantable contact lens.

Food Science Australia and the **University of Western Sydney Lactose Team** won the *Dairy Industry Association of Australia's Australian Innovation Award 2005*. The award recognises the team's sustained research achievements over more than ten years.

Mr Ian Galbally (Atmospheric Research) received the *Werner Strauss Achievement Award* from the Clean Air Society of Australia and New Zealand for his life-time commitment to air pollution research and substantial contributions to the study of atmospheric chemistry, agriculture and climate change.

Mr Wayne Ganther and **Dr Tim Muster** (Manufacturing and Infrastructure Technology) and **Rajiv Edavan** (Akzo Nobel) won the *Marshall Forham Best Research Paper Award for 2004* at the Australasian Corrosion Association conference. The paper was titled *Effects of Small Compositional Differences of Zinc Coupons on Corrosion Performance.*

Dr Stuart Gordon and **Mr René van der Sluijs** (Textile and Fibre Technology) received the *Communication to Industry Award* from the Australian Cotton CRC for their survey of 31 international and domestic cotton spinning mills, on the perceived quality of Australian cotton in the market place.

Dr David Hawking (ICT Centre) was awarded the inaugural *Chris Wallace Award for Research Contribution* from the Computing Research and Education Association for research excellence undertaken within a university or research institution in Australia or New Zealand.

Dr Rob Hough (Exploration and Mining) won the *Early Career Achievement in Science* as part of the WA Premier's Science Awards 2004. The award recognises excellence in scientific research achieved by a science researcher under the age of 35.

Dr Milos Ivkovich (Ensis) was awarded *Scientist of the Year 2004* by the Southern Tree Breeding Association for his original research in a breeding objective project. For the first time in radiata pine and for softwood species in the world, real economic weights were developed for a commercial breeding program to optimise solid wood production in radiata pine.

Dr Roger Jones (Atmospheric Research) won the *Burtoni Award* for his excellent research and contributions to adaptation to climate change.

Mr Mick Kelly (team leader), **Dr David Hainsworth** and **Dr David Reid** (Exploration

and Mining) won the *Australian Coal Association Research Program Award for Research Excellence in the Underground Category*. The award recognises the team's work towards the world's first automated longwall.

Mr Craig Korn and **Dr Nigel Ricketts** (Manufacturing and Infrastructure Technology) as part of the CRC for Cast Metals Manufacturing won the *CRC Association Award for Innovation* for a new cover gas which reduces greenhouse gas by more than 95 per cent.

Dr Mark Looney, Mr Peter Waters and the **Conductive Polymers Research Team** (Textile and Fibre Technology) in collaboration with the University of Wollongong's Intelligent Polymer Research Institute were awarded the ICSM 2004 prize for Australian Innovation at the International Conference on the Science and Technology of Synthetic Metals for their paper, *Preparation of electroconductive textiles based on a molecular templating process.*

Dr Shiroma Maheepala and **team** (Water for a Healthy Country) won the *2004 Stormwater Research Excellence Award*. The collaborative project between CSIRO, Urban Water, EPA Victoria, City of Greater Geelong and Corangamite Catchment Management Authority, developed a framework for sustainable stormwater management.

Dr John Manners (Plant Industry) was awarded the *2005 Sugar Research and Development Corporation R&D Service Award* for his outstanding contribution to research management and policy development.

Dr Colin Matheson (Forestry and Forest Products) was presented with a *special award* by the Southern Tree Breeding Association for his contribution to radiata pine breeding research. Dr Matheson was recognised for his significant contribution to more than 30 years in radiata pine genetics and improvement.

Dr Graeme Moad, Dr Mike O'Shea, Mr Gary Peeters and **Dr Ezio Rizzardo** (Molecular Science) won the *CRC for Polymers Chairman's Award for Excellence in Commercialisation 2004* for the commercialisation of a product (Ciba Irgamod RA20) by Ciba Speciality Chemicals.

Dr Ken Montgomery (team leader), **Mr Mark Hickey** (Textile and Fibre Technology) and their associates at Deakin University, Melbourne University, Royal Melbourne Hospital, Fremantle Hospital and St Vincent's Hospital won the *Medical Journal of Australia/Wyeth Award* for their work on medical sheepskins. The award recognises the best research paper published in MJA for the year 2004.

Dr Bridget Munro and **CSIRO's Intelligent Knee Sleeve team** (Textile and Fibre Technology) in collaboration with the University of Wollongong's Biomechanics Research Laboratory were awarded the *NSW Sports Safety Gold Medal Award 2004* for outstanding achievement in applied research in sports medicine for the development of an innovative product designed to reduce sports related injuries.

The **Newcastle Energy Centre** was presented with the Engineers Australia *Engineering Excellence Awards 2004* by the Newcastle Division of the Institution of Engineers.

Dr A O (Nick) Nicholls (Sustainable Ecosystems) received the inaugural *Ecological Society of Australia (ESA) Member's Service Prize 2004*. The award recognises outstanding contributions to ecology made by Australia ESA members, either within the ESA or the wider Australian community, when acting on behalf of the ESA.

Ms Cindy Ong (team leader), **Mr Michael Caccetta, Dr Tom Cudahy,** (Exploration and Mining), **Dr Mark Piggott** (BHPBIO) and **Dr Erick Ramanaidou** (Exploration and Mining) received a *SGIO WA Environment Award* in the Air Quality Category for their work in monitoring iron oxide dust levels around the Port Headland handling facility. This work also won a *Golden Gecko Award for Environmental Excellence* from the Department of Industry and Resources, WA. The Golden Gecko Awards are the highest environmental accolades achievable in the Western Australian mining and petroleum industries.

Ms Sharon Pettiford (Livestock Industries) was awarded a *Science and Innovation Award for Young People in Agriculture, Fisheries and Forestry* for her work on the health and survival of livestock during transportation.

Mr George Poropat and the **Sirovision team** (Exploration and Mining) won the Queensland State *Achaeus Group Enterprise Workshop Business Award,* and the *Australian National Australia Enterprise Workshop Business Award* for their business plan for Sirovision – a new high-precision 3-D digital imaging technology for the mining industry.

Dr Peter Rayner (Atmospheric Research) in 2004 entered the top one per cent of the Institute of Scientific Information (ISI) Essential Science Indicators in terms of total citations in the field of Geosciences, with 27 papers cited 538 times to date. **Mr Ray Langenfelds** (Atmospheric Research) in 2005 entered the top one per cent of the ISI Essential Science Indicators in terms of total citations in the field of Geosciences for his paper on *Inter-annual growth rate variations of atmospheric* CO^2.

Dr Margaret Roper (Plant Industry) as part of a collaborative team, won the Grains Research and Development Corporation *Eureka Prize for Research* to improve the environmental sustainability of graingrowing. The group developed a coating for cereal grain seeds that protects developing plants against fungal disease.

Dr Yong-Ling Ruan (Plant Industry) received a *Goldacre Award* from the Australian Society of Plant Scientists for his research on cotton fibre biology.

Dr Brian Sowerby and **Dr James Tickner** (Minerals) won the *2004 Alan Walsh Medal for Service to Industry* for their development of the CSIRO Air Cargo Scanner. The unique scanner uses world-first neutron technology developed to accurately and rapidly detect and predict the composition, shape and density of objects packed in air cargo containers.

Dr Mark Stafford-Smith (Sustainable Ecosystems) won the *Northern Territory Research Award* for his work in setting up the Desert Knowledge CRC in mid-2003, as well as his intellectual leadership in developing his idea of the 'science of desert living', on which the Organisation's research program is based.

Dr Bob Sutherst (Entomology) and **Hearne Scientific Software** were joint winners of two *Australian Information Industry Association Awards* with their Dymex-Climex risk assessment software.

Dr Simon Toze and the **Water Reclamation team** (Land and Water) along with the City of Mandurah and Mirivac Fini were awarded the *Western Australian Water Industry Award for Water Recycling/ Treatment* for the research outcomes of the Halls Head Indirect Reuse Project.

Dr John Volkman (Marine Research) was awarded the *Australian Organic Geochemistry Medal* for lifetime achievement in the field of organic geochemistry.

Ms Fiona Walsh (Sustainable Ecosystems) accepted the *Planning Scholarship, Research and Teaching* award for the book *Planning for country: Cross-cultural approaches to decision-making on Aboriginal lands* from the *Planning Institute of Australia National Awards for Planning Excellence 2005.* It was a joint award to CSIRO, IAD Press and the Central Land Council.

Dr Louis Wibberley (Energy Technology) received the *2004 Coal Industry Advisory Board (CIAB) Award for Sustainable Coal Development.* The award emphasises the importance of coal in achieving the sustainable development of energy systems.

Dr Colin Wrigley (Food Science Australia) was awarded the *Archibald D Ollé Prize for Chemical Literature* from the Royal Australian Chemical Institute, in recognition of his contribution in editing and writing *The Encyclopedia of Grain Science.*

Dr Alex Zelinsky (ICT Centre) received a *2005 Clunies Ross Award* for his work which pioneered the development of computer-vision based human-machine interactions.

International Awards

Mr Ken Atkinson and the **Carbon Nanotubes Team** (Textile and Fibre Technology) in collaboration with the University of Texas, Dallas, won the *2005 Avantex Innovation Prize* for their project, *The Application of the Science and Technology of Spinning to Produce Pure Multiwalled Carbon Nanotube Yarns with Useful New Properties.*

Dr Ian Biggs, Ms Heidi Horan, Dr Sarah Park and **Dr Peter Thorburn** (Sustainable Ecosystems) won the *Kynoch Prize* for the best agricultural paper at the South African Sugar Technologists' Association.

Dr Mark Cameron and **Dr Kerry Taylor** (ICT Centre) and **Mr Tim Austin** (Australian Bureau of Statistics) won a *best paper award* at the Institute of Electrical and Electronics Engineers UK conference on e-Technology, e-Commerce and e-Services.

Dr Frank de Hoog and **Mr Union Huynh** (Mathematical and Information Sciences) were awarded the *Professional Engineering Publishing Award* from the Journal of Mechanical Engineering Science (London) for two papers, '*Predicting winding stresses for wound coils of linear orthotropic material*' and '*Predicting winding stresses for wound coils of non-linear orthotropic material*'.

Dr Geoff Downes and **Dr Rob Evans** (Ensis) received the *2004 and 2005 Josef Umdasch Research Prize* presented by the Umdasch Group in Austria. Dr Downes received the prize in 2004 and Dr Evans in 2005. The prize is offered for outstanding achievements in the field of wood and forestry sciences, in particular innovations and improvements in wood technology, wood processing and products along with the environmental issues connected with the processing and utilisation of wood; new cultivation processes, environmentally compatible timber production and new afforestation techniques; and innovations with special regard to the whole forestry wood chain.

Dr Asoka Edirisinghe (Livestock Industries) and co-authors J P Louis and G E Chapman won the 2005 *John I Davison Award for Practical Papers* from the American Society of Photogrammetry and Remote Sensing. The award winning paper was titled *Potential for Calibrating Airborne Video Imagery Using Preflight Calibration Coefficients*.

Dr Ron Ekers (Federation Fellow, Australia Telescope National Facility) was named the *Janksy Lecturer* for 2004 by the US National Radio Observatory which runs an annual series of named lectures.

Dr Lloyd Evans (Honorary Fellow, Plant Industry) received the *Adolph E Gude, Jr Award of the American Society of Plant Biologists* for his outstanding contributions to our understanding of the physiological basis for yield in major crop species and for the control of flowering in higher plants.

Mr Stephen Grove (Food Science Australia) was awarded the *International Student Travel Scholarship* by the International Association for Food Protection.

Dr Rebecca Handcock (Livestock Industries) and co-author Ferenc Csillag, won the *2005 Boeing Award for Best Paper in Image Analysis and Interpretation* from the American Society of Photogrammetry and Remote Sensing Annual Conference.

Dr Charles Krebs (Sustainable Ecosystems) was awarded the *Canadian Northern Science Medal* for his work spanning over 40 years that has shaped the field of population and community ecology.

Dr Chris Margules (Sustainable Ecosystems) has been honoured in the Institute of Scientific Information's influential list of *Highly Cited Researchers*. Dr Margules' research citations place him among the 270 scientists whose publications have received the highest number of citations during 1983–2002.

Dr Tara Martin (Sustainable Ecosystems) was awarded the *Oxford University Press Award* for best student presentation at the Society for Conservation Biology Meeting 2004, New York.

Dr Trevor McDougall (Marine Research) received the *A G Huntsman Award for Physical/Chemical Oceanography* by the Royal Society of Canada, for his outstanding

scholarship and excellent contributions to marine services, and his continuing influence on the development of marine science.

Dr Sadanandan Nambiar (Forestry and Forest Products) received the *International Union of Forest Research Organisation Host Scientific Award 2005*. The award recognises his distinguished contributions to the science and practice of sustainable management of forests over the last decades, the impact of his work nationally and internationally, and his international reputation for scientific leadership and application of science for sustainable management.

Dr Silvia Pfeiffer and **Dr Claudia Schremmer** (ICT Centre) were awarded *Best Industry/Short paper* presentation at the 11th International Multimedia Modelling Conference in Melbourne.

Dr Martin Platt (Atmospheric Research) received the *International Coordination-group for Laser Atmospheric Studies Lifetime Achievement Award*. The award is given to individuals who are international leaders and contributors to lidar research.

Dr Steve Rintoul (Marine Research) won the inaugural *George Wust Prize* by the German Society of Marine Research and the international Springer journal *Ocean Dynamics* for work that has enabled Australia to become a world leader in Southern Ocean research.

Dr Brian Walker (Sustainable Ecosystems) was awarded the *2004 Sustainability Science Award* by the Ecological Society of America, along with four northern hemisphere colleagues, for a recent paper making the greatest contribution to the integration of ecological and social sciences.

CSIRO Medals and Awards

The CSIRO Medals 'Honouring Excellence'

The Chairman's Medal

The *2004 Chairman's Medal* was presented by Ms Catherine Livingstone, CSIRO Chairman. The *CSIRO Medals* and the *Business Excellence Medal* were presented by the Hon Gary Nairn MP, Parliamentary Secretary to the Prime Minister. The Lifetime Achievement

From left to right, top row: Ms Catherine Livingstone (Chairman), Dr Peter Caccetta, Dr Norm Campbell, Dr Geoff Garrett (Chief Executive). Bottom row: Dr Harri Kiiveri, Dr Donald McFarlane, Dr Gary Richards, Mr Jeremy Wallace and Dr Xiaoliang Wu with the Chairman's Medal certificate. Photo: Mark Fergus, CSIRO

Medals were presented by Dr Geoff Garrett, CSIRO Chief Executive. The Medals ceremony was held on 9 November 2004.

The Mapping and Monitoring Team (Mathematical and Information Sciences) won the *2004 Chairman's Medal* for developing a suite of mapping technologies to assist farmers, environmentalists and the Government to address key environmental issues such as salinity and soil degradation.

The winners of the *Chairman's Medal* were: **Dr Peter Caccetta** (team leader), **Dr Norm Campbell, Dr Joanne Chia, Miss Suzanne Furby, Dr Harri Kiiveri, Dr Donald McFarlane, Dr Gary Richards** (Australian Greenhouse Office), **Mr Jeremy Wallace** and **Dr Xiaoliang Wu.**

The CSIRO Medals for Research Achievement

The *CSIRO Medals for Research Achievement* for 2004 were awarded to:

- **The Rust Disease Resistance Team** for a series of major and outstanding scientific discoveries of international significance in plant biology in relation to how plants resist major and damaging diseases caused by rust fungi. Team: **Dr Jeff Ellis** (team leader), **Dr Mick Ayliffe, Dr Peter Dodds, Dr Greg Lawrence** and **Dr Tony Pryor**

From left to right, top row: Dr Geoff Garrett (Chief Executive), Dr Mick Ayliffe, Dr Tony Pryor. Bottom row: Dr Peter Dodds, Dr Jeff Ellis and Dr Greg Lawrence. Photo: Mark Fergus, CSIRO

- **The Petroleum Reservoir Characterisation Team** for developing and applying new methods to assess reservoirs in deep sedimentary formation. Team: **Dr Lincoln Paterson** (team leader), **Dr Jonathan Ennis-King, Dr Michael E Glinsky** (BHP Billiton Petroleum) and **Dr James Gunning**

From left to right: Dr Jonathan Ennis-King, Dr Geoff Garrett (Chief Executive), Dr Lincoln Paterson and Dr James Gunning. Photo: Mark Fergus, CSIRO

- **The High Power Supercapacitor Team** for the development and assistance in the commercialisation of advanced high power, small form factor supercapacitors for wireless communication products. Team: **Dr Calum Drummond** and **Dr Tony Vassallo** (team leaders), **Mr Norman Becker, Mr Daniel Bell, Mr Phil Casey, Mr Don Chase, Mr Harro Drexler, Dr Rob Eldridge, Dr Celesta Fong, Dr Thomas Gengenbach, Dr Patrick Hartley, Mr Rob Helstroom, Dr Tony Hollenkamp, Dr Richard Jarrett, Mr Oddvar Johanssen, Ms Ngoc Le, Ms Maree O'Sullivan, Mr Andrew Palmisano, Dr Tony Pandolfo, Dr Brian Ricketts, Mr Claude Sacchetta, Dr Doug Shaw, Mr Oleg Skrybin, Dr Trevor Smith, Dr Ross Sparks** and **Mr Steve Weir.**

From left to right, top row: Dr Geoff Garrett (Chief Executive), Dr Doug Shaw and Dr Tony Pandolfo. Bottom row: From left to right, Mr Claude Sacchetta, Dr Trevor Smith, Dr Tony Vassallo, Dr Calum Drummond and Dr Richard Jarrett. Photo: Mark Fergus, CSIRO

Minor contributors: **Dr Tim Bastow, Ms Elizabeth Gawranski, Mr Mark Greaves, Mr Richard Harris, Dr Anita Hill, Mr Hanz Jaeger, Mr Michael Kelly, Ms Jeanette Lucas** and **Dr Sunil Sharma.**

The CSIRO Medals for Lifetime Achievement

Dr Paul Fraser (Atmospheric Research) and **Mr George Harley** (Corporate Property)

From left to right: Dr Geoff Garrett (Chief Executive), Dr Paul Fraser and Mr George Harley Photo: Mark Fergus, CSIRO

were each awarded a *CSIRO Medal for Lifetime Achievement*. Dr Fraser was recognised for 30 years of world-class scientific research on chlorofluorocarbons (CFCs) and other ozone depleting substances in the global atmosphere, and for the major impact of his work on national and global policy development for protection of the ozone layer.

Mr Harley was recognised for 19 years leading the multi-disciplinary Corporate Property team to rationalise, consolidate and redevelop CSIRO's research property portfolio around Australia, underpinned by innovative and unique management practices.

From left to right, top row: Dr Geoff Garrett (Chief Executive), Dr Anh Bui, Dr Iztok Livk, Ms Deanne Labbett, Dr Phillip Fawell, Dr John Farrow, Dr Ilija Sutalo, Dr Robyn Bell, Mr Andrew Brent, Dr Robert White, Dr Murray Rudman and Dr Tuan Nguyen. From left to right, bottom row: Mr Kosta Simic, Mr Andrew Owen, Dr Alex Heath, Mr David Paterson and Ms Jean Swift. Photo: Mark Fergus, CSIRO

The CSIRO Medal for Business Excellence

The *CSIRO Medal for Business Excellence* was awarded to the **Improved Thickener Technology Team** for the processes they have used to ensure research outcomes are converted into substantial financial benefits to the minerals industry. Team: **Dr John Farrow** (team leader), **Ms Fiona Baldacchino, Dr Robyn Bell, Mr Andrew Brent, Dr Anh Bui, Dr Phillip Fawell, Mr Neil Francis, Dr Alex Heath, Mr Warren Jones, Ms Deanne Labbett, Mr Anthony Lawton, Dr Iztok Livk, Dr Tuan Nguyen, Mr Andrew Owen, Mr David Paterson, Dr Murray Rudman, Mr Kosta Simic, Mr David Stribley** (AMIRA International), **Dr Ilija Sutalo, Ms Jean Swift, Dr Len Warren** and **Dr Robert White.**

The CSIRO Awards 'Celebrating 2004 Achievements' – Ceremony held 8 February 2005

One-CSIRO Award

The *One-CSIRO Award* was awarded to the **Crop Biofactories Initiative** for their work on the development of technologies that enable the production of chemicals from biological sources. Team Leader: **Dr John Oakeshott.** Team members were: **Dr Lloyd Graham, Dr Allan Green, Dr Victoria Haritos, Dr Phil Hendry, Dr Mike O'Shea, Dr Greg Simpson** and **Dr Surinder Singh.**

One-CSIRO Award (Runners-up)

Two runners-up were recognised for the *One-CSIRO Award* they were the Careers Online Team and Fast Track. The **Careers Online Team** were: **Mr Ian Chalker** (team leader). Team members were: **Ms Melanie Herpen, Ms Amanda Lawrence, Ms Dianne Livingstone** and **Ms Kathleen Rice.**

The **Fast Track team** (Business Development and Commercialisation) were: **Dr Attila Brungs** and **Dr Kate Gradwell** (team leaders). Team members were: **Mr Robert Beardow**, **Mr Jonathan Brabner, Mr Heath Carson, Ms Penny Clayton, Mr Michael De Robertis, Ms Annabel Forbes** (replaced by Marie Louise-Symons), **Ms Nicole Goldschmidt** (replaced Andrew Lacy), **Ms Carolyn Hart, Mr David Lau, Mr Ashley McConnell, Ms Karen Rogers**, **Mr Tony Thomas** (replaced by Ewan Perrin) and **Ms Noelene Treloar.**

Look Out!!! Award

The Look Out!!! Award was awarded to the Weather Applications Team (Atmospheric Research) for outstanding innovative development of weather applications and for developing new commercial markets in weather prediction. Team leaders were: **Mr Jack Katzfey** and **Mr John McGregor.** Team members were: **Mr Bob Cechet** (Geoscience Australia), **Mr Harvey Davies**, **Mr Michael Edwards**, **Mr Russell Howden**, **Mr Lars Katzfey** and **Ms Kim Nguyen.**

Partnership Excellence Award

The *Partnership Excellence Award* was awarded to the Food Science Australia joint venture in recognition of the team's highly effective partnership with industry and Government. In pooling talented staff, world-class laboratories and pilot plants, and jointly managing intellectual property, the impact of Food Science Australia is significantly greater than that of the previously competing parts. Team leaders were: **Mr Ian Gould** and **Ms Margaret Darton** (Department of Primary Industry (DPI)). Team members were: **Dr Michael Eyles, Dr Bruce Kefford** (DPI), **Mr Chris Langslow, Ms Judy Marcure**, **Professor Alastair Robertson, Dr Leigh Schwartzkoff** and **Mr Alan Tooth.**

Occupational Health and Safety Achievement Award

The Occupational Health and Safety Achievement Award was awarded to the **Managing Plant and Equipment Hazards HAZOP Facilitation Team** (Minerals). The team has been at the forefront of using HAZOP (hazard and operability study) to reduce health and safety risks and environmental impacts inherent in the design and construction of high-risk/complex experimental systems. The team's primary objective has been to facilitate a smooth start-up, and to enable safe and reliable ongoing operation. They have applied HAZOP to determine where to build, to check design safety and to establish operating procedures. Team leader: **Dr Angelica Vecchio-Sadus.** Team members were: **Ms Irene Kyriakidis** and **Mr Terry Norgate.**

Environmental Achievement Award

The *CSIRO Environmental Award* was awarded to the Sustainable Irrigation System Directorate (Land and Water) for their combined aerated septic tanks, and Wetland Technology which led to a sustainable, environmentally acceptable, aesthetically pleasing and inexpensive solution to on-site sewage treatment problems for up to 100 people. Team leader: **Mr John Blackwell.** Team members were: **Dr Evan Christen, Dr Nihal Jayawardane, Mr Renzo Manente, Dr David Mitchell** (Mathematical and Information Sciences), **Mr Leo Zandona** and **Mr Roy Zandona.**

Service from Science Award (two winners)

The *Service from Science Award* was awarded to the **Wind Energy Research Unit** (Atmospheric Research) and the **Grain Protection Genes** (Entomology).

The **Wind Energy Research Unit** were recognised for their pioneering research effort to establish wind energy prospecting and wind energy forecasting in Australia. The group has greatly assisted the emerging renewable energy industry, has demonstrated Australia's wind energy potential to governments and industry and has been successful in creating a spin-off company. Team leader: **Dr Peter Coppin**. Team members were: **Dr Keith Ayotte** (Windlab Systems), **Mr Rob Dark,**

Mr Robert Davy, **Mr Chris Dury, Dr Peter Hurley, Mr Richard Hurley**, **Mr Mark Kitchen**, **Mr Chris Price**, **Mr Chris Russell** and **Dr Nathan Steggel** (Windlab Systems).

The **Grain Protection Genes** team identified, developed opportunities and successfully negotiated a $20 million joint venture with CSIRO's largest client – the Grains Research and Development Corporation (GRDC). The joint venture represents a new way of doing business for CSIRO and is a model to shift the relationship with CSIRO's largest client from project based agreements to a deeper strategic partnership that aligns priorities of both organisations. Team leader: **Dr Peter East.** Team members were: **Dr John Curran, Mr Mark Hardwick, Mr Sid Jain, Dr John Oakeshott** and **Dr James Ridsdill-Smith.**

Go for Growth Award (two winners)

There were two winners of the *Go for Growth Award,* they were the **Strategic Research Fund for the Marine Environment** (Marine Research) and the **e-Health Research Centre** (a joint venture of the CSIRO ICT Centre and Queensland Government).

The **Strategic Research Fund for the Marine Environment** was recognised for its development and promotion of a new direction in strategic environmental marine science by aligning CSIRO's long-term research strengths with the WA State Government's policy and natural resource management agenda. Team leader: **Dr John Kessing.** Team member: **Dr Nan Bray**.

The **e-Health Research Centre** is a $15 million joint venture between CSIRO and the Queensland Government. It is the largest single-funded e-health research and development facility in the southern hemisphere. World-class researchers undertake research and development in chronic health conditions, with the aim of building knowledge on how the next generation of ICT can improve the delivery of patient centred health care. Team leader: **Mr Gary Morgan.** Team members were: **Mr Justin Boyle, Ms Catherine Daly, Dr David Hansen, Mrs Karen Harrap, Ms Jean Jacquet, Dr Mohan Karunanithi, Ms Athanasia Kassolos, Mr Craig Kennedy, Ms Barbara Lee, Dr Anthony Maeder, Mr Colin Murphy, Ms Marilla O'Dwyer, Dr Chaoyi Pang, Dr Birgit Planitz, Mr John Ryan-Brown** and **Dr Tim Wark.**

Sir Ian McLennan Achievement for Industry Award

This award was established by the former CSIRO Advisory Council in 1985 to recognise outstanding contributions by CSIRO scientists to Australian industry.

The 2004 Award was presented on 14 October 2004 by Sir Bruce Watson, Former Chief Executive and Chairman, MIM Holdings Ltd.

The winner was **Mr Peter Reid** of Plant Industry for development of cotton varieties which have had major commercial impacts in Australia and overseas.

John Philip Award

Dr Joy Dempsey (Livestock Industries) and **Dr Jo-Anne Rasmussen** (Molecular Science) were both awarded a 2004 *John Philip Award for the Promotion of Excellence in Young Scientists.*

Fellowships and Societies

Dr Michael Bange (Plant Industry) commenced an *Australian-American Fulbright Scholarship* at Texas A and M University and the University of Florida. The Scholarship will allow him to build collaborative frameworks in cotton research and participate in the development of novel decision support systems for US and Australian farming systems.

Dr Charles Butt (Exploration and Mining), **Dr John Church** (Marine Research), **Mr Shaun Coffey** (Livestock Industries), **Dr Joanne Daly** (Entomology), **Dr Richard Richards** (Plant Industry) were elected as Fellows of the *Australian Academy of Technological Sciences and Engineering.*

Mr Brian Carter (Molecular Science) was elected a Fellow of the *Institution of Engineers, Australia.*

Dr Evan Christen (Land and Water) was awarded an *Australian Academy of Science Scientific Fellowship* to visit Korea to study pesticide movement in agricultural drainage.

Ms Sharon Egan (Livestock Industries) was awarded the *R S Merkal Memorial Fellowship* to attend the 8th International Colloquium on Paratuberclulosis by the International Association of Paratuberculosis.

Dr Jeffrey Graham Ellis (Plant Industry) and **Dr Jorgen Segerlund Frederiksen** (Atmospheric Research) were elected as Fellows to the *Australian Academy of Science.*

Dr Ron Ekers (Federation Fellow, Australia Telescope National Facility) was elected a Fellow of the *Royal Society.*

Dr John Finnigan (Atmospheric Research) was made an Honorary Professor at the *University of Edinburgh.*

Dr Cathy Foley (Industrial Physics) was elected Vice President of the *Australian Institute of Physics.*

Dr Stephen Giugni (ICT Centre) was awarded a *Vincent Fairfax Fellowship* to support and further the development of Australians who factor ethics into their leadership practice.

Dr Liz Humphreys (Land and Water) was made a Fellow of the *Australian Institute of Agricultural Science and Technology* for her contribution to agricultural research over the past 20 years.

Professor Ian Macreadie (Health Sciences and Nutrition) was awarded a Fellowship at the Institute of Microbiology in the University Hospital of Lausanne, Switzerland.

Dr Doina Olaru (Atmospheric Research) received the *2004 Early Career Symposium Fellowship* from the Academy of Technological Sciences and Engineering.

Dr David Post (Land and Water) was awarded a Fellowship of the *Modelling and Simulation Society of Australia and New Zealand* for service to the Society and the field of Modelling and Simulation.

Dr Nick Savvides (Industrial Physics) was elected Fellow of the *Australian Institute of Physics.*

Dr Greg Simpson (Molecular Science) was elected President of the *Royal Australian Chemical Society.*

Dr Gang Wei (Industrial Physics) was awarded *Honorary Member of the Asia Pacific Nanotechnology Forum* for his outstanding contribution to the organisation of the third Annual Conference of the Asia Pacific Nanotechnology Forum, Shanghai, China.

Governance

Governance

Introduction

One of the key objectives of CSIRO's Strategic Plan 2003–07 is a renewed focus on good governance. In line with the development of the Strategic Plan, the Board initiated a new dialogue with management on governance in 2003, to strengthen CSIRO's governance culture and to ensure the Organisation is able to deliver on its strategic goals.

This proactive approach within the Organisation, combined with a stronger focus on governance within government and the community at large, has seen CSIRO implement a range of measures to update, enhance and communicate its governance arrangements, with a focus on a unified and standard One-CSIRO approach.

Key achievements in 2004–05 included:

- the development of a new CSIRO Governance Framework
- the development of a new Science Investment Process
- the implementation of Science Assessment Reviews for all Divisions
- the updating of the Performance Measurement Framework, and its integration with Operational Planning, providing 'bench to Board' alignment of planning and performance
- the reform of all organisational policy.

Good governance in CSIRO

CSIRO is an Australian Government statutory authority with primary responsibilities to carry out scientific research to benefit Australian industry and the economy, and to provide environmental and social benefits to all Australians.

Governance covers the ways in which CSIRO is organised, directed and managed, the ways in which it operates, engages with the outside world, and the ways it is held accountable for its decisions and actions.

Good governance ensures that CSIRO can be trusted to do what it was established to do. This means that CSIRO has the right people and systems in place to ensure that it remains relevant in delivering excellent science for the benefit of Australia, and to ensure its ongoing sustainability.

Good governance also requires continuous improvement, open communication and the involvement and commitment of all staff at all levels within the Organisation. CSIRO recognises that good governance cannot be measured in purely financial terms in a public sector body because performance is measured against broader national, social and community objectives.

CSIRO Governance Framework

As part of this process of continuous improvement, and the ongoing dialogue between the Board and management about good governance, CSIRO developed an updated Governance Framework in 2004–05.

The Governance Framework brings together, for the first time, in one document information about all of the governance elements for CSIRO. It is designed to improve transparency and understanding among people both within and outside the Organisation about governance in CSIRO.

CSIRO can learn from best practice public sector governance as well as corporate

governance in the private sector. However, CSIRO's Governance Framework must reflect its own unique role, culture, operations and accountabilities.

The CSIRO Governance Framework consists of:

1. Overarching elements
   - External – including CSIRO's governing legislation and its responsibilities to the Minister, Australian Government, Parliament and public
   - Internal – CSIRO's own overarching governance structure, including the Board and executive management, their committees and delegations
2. Enabling elements
   - Directing – including strategic direction, operational planning and organisational policy
   - Managing – key processes and procedures for the full range of CSIRO's operations
   - Assuring – including the Science Assessment Reviews, Performance Measurement Framework and internal and external audits.

Overarching elements

Governing legislation

CSIRO is an Australian Government statutory authority constituted and operating under the provisions of the *Science and Industry Research Act 1949* (SIR Act). Reporting, accountability and other rules for CSIRO's operations are set out in the *Commonwealth Authorities and Companies Act 1997* (CAC Act).

Functions

In summary, CSIRO's primary functions as set out in its governing legislation are:

- to carry out scientific research
  - to assist Australian industry and to further the interests of the Australian community
  - to contribute to national and international objectives and responsibilities of the Australian Government
- to encourage and facilitate the application and use of the results of its scientific research.

Secondary functions include international scientific liaison, training of research workers, publication of research results, and dissemination of information about science and technology.

Powers

In summary, the Organisation has power to do whatever is necessary for the best performance of its functions. In particular, it may:

- arrange for research and other work to be undertaken outside CSIRO
- form partnerships or companies
- make its discoveries and inventions available for fees, royalties or other consideration
- pay bonuses to staff for discoveries or inventions
- charge fees for research, facilities or services provided to others.

Responsible Minister

From 1 July 2004 to 25 October 2004 the Ministers responsible for CSIRO were the Honourable Dr Brendan Nelson MP, Minister for Education, Science and Training and the Honourable Peter McGauran MP, Minister for Science.

From 26 October 2004 to 30 June 2005 the Minister responsible for CSIRO was the Honourable Dr Brendan Nelson MP, Minister for Education, Science and Training.

Under the *Science and Industry Research Act 1949*, the Minister has the power to:

- add to the purposes for which CSIRO may carry out scientific research (sub-paragraph 9(1)(a)(iv))
- provide to the CSIRO Board in writing, directions and guidelines with respect to the performance of the functions, or the exercise of the powers, of the Board or of the Organisation (section 13 (1)).

The Minister did not exercise any of these powers during 2004–05.

Under section 28 of the *Commonwealth Authorities and Companies Act 1997*, the Minister may, after consultation with the Board, notify the Board of a general policy of the Commonwealth Government that is to apply to CSIRO.

The Minister did not notify the Board of such a general policy in 2004–05.

Under section 47A of the *Commonwealth Authorities and Companies Act 1997,* the Finance Minister may, in writing, give directions to the Board on matters related to the procurement of goods or services. In December 2004, the Finance Minister made a number of such directions in the form of the *Finance Minister's (CAC Act Procurement) Directions 2004*. The Directions commenced with effect on 1 January 2005. Under the Directions, CSIRO is required to apply relevant parts of the *Commonwealth Procurement Guidelines ('CPGs')* to 'covered' procurements (as defined in the CPGs) worth more than $400 000 (or $6 million if relating to construction services).

Structure and responsibilities of the CSIRO Board

Under the SIR Act, the CSIRO Board comprises a non-executive Chairman, up to eight other non-executive members and the full-time Chief Executive. All members, including the Chief Executive, are appointed by the Governor-General. Each member brings complementary skills and experience to the Board.

Further details of the 2004–05 Board members, including qualifications, terms of appointment, remuneration, membership of Board Committees and attendance at meetings are shown on page 203 in the Financial Statements.

Under the SIR Act, the primary functions of the Board are:

(a) to ensure the proper and efficient performance of the functions of the Organisation

(b) to determine the policy of the Organisation with respect to any matter

(c) to give directions to the Chief Executive.

The role of the Board is described in detail in the CSIRO Board Charter. In summary, the Board is responsible to the Australian Government (through the responsible Minister) for the overall strategy, governance and performance of CSIRO. This role includes:

- providing strategic direction to CSIRO
- ensuring best practice governance is implemented in CSIRO, including legal compliance, risk management and commercial oversight
- approving strategic and operational plans and monitoring CSIRO's operating performance
- ensuring the Minister is kept properly informed, including approving all matters requiring Ministerial approval.

The Board has an Audit Committee, a Commercial Committee and a Remuneration Committee. All matters considered and determined by the Committees are submitted to the Board for information and, where appropriate, ratification or decision. Other committees can be established from time to time to assist in the execution of the Board's duties.

The Board and Committee Charters are reviewed annually, most recently in June 2005, and are accessible on the CSIRO intranet. The Board Charter requires the Chairman to monitor Board performance and coordinate a review of performance at least every 18 months. Board Committee Charters require them to meet at least once per year to assess their performance and report the outcomes to the Board.

The Board meets formally every second month for one or two days. In the pursuit of their duties, Board members may take such independent professional advice as is considered necessary, and have complete access to senior management.

The CSIRO Board

Chairman

Ms Catherine Livingstone
BA(Hons) FCA FTSE
Company Director
1 January 2001 –
31 December 2005

Dr Geoff Garrett
BA(Hons) MA PhD
Chief Executive
8 January 2001 –
31 December 2008

Professor Suzanne Cory AC
BSc MSc PhD FAA FRS
Director
The Walter and Eliza Hall Institute of Medical Research
26 June 2002 – 25 June 2007

Dr Terry Cutler
BA(Hons) PhD FAIM
Principal
Cutler and Company Pty Ltd
25 July 2002 – 24 July 2007

Mr Peter Duncan
BE(Hons)
Company Director
26 June 2002 –
22 August 2005

Mr Brian Keane
FAICD
Director
30 July 2003 – 29 July 2008

Ms Deborah O'Toole
LLB
Company Director
16 April 2003 –
15 April 2008

Ms Lisa Paul
BA(Hons) PSM
Secretary
Department of Education, Science and Training
16 December 2004 –
15 December 2009

Professor Alan Robson AM
BAgrSc PhD FTSE FAIAS
Vice-Chancellor
University of Western Australia
30 July 2003 – 29 July 2008

Dr Ed Tweddell
BSc MBBS(Hons) FRACGP FAICD
Company Director
26 June 2002 – 4 August 2005

Terms completed during the year:
Dr Jeff Harmer

Board Audit Committee

The Board Audit Committee meets quarterly or more frequently as required. The Audit Committee's purpose as detailed in the Committee's Charter is:

- to assist CSIRO and its Board in key governance areas of risk management, internal control and compliance by monitoring and reporting on the following:
  - financial performance and the financial reporting process, including the annual financial statements
  - the acceptability of correct accounting treatment for, and disclosure of, significant transactions which are not part of CSIRO's normal course of business
  - the operation and implementation of the risk management framework
  - the effectiveness of systems of internal control, including delegations, management information systems and safety and environmental performance
  - the scope of work, performance and independence of the (RA&A) unit
  - the scope of work, independence and performance of the external auditor
  - CSIRO's process for monitoring compliance with laws and regulations, Government policy and its own Code of Conduct.

Under the CAC Act, the Commonwealth Auditor-General is the external auditor for CSIRO. The Board Audit Committee reviews the Australian National Audit Office (ANAO) audit plan and meets with the external auditor regularly throughout the year and specifically prior to recommending financial statements to be signed by the Board.

Board Commercial Committee

The Board Commercial Committee (BCC) meets at least four times per year. The purpose of the Committee is to assist the CSIRO Board in fulfilling its governance responsibilities in relation to CSIRO's business development and commercialisation activities by:

- considering reports and recommendations from CSIRO management on business development and commercialisation functions and providing advice on the proper and efficient performance of these
- recommending to the Board any new policies or directions that are required for these functions
- monitoring CSIRO processes relating to the business development and commercialisation activities and financial delegations in relation to transactions
- facilitating open communication between the CSIRO Board, Board Commercial Committee, senior management and the Commercial Executive (ComEx) Committee.

BCC is supported by management's Commercial Executive (ComEx) Committee which provides advice on internal management processes and oversees commercial activities.

Board Remuneration Committee

The Board Remuneration Committee meets at least twice per year. The purpose of the Committee is to assist by making recommendations to the Board in relation to the Chief Executive's remuneration arrangements and in ensuring that the Organisation has an appropriate and competitive remuneration structure by:

- determining the remuneration arrangements for, and assessing performance of, the Chief Executive

- ratifying recommendations of the Chief Executive in respect of the remuneration and performance assessment of Executive Team members
- exercising oversight of the remuneration policy of the Organisation including the senior executive banding structure (focus on positions, not individuals) and with references to the market.

The Remuneration Tribunal determines the remuneration and allowances of non-executive Board members and the Chief Executive.

Structure and responsibilities of CSIRO executive management

The Board Directions to the Chief Executive set out the formal directions given to the Chief Executive by the Board under the SIR Act. These Directions are reviewed annually and were updated and approved in June 2005. They are intended to harmonise the requirements of the SIR Act and the CAC Act so that CSIRO will be fully compliant with the requirements of both.

The Chief Executive is responsible to the Board for the overall development of strategy, management and performance of CSIRO. The Chief Executive manages the Organisation in accordance with the strategy, plans and policies approved by the Board to achieve agreed goals, and is supported by an Executive Team and Executive Management Council.

The Executive Team and Executive Management Council are supported by a number of Management and Advisory Committees. In 2004–05, two new advisory committees were formed – the Enterprise Risk Management Advisory Committee and the Asset Management Committee.

CSIRO has an Authorities Manual that documents the delegations and authorities given by the Chief Executive, and provides information for staff on the principles for the devolution and accountable exercise of powers, as well as guidelines and details of approval processes. This was last updated in mid–2004 and is accessible on the CSIRO intranet.

Disclosure of interests and ethical behaviour

Section 10F of the SIR Act requires written disclosure by the Chief Executive to the Minister of all direct or indirect pecuniary interests in any business or in any body corporate carrying on a business. Sections 27F-K of the CAC Act require the disclosure of material personal interests in a matter that is being considered by the Board and prohibits a member from being present during consideration or voting on such matters, unless otherwise determined by the Board or the Minister.

All of these requirements are currently being met.

The CSIRO Code of Conduct applies to the Organisation's Board, management and staff. It is accessible on the CSIRO intranet and provides a benchmark against which conduct can be assessed to ensure the highest ethical standards are met.

The CSIRO Governance Framework also articulates governance principles, intended as a guide for all staff so that they can more effectively contribute to the good governance of the Organisation.

The overarching principle for all CSIRO staff is Professional Autonomy. CSIRO recognises that individual creativity is required for success in scientific research and commercial activities, but all staff must be aware of the parameters and context within which they work. A shared awareness of the responsibilities of all staff will help to create a One-CSIRO environment that allows people to work creatively together and across boundaries.

The CSIRO Executive Team 2004–05

Dr Geoff Garrett
BA(Hons) MA PhD
Chief Executive

Dr Ron Sandland
BSc PhD AIA FTSE
Deputy Chief Executive

Mr Mehrdad Baghai
BSE MPP JD
Executive Director
Business Development
and Commercialisation
(term completed on
ET 14 March 2005)

Dr Michael Barber
BSc PhD FAA
Executive Director
Science Planning

Dr Michael Eyles
BSc(Hons) PhD
Group Executive
(Agribusiness and Health)

Dr Rod Hill
DSc FTSE FAICD
Group Executive
(Sustainable Minerals
and Energy)

Dr Warren King
BSc(Hons) PhD FAICD
Group Executive
(Information Technology,
Manufacturing and Services)

Mr Peter May
BEc MA Grad Cert Mgt
Executive Director
People and Culture

Dr Steve Morton
BSc(Hons) PhD
Group Executive
(Environment and
Natural Resources)

Mr Nigel Poole
LLB, BCom, FAICD
Executive Director
Business Development
and Commercialisation

Ms Donna Staunton
BA LLB
Executive Director
Communications

Mr Mike Whelan
BEc
Chief Finance Officer and
Executive Director
Corporate Operations

Organisational Chart

Minister

Education, Science and Training – The Hon Dr Brendan Nelson MP

CSIRO Board[1]

Ms Catherine Livingstone (Chairman)
Professor Suzanne Cory – Dr Terry Cutler – Mr Peter Duncan
Dr Geoff Garrett – Mr Brian Keane – Ms Deborah O'Toole
Ms Lisa Paul – Professor Alan Robson – Dr Ed Tweddell

Executive Team[2]

Dr Geoff Garrett – Dr Michael Barber – Dr Michael Eyles
Dr Rod Hill – Dr Warren King – Mr Peter May
Dr Steve Morton – Mr Nigel Poole – Dr Ron Sandland
Ms Donna Staunton – Mr Mike Whelan

Executive Management Council[3]

Agribusiness and Health
- Food Futures
- Food Science Australia[4]
- Forestry and Forest Products and Ensis
- Health Sciences and Nutrition[4]
- Livestock Industries
- Plant Industry
- Preventative Health

Environment and Natural Resources
- Atmospheric Research[5]
- Entomology
- Land and Water
- Marine Research[5]
- Sustainable Ecosystems
- Water for a Healthy Country
- Wealth from Oceans

CSIRO-wide Support
- Business Development and Commercialisation
- Communications
- Corporate Operations
- Finance
- People and Culture
- Science Planning

Information Technology, Manufacturing and Services
- Australia Telescope National Facility
- Industrial Physics
- Information and Communication Technologies Centre
- Manufacturing and Infrastructure Technology
- Mathematical and Information Sciences
- Molecular Science[4]
- Textile and Fibre Technology

Sustainable Minerals and Energy
- Energy Technology
- Energy Transformed
- Exploration and Mining
- Light Metals
- Minerals
- Petroleum Resources

[1] Board as at 30 June 2005. For details of Board changes during 2004–05 see page 117.

[2] Executive Team as at 30 June 2005. Mr Mehrdad Baghai completed his term on 30 June 2005 and Dr Alastair Robertson replaced Dr Michael Eyles on 1 July 2005.

[3] As from 1 July 2005, the current four group structure will change to a three group structure. The new groups are: Agribusiness; Information, Manufacturing and Minerals; and Sustainable Energy and Environment.

[4] During the reporting year, part of Health Sciences and Nutrition moved into Food Science Australia with the remainder into Molecular Science, which was renamed Molecular and Health Technologies.

[5] During the reporting year, Atmospheric Research and Marine Research merged to form Marine and Atmospheric Research.

Enabling elements

Strategy Review

Building on the Strategic Plan 2003–07 and the six key messages therein, CSIRO initiated a project in 2004 to develop a framework for the Organisation's future strategy. This work has focused on identifying and clarifying CSIRO's core roles and responsibilities in delivering value for Australia as a key part of the National Innovation System. It has also served to clarify CSIRO's vision for its own future, in a changing global environment.

Operational Planning

In line with its responsibilities under the SIR Act, CSIRO undertook further work in 2004–05 to improve Operational Planning, which provides the link between the Organisation's strategy and annual decisions on priority activities and resourcing. The uniformity of planning by Divisions and Corporate Groups was strengthened, to provide genuine One-CSIRO planning, to facilitate cross-divisional activity, and to assist with decision-making in the new Science Investment Process (see below).

Science Investment Process

As part of the implementation of the 2003–07 Strategic Plan, CSIRO recognised that work was required to refine the way CSIRO invests in science (and support projects) across the Organisation.

Enhanced strategic and analytical processes were developed in 2004–05 to enable CSIRO to implement a more systematic and deliberate approach to managing its investment portfolio. This will ensure that CSIRO is able to:

- focus skills and energies on the most important issues for Australia
- continue to increase the impact and relevance of CSIRO science
- maintain an appropriate balance between all the roles and responsibilities of CSIRO
- ensure greater transparency and the wise investment of taxpayers' dollars.

Performance Measurement Framework

CSIRO's Performance Measurement Framework was updated in 2004–05 to ensure a continued focus on delivery and execution of the goals in the 2003–07 Strategic Plan.

The Executive Team regularly receives an Organisational Performance Report consisting of the five elements below, with a report provided to the Board every four months:

- strategy implementation goals
- organisational health measures
- program performance
- science highlights
- outcomes.

During 2004–05, significant improvements were also made in the integration of the Performance Measurement Framework and CSIRO's Operational Planning. The result has been a reduction of the reporting requirements on staff, and greater transparency and consistency in planning, assessing performance and responding to results to improve the delivery of impact from science.

CSIRO Policies

As part of its focus on governance, CSIRO recognised the need to update and standardise its policies, in order to improve accessibility and understanding among staff. CSIRO implemented a new Policy Framework in 2004–05, with all CSIRO policies grouped by category and systematically reviewed. An inventory of all existing CSIRO policies was completed, and a new One-CSIRO policy template was also introduced, which will improve standardisation across the Organisation and clarify the differences between policy, procedures and guidelines.

During the financial year, operational policies were established or updated in the following areas:

Policy category	New and updated policies
Science and Research	• Project Management policy updated
Commercial	• All Commercial policies updated
Financial	• New Procurement policy released
People	• New Whistleblower policy released • Public Comment by CSIRO Staff policy updated • All People and Culture policies updated • OHS&E Incident Reporting, Recording and Investigation Procedure updated • Measuring OHS&E Performance Procedure updated • Safe Use of Firearms Procedure updated • Guidelines on controlling and reducing waste on CSIRO sites

Science Assessment Reviews

In line with the policy approved by the Board in June 2004, CSIRO began a process of Science Assessment Reviews in 2004–05 to ensure that the quality and relevance of its science base is maintained. All of CSIRO's Divisions are to be reviewed by external panels on a three-year rolling cycle.

The following Divisions were reviewed in 2004–05: Petroleum Resources, Entomology, Industrial Physics, Minerals, Food Science Australia, Health Sciences and Nutrition and Molecular Science. Reports are provided to the Board and Minister at the conclusion of each review. The findings of each review are analysed and organisational and other high-level issues are assessed as part of the annual Science Health Report.

Recognising and managing risk

The Board has responsibility for ensuring an appropriate risk management framework is in place to identify and manage strategic and operational risks to the Organisation.

An organisational risk profile is completed annually and reported to the Board through the Board Audit Committee (BAC). The BAC reviews management's policies and procedures and internal compliance.

Taking organisational risks into account, the internal Risk Assessment and Audit unit undertakes a systematic program of organisation-wide functional audits, divisional assurance audits and project-specific risk assessments in accordance with a formal charter endorsed by the Audit Committee.

The Executive Team is responsible for the implementation of mitigation strategies. In appropriate circumstances, insurance is used as a method to transfer the financial impact of risk. The Executive Team's risk management activities are supported by an Enterprise Risk Management Advisory Committee chaired by the Chief Finance Officer.

Safeguarding integrity in financial reporting

CSIRO's financial statements are required by clause 1(b) of Schedule 1 to the CAC Act 1997. The statements are prepared in accordance with the:

- Finance Minister's Orders

- Australian Accounting Standards and Accounting Interpretations issued by the Australian Accounting Standards Board
- Consensus views of the Urgent Issues Group.

The financial statements are accompanied by a Management Representation letter to the Australian National Audit Office (ANAO) signed by the Chief Executive and the Chief Finance Officer declaring that the statements present fairly the financial position of CSIRO and the results of its operations and cash flows as at year end.

This statement is supported by Accountability Checklists relating to compliance with policy signed by senior managers throughout the Organisation. This is a simple mechanism whereby specific assurances can be gained about the Organisation's financial state of affairs and control environment.

Fraud control and security

In accordance with Commonwealth Fraud Control Guidelines, a comprehensive fraud risk assessment was completed in September 2004. As a result of the assessment, a fraud control plan was prepared in compliance with the Guidelines. In addition, appropriate fraud prevention, detection, investigation and reporting procedures and processes are in place. Annual fraud data has been collected and reported to authorities in accordance with the Guidelines.

Protective, physical, personnel and administrative security practices are conducted in accordance with the CSIRO Corporate Security Plan. The Plan was developed to identify security objectives that require improvement or continued management by the Corporate Security Adviser, and Divisional and Site Security Officers.

Developments since 30 June 2005

The CAC Act requires CSIRO to report developments since the end of the financial year, giving particulars of any matter or circumstance that has arisen and has significantly affected or may significantly affect:

(i) the authority's operations in future financial years

(ii) the results of those operations in future years

(iii) the authority's state of affairs in future financial years.

On 1 July 2005, the CSIRO's four group structure changed to a three group structure. CSIRO's research Divisions are now grouped into Agribusiness; Information, Manufacturing and Minerals; and Sustainable Energy and Environment.

On 1 July 2005, the following Divisional changes also took effect:

- Atmospheric Research and Marine Research merged to form Marine and Atmospheric Research
- part of Health Sciences and Nutrition moved into Food Science Australia, with the remainder moving into Molecular Science, renamed to form Molecular and Health Technologies.

Service Charter

The CSIRO service charter sets out the standards of service we aim to deliver to our customers and our commitment to ensuring that these standards are maintained. For a complete version of CSIRO's Service Charter see www.csiro.au/servicecharter or page 1 for more details.

Since 1926, CSIRO has been advancing the frontiers of science in selected fields and forming important alliances with government, industry and communities in over 80 countries. We value our collaborations as they have enabled us to reach a much broader constituency with our science and create impact in Australia and around the world.

Other CSIRO services include training of research workers, publication of research results, and dissemination of information about science and technology.

Our customers

Our customers are essential to our success. They include partners from:

- Commonwealth, State and Territory governments and their agencies
- Australian and global business, industries and research organisations
- the Australian and International community.

We believe that

- our customers and partners are essential to our success
- our diversity and breadth allow us to tackle complex problems and opportunities on a national and global scale
- scientific innovation is an important driver of Australia's economic growth.

Relevance

CSIRO maintains relevance in its work through:

- input from advisory committees representing the government, industry and research community
- listening to the community and recognising its concerns where they relate to matters of science or our behaviour.

Our service standards

Communication

When you communicate with CSIRO, we will:

- be courteous
- be willing to assist you and be responsive to your needs
- treat you fairly and professionally
- be sensitive to diversity issues
- be accountable and adhere to sound business practices in accordance with relevant legislation.

Service delivery

When we perform services for you, we will:

- explain our services and deliverables to you
- aim to exceed your expectations
- demonstrate technical and professional competence in providing the services
- respect and maintain customer confidentiality.

Service evaluation

After we have completed our service delivery, we will:

- use customer review tools such as our Customer Value Survey to seek feedback from our customer base on our performance
- review the feedback you provide to us and consider measures to further improve our service delivery
- continue to respect customer confidentiality beyond the term of our engagement.

Provide feedback to CSIRO

CSIRO greatly welcomes feedback on our performance. Should you wish to contact us in this regard, the first port of call would normally be the CSIRO officer with whom you have been dealing; alternatively senior management in the relevant Division or Business Unit.

General feedback should be forwarded to:

CSIRO Enquiries

Bag 10
Clayton South VIC 3169

Phone: 1300 363 400
International: +61 3 9545 2176
Fax: +61 3 9545 2175
Email: customer-relations@csiro.au
Web: www.csiro.au

Administrative Law

Freedom of information

The *Freedom of Information Act 1982* ('FOI Act') provides the public with a general right of access to documents held by Commonwealth agencies including CSIRO. The general right is limited by exceptions to protect essential public interests or the privacy or business affairs of those who give information to the agency.

The following information is provided in compliance with section 8 of the FOI Act:

- the functions and powers of CSIRO are set out in Section 2, page 115
- information about CSIRO's procedures for external consultation is set out in Appendix 5
- CSIRO holds the following categories of documents:
  - corporate records including documents relating to government, policy, finance, personnel, business development, commercialisation, communication, real property, intellectual property and education
  - business unit records including documents relating to scientific research and technology transfer
- members of the public may obtain access to scientific and technical publications from **CSIRO** PUBLISHING (www.publish.csiro.au). CSIRO administrative manuals are available from the Freedom of Information Officer.

Part V of the FOI Act confers a right to request amendment of a document to which lawful access has been granted, where the applicant claims that information in the document:

- relates to his or her personal affairs
- is incomplete, incorrect, out-of-date or misleading
- has been used, is being used, or is available for use by the agency or Minister for an administrative purpose.

In the year to 30 June 2005, CSIRO received 14 requests for information under the FOI Act and no requests for amendment in relation to documents provided under the Act.

Archives

CSIRO maintains an archives collection which includes records dating from the establishment in 1926 of the Council for Science and Industrial Research, the predecessor of CSIRO. Certain CSIRO records are held by Australian Archives. Disposal arrangements for CSIRO records are made in accordance with the provisions of the *Archives Act 1983*. Access to records over 30 years old is provided in accordance with that Act.

Privacy

The *Privacy Act 1988* provides for Information Privacy Principles (IPPs) and National Privacy Principles (NPPs). In the year to 30 June 2005, the Privacy Commissioner did not undertake any investigations under section 36 of the *Privacy Act 1988* in relation to CSIRO.

Administrative Decisions (Judicial Review) Act

The *Administrative Decisions (Judicial Review) Act 1977* enables a person aggrieved by certain classes of administrative decisions made by Commonwealth agencies including CSIRO to obtain reasons for or challenge those decisions. In the year to 30 June 2005, CSIRO received no challenges or requests for statements of reasons under the ADJR Act.

Contact

All enquiries under the above legislation (including FOI requests) should be directed to:

Freedom of Information Officer and Privacy Officer

CSIRO
PO Box 225
CAMPBELL ACT 2602

Tel: (02) 6276 6123
Fax: (02) 6276 6437
Email: rosemary.caldwell@csiro.au

Occupational health and safety

CSIRO is required to report annually in accordance with the requirements of section 74 of the *Occupational Health and Safety (Commonwealth Employment) Act 1991* (OH&S Act).

The Occupational Health Safety and Environment (OHS&E) objective is to continuously improve the safety of the working environment to prevent injuries and illness whilst caring for the natural and built environment.

CSIRO recognises that people's safety is paramount and has made significant advances in its occupational health and safety (OH&S) activities during 2004–05.

Our slogan *'Healthy Safe Clean Science'* captures the essence of the OHS&E Management Strategy of CSIRO.

CSIRO Divisional OH&S risk profile

In response to the organisational OH&S risk profile conducted in late 2003, the Divisions undertook to identify their own Divisional OH&S risk profiles. This process identified the risks associated with the activities the Divisions undertook and assisted to ensure optimal risk management processes were applied to reduce high-level actual and potential risk.

OHS&E Strategic Plan 2004–07

CSIRO's commitment to OHS&E is reflected in the CSIRO Strategic Plan 2003–07 Objective (5.2) to 'Be among the best in governance, OHS&E and performance management processes.' The next step in our OHS&E growth is the OHS&E Strategic Plan 2004–07. This will guide the development of future OHS&E Improvement and Operational Plans. The OHS&E Network recognises that critical to the success of achieving this strategy is management's commitment to the OHS&E priorities including senior management balancing OHS&E priorities with other priorities outlined in CSIRO's Strategic Plan 2003–07. A coordinated approach is anticipated to result in better risk management and improved performance, and is a critical step to achieving 'One-CSIRO OHS&E'.

The OHS&E Strategic Plan objectives are to:

- minimise the potential for catastrophic incidents in the Organisation
- reduce the impact (claims cost, welfare, pain and suffering, time lost from projects) of our most frequent incident areas
- identify and assess current and emerging risks, and develop and promote strategies to eliminate or minimise those risks.

On the basis of the resource information, and in consultation with Chiefs, the Executive Team and the People and Culture Network, the OHS&E Network will focus on delivering the following OHS&E Strategic Priorities for 2004–07:

- improve the quality of OHS&E risk management:
  - reduce Divisional high risks
  - provide a program to improve safe operation of plant and equipment
  - identify and implement an OHS&E information technology management system to improve workflow
- reduce high impact/high frequency incidents:
  - implement programs to reduce the actual and potential impact of musculoskeletal incidents
  - implement programs to reduce the actual and potential impact of other high frequency incidents
- analyse current and future organisational trends and issues in OHS&E:
  - enhance staff capabilities in a changing environment
  - enhance leadership behaviour and accountability

- enhance integration of environmentally sustainable management practices:
  - implement an environmental management system that supports sustainable development
  - develop initiatives for the storage and disposal of radioactive sources.

Health and Wellbeing Strategy

One of the major activities in 2005 has been the development of the CSIRO Health and Wellbeing strategy. CSIRO is building employee health and wellbeing into organisational development and change including job design, project plan and employee personal development. The Strategy aims to develop and support the delivery of a range of information, initiatives and activities to encourage and support staff who have an interest in enhancing their physical and mental wellbeing. In doing so the Strategy will:

- recognise the needs, preferences and attitudes of different groups of participants
- recognise that an individual's lifestyle is made up of a personal set of health habits
- adapt to the special features of each workplace environment
- empower employees to make positive health and lifestyle choices.

CSIRO OHS&E Annual Report

The 2004 CSIRO OHS&E Annual Report was released in February 2005. The report profiles the Organisational and Divisional activities, achievements and performance in OHS&E in supporting our science. The report is available on the internet for public viewing at: http://www.csiro.au/OHSEreport2004.

OHS&E Annual Conference – 'Sustaining a healthy working life'

The 2004 CSIRO OHS&E Conference was held in Canberra and featured internal and external presenters from the disciplines of health, wellbeing and environment. One hundred and ten delegates from across the Organisation enjoyed a lively series of presentations. The conference theme reflected the comments and feedback received from the 2004 Conference attendees. The objectives of the 2005 Conference were to:

- promote a positive culture where health, fitness and nutrition are integrated
- define and develop the concept of sustainability for CSIRO workplaces
- support and encourage staff to maintain a healthy life, enhance their quality of life and thereby assist CSIRO to achieve its research objectives
- raise awareness about work/life balance and its relationship to maintain a healthy science workforce.

Work Outcomes Research and Cost-benefit (WORC) Project

CSIRO was invited to participate in the Work Outcomes Research and Cost-benefit (WORC) Project, the first research protocol in Australia to assess the cost-benefit, in dollar terms, for initiating a proactive screening and treatment program for depression in the workplace. The WORC project was funded by the Commonwealth Department of Health and Ageing and conducted by the University of Queensland in conjunction with Harvard University. Approximately 1 600 staff elected to participate and completed the on-line survey. All participants received direct feedback on completion of the survey. A summary report will be provided to CSIRO as part of a National report once the survey has been completed.

Safety, Rehabilitation and Compensation Commission (SRCC) Awards

Submissions from the Divisions of Minerals and Plant Industry reached the finals in the category of Leadership in Injury Prevention

and Management at the 2004 SRCC Awards. Both entries were awarded an Encouragement Award for their initiatives. CSIRO Minerals impressed the committee with the Division's, strong and proactive management commitment to OHS&E driving positive change whilst Plant Industry demonstrated how increased communication helped build relationships and open up networks across the Division to improve the profile of OHS.

Notifiable incidents

Notifiable Incidents are required to be reported to Comcare under the OH&S Act and other authorities such as the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) under their legislation. The type of incidents to be reported are death, serious personal injury, incapacity of more than 30 successive days or shifts or a dangerous occurrence which could have produced any of these conditions.

CSIRO reports and investigates any incident deemed to have caused or have the potential for causing an injury or an illness through the OHS&E incident reporting, recording and investigation procedure.

A total of 42 notifiable incidents were reported to Comcare over the year. This included 24 serious personal injuries, zero cases of work incapacity greater than 30 days and 18 dangerous occurrences. This is considerably lower than last year where there were 72 reported incidents.

OH&S statistics

Injury statistics

There have been significant improvements in CSIRO's OH&S performance over the last three years since OHS&E was re-structured (see Figure 1). Three injury performance measures are reported quarterly. The Lost Time Incident Frequency Rate (LTIFR) and the Medical Treatment Frequency Rate (MTFR) have improved. The Average Time Lost Rate (ATLR) indicates a decline in performance since last year.

The highlight of injury performance has been the reduction in the number of incidents, lost time injuries, claims and the amount of time lost due to injury/illness. This is reflected in the continuing improvement in the LTIFR and the MTFR. Although less staff have been injured they are taking longer off work.

Of note is that approximately ten per cent of all incidents are attributed to recreational, sporting or travel to/from work.

Figure 1: CSIRO's OH&S Performance 2002–05

OHS injury performance of CSIRO 2002–05								
Year to date	Incidents (including near misses)	Number of claims	LTI > 1 day	Cost to date ($)	Time lost to date (weeks)	MTFR	LTIFR	ATLR (5 work-day week)
YTD June 2002	1 035	318	82	690 037	222.1	27 (25)	7.05 (6)	2.7 (2.5)
YTD June 2003	1 044	238	67	457 910	263.9	20 (17)	6 (5)	3.9 (3)
YTD June 2004	975	278	70	594 728	144.92	24 (20)	5.9 (4.4)	2.1 (1.9)
YTD June 2005	873	220	40	314 447	139	19 (17)	3.6 (3.1)	3.5 (3.8)

( ) denotes less sport and travel to/from work

Our effort to improve OH&S performance since the restructure has provided the following excellent results since June 2002:

- 15% reduction in the number of incidents
- 31% reduction in the number of claims
- 51% reduction in lost time injuries
- 54% reduction in costs paid Comcare to date (a saving of $375 500)
- 37% reduction in time lost (weeks)
- 49% reduction in LTIFR
- 30% reduction in MTFR

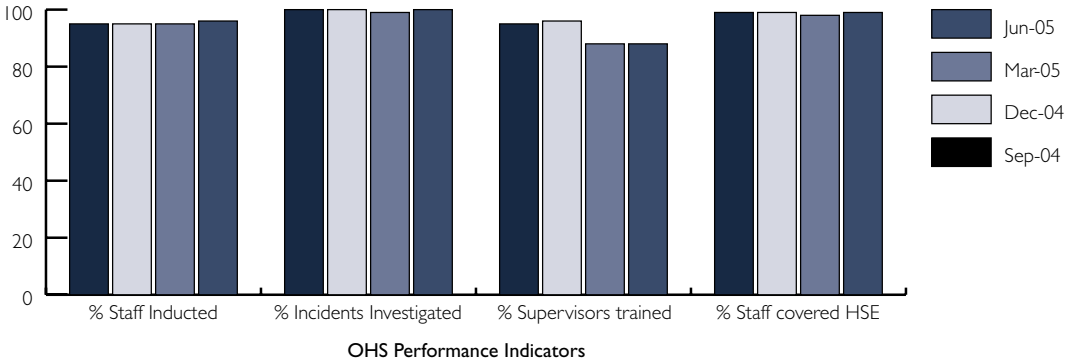
Definitions:

- *Lost Time Incident Frequency Rate (LTIFR) is the number of incidents involving lost time from work greater than or equal to one full day or shift per million hours worked*
- *Medical Treatment Frequency Rate (MTFR) is the number of compensation claims per million hours worked*
- *Average Time Lost Rate (ATLR) is the average time lost for the number of incidents during the period*

Positive Performance Indicators

CSIRO has implemented Positive Performance Indicators to measure performance against four important safe systems of work (see Figure 2).

Figure 2: CSIRO Aggregated OHS Performance Indicators July 2004 – June 2005



The recent drop in performance of the percentage of supervisors trained in OHS&E is due to an increase in the standard of the PPI requiring Supervisors to be trained every three years.

OH&S investigations

Provisional improvement notices (PIN)

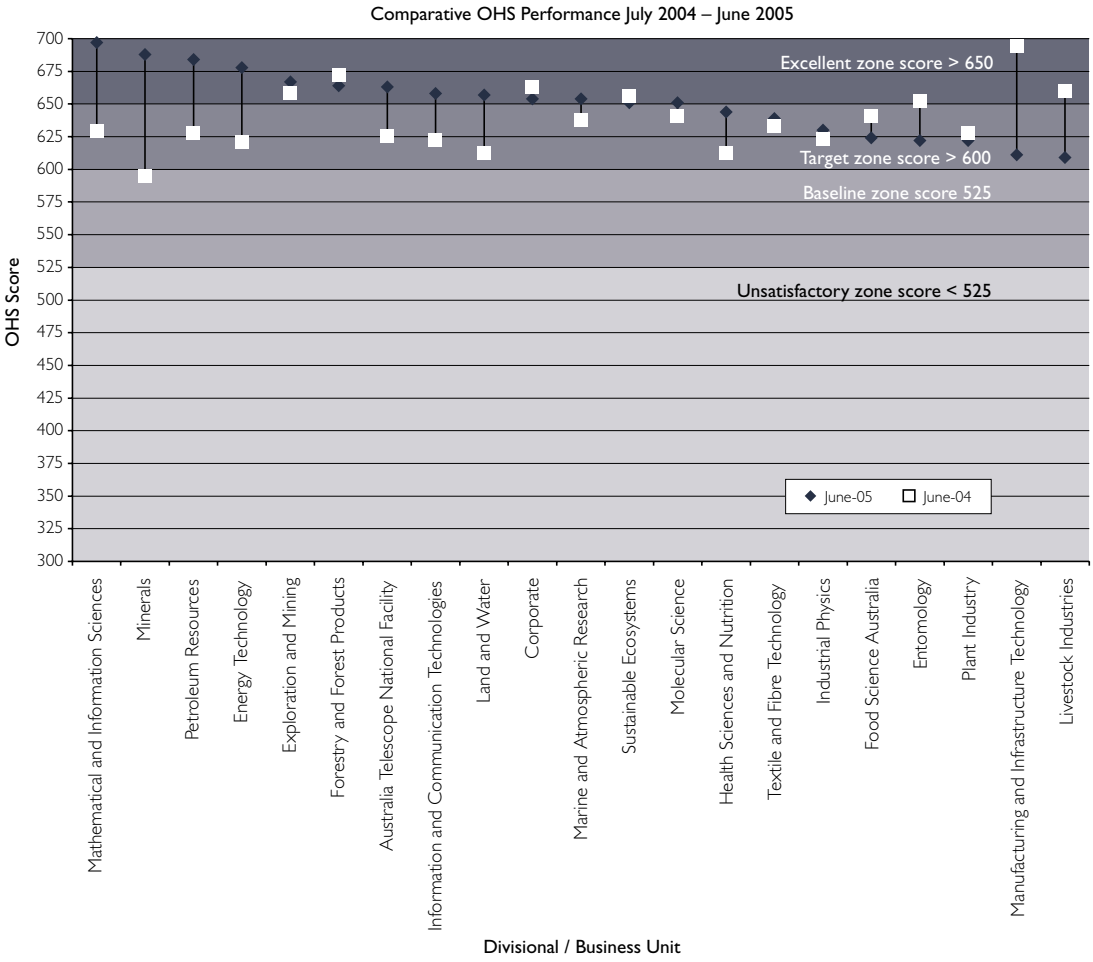
A PIN is a notice served to an employer or an employee by a Health and Safety Representative (HSR) who believes that a contravention of the Act has or is occurring. It is usually issued when there is no supervisor present or when consultation has broken down.

Internal benchmarking

CSIRO Divisions are provided with a quarterly chart of their performance to enable internal benchmarking.

CSIRO has adopted a target score of 100 for each of the seven injury and positive performance indicators to a total of 700. Figure 3 demonstrates improvement over the last year. All Divisions are now in the target zone or above.

Figure 3: Combined injury and PPI performance for July 2004 to June 2005



No Provisional Improvement Notices were raised.

Prohibition and improvement notices (Comcare)

Prohibition Notice
A notice issued during the course of an investigation by an investigator to an employer to cease an activity or remove an immediate threat that poses a risk to the health and safety of any person.

Improvement notice
A notice issued during the course of an investigation by an investigator who believes that a person is, has and/or is likely to again, contravene a provision of the Act or regulations. The notice specifies the provision(s) of the Act being contravened and the time frame by which the contraventions must be rectified.

No prohibition or improvement notices were raised.

Comcare audits

Comcare conducted a whole of agency audit in 2004. The three workplaces chosen for review were the Divisions of Plant Industry, Urrbrae, SA; Marine Research, Cleveland, QLD; and Corporate Groups, Canberra, ACT. Several actions were raised for CSIRO to address across all Divisions. Comcare was satisfied with the detailed action plan and the time frames for completion.

Comcare has conducted three audits of compliance with asbestos legislation and regulations. The three Divisions chosen for review were the Divisions of Atmospheric Research; Manufacturing and Infrastructure Technology; and Industrial Physics. Initial informal reports indicate satisfaction with compliance at all three sites.

Comcare investigations

Comcare conducted four investigations of incidents. The Divisions investigated were Land and Water, Urrbrae, SA, following an incident involving two employees receiving minor facial burns from a ultra-violet light source; Livestock Industries, St Lucia, QLD, following an incident involving an employee receiving minor facial burns from a ultra-violet light source; Plant Industry, Black Mountain, ACT following a fire in a fume cupboard which caused minor facial burns to a student; Atmospheric Research, Aspendale, VIC, following a minor nitrogen gas release during decanting.

Comcare reported their satisfaction on the completion of recommendations to prevent re-occurrences. CSIRO is meeting Comcare expectations through detailed action plans which demonstrate commitment in addressing recommendations.

Comcare review of previous investigations

Comcare conducted four reviews of previous investigations of incidents dating back to 2001 and 2003. They reported their satisfaction on the completion of the recommendations to prevent re-occurrences. CSIRO is meeting Comcare expectations through detailed action plans which demonstrate commitment in addressing recommendations.

ARPANSA investigations

ARPANSA conducted investigations following three incidents involving ultra-violet exposure resulting in minor facial burns to staff. The Divisions investigated were Land and Water Urrbrae, SA; Livestock Industries, St Lucia, QLD; and an on-going investigation at Entomology, St Lucia, QLD. Apart from the on-going investigation, ARPANSA have indicated their satisfaction that CSIRO is meeting their responsibilities.

ARPANSA conducted two planned inspections of two Divisions to confirm action items and monitor compliance following investigations to incidents. The Divisions inspected were the Divisions of Land and Water and Plant Industry. ARPANSA have indicated their satisfaction that CSIRO is meeting their responsibilities.

Commonwealth disability strategy reporting

For the purposes of the Commonwealth Disability Strategy (CDS), CSIRO's 'Role' is that of an 'Employer'. Activities relevant to the Strategy form part of CSIRO's Workplace Diversity Plan.

In CSIRO's most recent staff survey, responses from staff with a disability are broadly consistent with those of other staff, indicating that across a range of employment related matters, staff with a disability do not perceive any differential treatment. However, only two per cent of respondents to the survey identified themselves as having a disability, whereas the percentage of total staff registered as having a disability is six per cent.

Further research is needed to determine whether the low response rate indicates that staff with a disability are not participating in the poll, or if they are simply not identifying themselves as having a disability when completing the survey.

Performance against the indicators issued by the Office of Disability is detailed in the following table:

Environmental management, energy and heritage reporting

Environmental Policy

CSIRO recognises environmental management of its operations as one of the highest corporate priorities and a key to sustainable development.

CSIRO is committed to:

- conducting our scientific research in a manner that supports sustainable development and makes efficient use of resources taking whole life-cycle principles into account
- using scientific processes, practices, material or products that avoid, reduce or control pollution
- achieving continuous improvement of our environmental management system performance through proactive and vigilant management of our scientific research in an ecologically sound manner
- supporting the National Greenhouse Strategy by voluntarily reducing our greenhouse gas emissions, through the efficient use of energy
- conducting our activities in compliance with relevant Commonwealth, State, Territory and local environmental legislation and regulations
- identifying environmental aspects and assessing impacts before starting new activities or projects and before decommissioning a facility or leaving a site

Performance indicator	Actions 2004–05
Employment policies, procedures and practices comply with the requirements of the *Disability Discrimination Act (DDA) 1992.*	In this reporting period the following policies were reviewed: EEO, harassment, bullying, Contact Officers, relocation, separation, defence leave, remote locality conditions, inefficiency, attendance, career management, overtime, salary packaging and studentships.
Recruitment information for potential job applicants is available in accessible formats on request.	All web authors must comply with the Web Content Accessibility Guidelines.
Agency recruiters and managers apply the principle of 'reasonable adjustment'.	All CSIRO managers have access to information on 'reasonable adjustment' through a CSIRO publication *What is fair, what is not?*
Training and development programs consider the needs of staff with disabilities.	Corporate development programs are conducted at venues that can cater to the needs of participants with disabilities.
Training and development programs include information on disability issues as they relate to the program.	The Organisation's Managing People Program covers managing diversity, including staff with a disability.
Complaints/grievance mechanism, including access to external mechanisms, in place to address issues and concerns raised by staff.	CSIRO has internal mechanisms for resolving complaints that, in the formal stages, involve investigation by an independent investigator, as well as scope to refer the matter to the Human Rights and Equal Opportunity Commission.

- communicating openly and honestly with our people, stakeholders and the community on environmental issues
- providing training to ensure that our people, business partners and service providers are aware of our environmental policy and are able to fulfill their environmental responsibilities accordingly
- regularly setting and reviewing environmental objectives and targets
- measuring environmental performance, by reviewing our environmental incidents, conducting regular monitoring, audits and inspections, and assessments of compliance with CSIRO policy and legal requirements
- regularly reviewing our Environmental Management System to ensure its appropriateness and effectiveness in fulfilling our environmental responsibilities.

Environmental Management System

In pursuing these objectives, CSIRO has implemented an integrated environmental management system based on the principles of the international standard for Environmental Management Systems (EMS) *AS/NZS ISO 14001:1996* on all of our operational sites.

CSIRO's EMS seeks to control the environmental impact of the Organisation. Incremental and continuous improvement has been achieved in business practices within the office environment, within research facilities and laboratories and in facility construction and maintenance.

CSIRO's Australian Animal Health Laboratory (AAHL) achieved certification to the EMS standard *AS/NZS ISO 14001:1996* in May 2005. AAHL's EMS is based on the framework stipulated in CSIRO's EMS Manual. Since 1998, this manual has provided guidance for each CSIRO Division to implement their EMS, in order to ensure regular review of environmental aspects and impacts of their activities, and set environmental objectives and targets accordingly.

Organisational activities in accordance with ecologically sustainable development

CSIRO's research is committed to achieving positive environmental outcomes focusing on large-scale integrated solutions to biodiversity issues on a regional and national scale. CSIRO scientists work closely with community, industry and government groups and organisations.

Legislative compliance

Environmental legal compliance is managed by the Corporate OHS&E function, via the Divisional and Group OHS&E Managers and site-based Environmental Officers.

All CSIRO staff have access to an on-line database providing details of the relevant current environmental legal requirements for each State and Territory. The CSIRO Environment Policy drives the requirement for legal compliance and this is supported by the EMS implemented within each Division. They contain specific procedures for the execution of activities aimed at maintaining legal compliance. Specific requirements are managed at a local level by maintenance of registers of legal obligations and registers of environmental aspects and impacts.

A review of environmental legal compliance was conducted by Risk Assessment and Audit (RA&A) in May 2005 across a sample of Divisions located in Victoria. The review found that the current process for identifying legal obligations appears adequate, as evidenced by a comprehensive framework for the management of environmental legal compliance at these Divisions. However, the review also identified opportunities for staff training in environmental legal compliance and auditing.

Environmental Management Systems Committee

The CSIRO Environmental Management Systems Committee (EMSC) is responsible for the development and implementation of environment policy and system implementation. The EMSC is responsible for reporting to the CSIRO Executive and Board on CSIRO's environmental performance. The EMSC meets every three months and all staff have access to the minutes of the meetings via the intranet.

Effects of CSIRO's activities on the environment

Notifiable environmental incidents

CSIRO reports and investigates any incident deemed to have an environmental impact through the OHS&E incident reporting, recording and investigation procedure.

There were no notifiable incidents reported in the financial year, however, fourteen environmental incidents were recorded:

- Seven – release to air – liquid fuel, two odour, two flammable gas, chemical and asbestos
- Three – release to sewer – biological substances, hazardous waste and flammable liquid
- One – contamination of land by poisonous substances
- One – release to soil of corrosive substance
- One – release to stormwater of chemicals
- One – damage to flora/fauna.

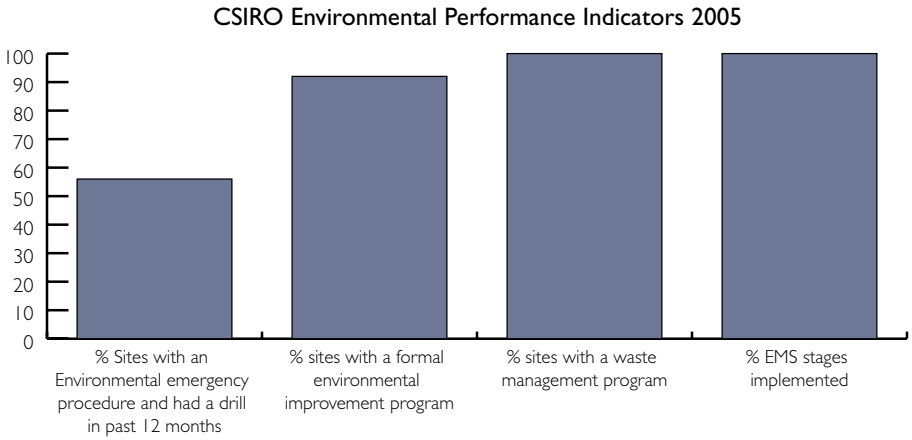
Environmental positive performance indicators

An updated 'Measuring Occupational Health, Safety and Environmental Performance Procedure' was released in December 2004. In accordance with this procedure, Divisions are required to collect, collate and report data on two Environmental Resource Indicators (ERIs) and three Positive Performance Indicators (PPIs). Three new PPIs were developed for 2004–05 as indicated below. See also Figure 1. These have been reported for the first time, less the percentage of sites that have completed the implementation of the EMS. The implementation of the EMS was a high priority activity in 2004–05. The requirement to have all stages implemented by 30 June 2005 has been achieved.

The four PPIs are:

- percentage of sites with an environmental emergency response procedure and had a drill within the last 12 months
- percentage of sites with a formal environmental improvement program
- percentage of sites with a waste management (reduce/reuse/recycle) program
- percentage of sites that have completed the implementation of the EMS.

Figure 1: Environmental Positive Performance Indicators for 2004–05



Resource indicators:

- rate of electricity use for each site
- rate of water use for each site.

Environmental remediation

CSIRO Corporate Property oversees the environmental management of sites and the remediation of any environmental issues that affect the land. Any CSIRO property that is intended for disposal has, as part of the pre-disposal process, due diligence tasks, and an environmental assessment performed with any issues identified to be remediated prior to disposal.

Corporate Property has initiated pre-sale environmental investigations for Cannon Hill, Cleveland, Indooroopilly, Townsville and Woodville in SA.

Phase one investigative reports have been performed for Cannon Hill, Cleveland, Indooroopilly, Atherton and Woodville sites with only minor items identified as requiring attention.

Additional Phase one and two level works are being conducted at Woodville (as preliminary work to a partial or full disposal of the property) and additional work is occurring at Atherton, as preliminary work to a partial disposal of surplus land.

Remediation of the following sites: Prospect and Bradfield Park sites, NSW and Syndal site, Vic has been completed.

CSIRO National Environmental Protection Measures (NEPMs) submissions

Of the four NEPMs required to be reported by Commonwealth agencies, two were reported on by CSIRO during 2004–05:

- *Diesel vehicle emissions*

  CSIRO contributes to the Commonwealth's annual report on progress in reducing pollution from diesel vehicles. CSIRO reported on 130 registered diesel vehicles in 2004–05. Twenty-six of these vehicles were used in capital city areas, 98 in areas outside of capital cities and six were used equally in both areas.

- *National Pollutants Inventory (NPI)*

  CSIRO reported two sites that are above the emissions thresholds for this NEPM. Clayton (Vic) and Black Mountain (ACT) sites burn natural gas in excess of 400 tonnes per year, primarily for space heating purposes. The emissions from the combustion of this gas will be added to the NPI database.

Environmental Management System improvements and review

Environmental Management System improvements

A concentrated effort over the past 12 months has seen all CSIRO Divisions achieve full implementation of their EMS by the end of June 2005. Each Division now has a comprehensive set of EMS procedures in place and corresponding registers, records and logs in order to demonstrate compliance with these procedures on each of the Divisions' sites. Additional improvements over the past year include:

- completion of CSIROClean EMS audits of all Divisions by the RA&A branch
- consolidated action plans, objectives and targets for each Division set as a result of the CSIROClean audits
- a guideline has been provided on controlling and reducing wastes on CSIRO sites
- our internal OHS&E risk assessment tool has been updated to provide better guidance on identifying and assessing environmental risk
- our OHS&E incident reporting procedure has been updated to include further information on reporting environmental, contacts and links to environmental authorities
- the inclusion of a environmental question into the staff satisfaction survey
- re-developed environmental performance indicators have been implemented and procedural guidance provided
- radiation safety officers gathered in Sydney to strengthen and improve the networks capability to address radiation OHS&E risks including waste disposal
- a 'Green Purchasing' audit was conducted by the Australian National Audit Office
- asbestos management audits were conducted by Comcare
- sixty-one staff with environmental management responsibilities attended training in environmental management and legal obligations in order to better prepare them for their roles
- environmental auditor training was also delivered to CSIRO OHS&E Managers.

Environmental Management System monitoring and review

The mechanisms used to monitor and review environmental management processes and to achieve continual improvement include:

- annual reporting on environmental performance indicators
- quarterly reporting on Divisions' progress with implementing the EMS
- EMS auditing using the internally developed CSIROClean audit tool
- quarterly meetings by the EMSC to review actions to improve the management of environmental activities
- bi-monthly reporting to the Board on environmental management.

Aspects identified in baseline audits

Baseline environmental audits were completed on all CSIRO sites by third party auditors. The EMSC examined these audit reports which determined that the Organisation's business units were generally operating in an environmentally responsible manner. However, the following environmental aspects were identified for attention:

- **Underground storage tanks (USTs) with potential for contamination**

  All identified out-of-use USTs (64) have now been removed or decommissioned, with remaining USTs (20) having to comply with the CSIRO 'Management of Underground Storage Tanks' procedure which requires owners to implement an ongoing UST management program so

that they are able to detect leaks, and fractures in USTs and associated lines.

- **Asbestos in buildings and fixtures**

  CSIRO's asbestos management program and procedure requires ongoing management of asbestos, with removal dependant on risk assessment. The management plan also requires asbestos audits and the development of asbestos registers for buildings and fixtures.

- **Stormwater contamination potential**

  Stormwater management plans are included in Divisional Environmental Management Plans, dependant on risk assessment and prioritisation within their EMS.

- **Ozone depleting substances (ODS) (refrigerants)**

  ODS management is incorporated into Divisional environmental objectives and targets, dependant on risk assessment and prioritisation within their EMS.

- **Trade and liquid waste**

  CSIRO conducted an organisational-wide Environmental Risk Review in 2004 that highlighted the potential significant environmental impact arising from improper management of trade waste. In response to these findings, a survey was used to gather data on trade waste management regimes across CSIRO's sites. As a result of the findings of this survey, an action plan has been implemented to ensure that affected Divisions include trade waste management as a priority target of their EMS.

Assessing Environmental Risk

CSIRO uses a risk management process whereby all project groups, prior to work or projects commencing, are required to identify potential environmental impacts, assess the risk and implement control strategies. This is part of the integrated Health Safety and Environmental Assessment and Control of Work Policy. Environmental hazard identification, incident reporting and investigation, and training has also been integrated into the OHS&E system.

A review of the Organisation's environmental impact (risk) exposure was conducted by the RA&A group, in conjunction with Divisional OHS&E Managers, and completed at the end of 2004.

Environmental performance was included as part of the review by RA&A. Resource usage and incident reports were collated and analysed to develop a risk profile for CSIRO that included potential and actual risk. The diverse nature of CSIRO's activities contribute to high-levels of inherent environmental risk exposure across a broad range of possible risk categories. An evaluation of existing controls to prevent and manage environmental impacts indicated that, 68 per cent of potential aspects, are being managed effectively.

The residual risk key areas where shortcomings in management controls were identified and present opportunities for management to revise or implement further environmental risk reduction strategies include:

- generation of waste and subsequent
- generation of pollution.

CSIROClean Audits

The completion of CSIROClean EMS audits of all Divisions provided the following key finding:

- The average standard of the EMS, according to the rating system used, is very good to excellent, with a mean response across all Divisions of 86 per cent. While this suggests that the level of implementation is adequate, the specific areas where implementation is lagging are those related to audit and review, particularly management review, and weaknesses in these areas mean that the ability of the system to 'close the loop' is impeded.

Radiation sources

Low-level radioactive contaminated soil from Fishermen's Bend in Victoria is stored at Woomera in a secure area in a Department of Defence building. Defence

provides security and controls access to the building. The store is inspected regularly.

Changes to the inventory of CSIRO radiation source holdings are reported to the Australian Radiation and Nuclear Safety Agency (ARPANSA) on a quarterly basis.

Energy services

Corporate Property provides advice and assistance to minimise the environmental impact of CSIRO's operations by improving energy management whilst supporting research. Professional advice on energy conservation initiatives is provided to all CSIRO Divisions and units and continuous auditing is carried out to achieve these objectives.

CSIRO is obliged to conform to current government energy policy and report its energy use to the government annually through the Australian Greenhouse Office (AGO). CSIRO is the second highest Australian Government energy consumer, using an estimated 9.4 per cent of the Commonwealth's energy in 2004–05. CSIRO complies with current Commonwealth Energy Policy and liaises with the AGO and other agencies regarding energy initiatives and benchmarks.

To proactively reduce CSIRO's emissions from electricity further, Corporate Property negotiated the purchase of 10 per cent green power between July 2004 and June 2006 at concessional rates, building upon the five per cent green power component in existing contracts. In more recent times, Corporate Property negotiated the purchase of 25 per cent green power for CSIRO sites in Western Australia until June 2006. CSIRO will pursue the purchase of additional green power at concessional rates in addition to continuation of energy initiatives to achieve lower greenhouse gas emissions.

Electricity and natural gas comprises 93 per cent of CSIRO's energy use, with the remainder used in transport and standby generating plant. CSIRO's energy efficiency initiatives, including building sustainability measures over the last decade, have been successful with energy usage plateauing, whilst the area of refurbished and air-conditioned laboratory space increased significantly.

CSIRO is also preparing energy and greenhouse emission benchmarks for comparison between its laboratories and also with external organisations.

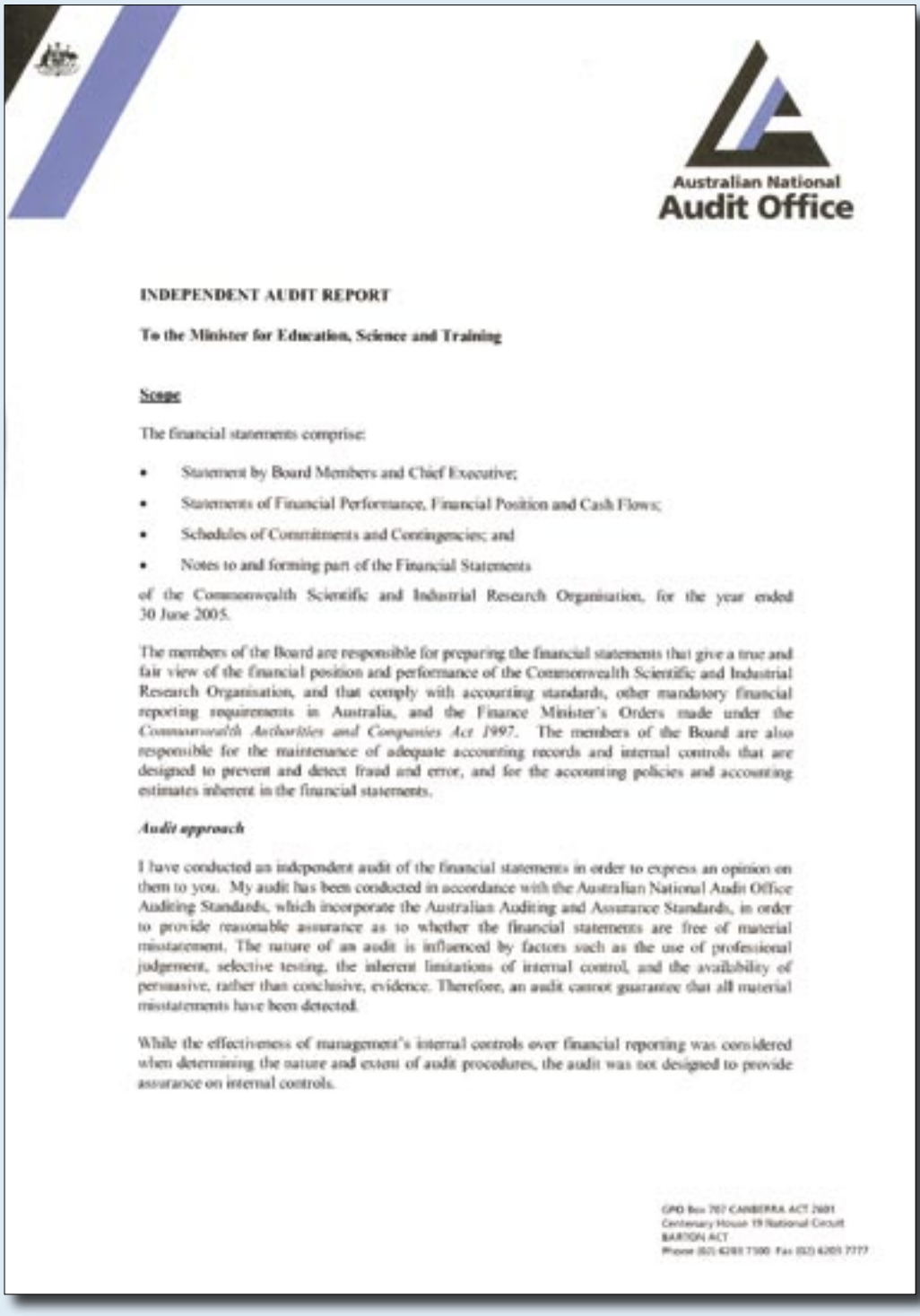
Heritage sites

Corporate Property maintains a Heritage Register for Land and Buildings and regularly reviews its holdings in accordance with Commonwealth and State heritage legislation and guidelines. The CSIRO register of heritage assets is listed on the CSIRO Property intranet web site and includes buildings, natural and cultural assets. The information is made available to any interested party who requests information concerning the CSIRO Heritage Register.

Corporate Property is presently reviewing the CSIRO heritage management plan in accordance with legislative requirements under the *Environment Protection and Conservation Biodiversity Act 1999.*

Financial Statements

Independent Audit Report



Australian National
Audit Office

INDEPENDENT AUDIT REPORT

To the Minister for Education, Science and Training

Scope

The financial statements comprise:

- Statement by Board Members and Chief Executive;
- Statements of Financial Performance, Financial Position and Cash Flows;
- Schedules of Commitments and Contingencies; and
- Notes to and forming part of the Financial Statements

of the Commonwealth Scientific and Industrial Research Organisation, for the year ended 30 June 2005.

The members of the Board are responsible for preparing the financial statements that give a true and fair view of the financial position and performance of the Commonwealth Scientific and Industrial Research Organisation, and that comply with accounting standards, other mandatory financial reporting requirements in Australia, and the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*. The members of the Board are also responsible for the maintenance of adequate accounting records and internal controls that are designed to prevent and detect fraud and error, and for the accounting policies and accounting estimates inherent in the financial statements.

Audit approach

I have conducted an independent audit of the financial statements in order to express an opinion on them to you. My audit has been conducted in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing and Assurance Standards, in order to provide reasonable assurance as to whether the financial statements are free of material misstatement. The nature of an audit is influenced by factors such as the use of professional judgement, selective testing, the inherent limitations of internal control, and the availability of persuasive, rather than conclusive, evidence. Therefore, an audit cannot guarantee that all material misstatements have been detected.

While the effectiveness of management's internal controls over financial reporting was considered when determining the nature and extent of audit procedures, the audit was not designed to provide assurance on internal controls.

GPO Box 707 CANBERRA ACT 2601
Centenary House 19 National Circuit
BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

I have performed procedures to assess whether, in all material respects, the financial statements present fairly, in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*, including accounting standards and other mandatory financial reporting requirements in Australia, a view which is consistent with my understanding of the Commonwealth Scientific and Industrial Research Organisation's financial position, and of its performance as represented by the statements of financial performance and cash flows.

The audit opinion is formed on the basis of these procedures, which included:

- examining, on a test basis, information to provide evidence supporting the amounts and disclosures in the financial statements; and
- assessing the appropriateness of the accounting policies and disclosures used, and the reasonableness of significant accounting estimates made by members of the Board.

Independence

In conducting the audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate the ethical requirements of the Australian accounting profession.

Audit Opinion

In my opinion, the financial statements of the Commonwealth Scientific and Industrial Research Organisation:

(a) have been prepared in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*; and

(b) give a true and fair view of the Commonwealth Scientific and Industrial Research Organisation's financial position as at 30 June 2005 and of its performance and cash flows for the year then ended, in accordance with:
  (i) the matters required by the Finance Minister's Orders; and
  (ii) applicable accounting standards and other mandatory financial reporting requirements in Australia.

Australian National Audit Office

Rebecca Reilly
Executive Director

Delegate of the Auditor-General

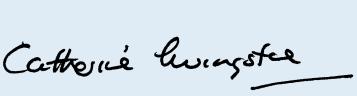
Canberra
25 August 2005

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
STATEMENT BY BOARD MEMBERS AND CHIEF EXECUTIVE

In our opinion, the attached financial statements for the year ended 30 June 2005 have been prepared based on properly maintained financial records and give a true and fair view of the matters required by the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997.*

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Commonwealth Scientific and Industrial Research Organisation ('the Organisation') will be able to pay its debts as and when they become due and payable.

This Statement is made in accordance with the resolution of the Board members.



Catherine B Livingstone
Chairman of the Board

24 August 2005

Geoff G Garrett
Chief Executive and Board Member

24 August 2005

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
STATEMENT OF FINANCIAL PERFORMANCE
For the year ended 30 June 2005

	Notes	2005 $'000	2004 $'000
REVENUE			
Revenues from ordinary activities			
Revenues from Government	6.1	577 138	568 646
Goods and services	6.2	280 893	296 151
Interest	6.3	7 884	7 498
Revenue from sale of assets	6.4	30 590	15 281
Reversals of previous asset write-downs	6.5	3 046	–
Contributions	6.6	160	273
Other revenues	6.7	25 653	16 082
Revenues from ordinary activities		**925 364**	**903 931**
EXPENSE			
Expenses from ordinary activities (excluding borrowing costs expense)			
Employees	7.1	535 168	521 739
Suppliers	7.2	299 297	288 935
Depreciation and amortisation	7.3	78 071	79 486
Write-down and impairment of assets	7.4	2 045	5 846
Value of assets sold	6.4	16 370	10 332
Net foreign exchange losses	7.5	163	374
Total expenses from ordinary activities (excluding borrowing costs expense)		**931 114**	**906 712**
		(5 750)	**(2 781)**
Borrowing costs expense	7.6	(3 481)	(3 047)
Share of net profits of joint ventures accounted for using the equity method	25 (f)	14	502
Net operating (deficit) from ordinary activities	22A	**(9 217)**	**(5 326)**
Net (deficit) attributable to the Australian Government		**(9 217)**	**(5 326)**
Net credit to asset revaluation reserve	22A	**237 579**	–
Total revenue, expenses and valuation adjustments recognised directly in equity		**237 579**	–
Total changes in equity other than those resulting from transactions with the Australian Government as owner		**228 362**	**(5 326)**

The above statement should be read in conjunction with the accompanying notes.

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
STATEMENT OF FINANCIAL POSITION
As at 30 June 2005

	Notes	2005 $'000	2004 $'000
ASSETS			
Financial assets			
Cash	8	158 675	178 998
Receivables	9	84 540	50 063
Investments accounted for under the equity method	10	516	502
Investments – other	10	14 817	12 585
Total financial assets		**258 548**	**242 148**
Non-financial assets			
Land and buildings	11	1 045 314	833 931
Plant and equipment	12	217 330	228 238
Intangibles	13	8 031	8 186
Inventories	14	966	796
Other non-financial assets	15	20 245	31 594
Total non-financial assets		**1 291 886**	**1 102 745**
Total assets		**1 550 434**	**1 344 893**
LIABILITIES			
Interest bearing liabilities			
Leases	16	79 817	85 032
Deposits	17	15 118	18 428
Total interest bearing liabilities		**94 935**	**103 460**
Provisions			
Employees	18	179 579	179 855
Other provisions	19	1 100	1 100
Total provisions		**180 679**	**180 955**
Payables			
Suppliers	20	38 743	40 659
Other payables	21	71 004	74 886
Total payables		**109 747**	**115 545**
Total liabilities		**385 361**	**399 960**
NET ASSETS		**1 165 073**	**944 933**
EQUITY			
Reserves	22A	712 256	481 251
Retained surpluses	22A	452 817	463 682
Total equity		**1 165 073**	**944 933**
Current assets		**264 426**	**261 451**
Non-current assets		**1 286 008**	**1 083 442**
Current liabilities		**180 484**	**188 181**
Non-current liabilities		**204 877**	**211 779**

The above statement should be read in conjunction with the accompanying notes.

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
STATEMENT OF CASH FLOWS
For the year ended 30 June 2005

	Notes	2005 $'000	2004 $'000
OPERATING ACTIVITIES			
Cash received			
Appropriations		577 138	568 646
Sales of goods and services		349 282	324 537
Interest		7 884	7 048
GST received from the Australian Taxation Office		15 380	8 251
Total cash received		**949 684**	**908 482**
Cash used			
Employees		535 968	529 283
Suppliers		360 324	297 227
Borrowing costs		7 419	3 047
Deposits		3 310	19 268
Total cash used		**907 021**	**848 825**
Net cash from operating activities	24 (a)	**42 663**	**59 657**
INVESTING ACTIVITIES			
Cash received			
Proceeds from sale of property, plant and equipment		2 154	35 536
Proceeds from sale of equity instruments and investments in intellectual property		8 879	10 390
Total cash received		**11 033**	**45 926**
Cash used			
Purchase of property, plant and equipment		64 830	67 325
Purchase of equity investments		3 974	11 980
Loan to external body		–	2 436
Total cash used		**68 804**	**81 741**
Net cash (used by) investing activities		**(57 771)**	**(35 815)**
FINANCING ACTIVITIES			
Cash used			
Finance leases		5 215	2 993
Total cash used		**5 215**	**2 993**
Net cash (used by) financing activities		**(5 215)**	**(2 993)**
Net increase/(decrease) in cash held		**(20 323)**	**20 849**
Cash at the beginning of the year		178 998	158 149
Cash at the end of the reporting period	8	**158 675**	**178 998**

The above statement should be read in conjunction with the accompanying notes.

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
SCHEDULE OF COMMITMENTS
As at 30 June 2005

	2005 $'000	2004 $'000
By Type		
Capital commitments		
Land and buildings[1]	27 186	16 793
Plant and equipment	2 205	24 432
Investments	6 105	856
Total capital commitments	**35 496**	**42 081**
Other commitments		
Operating leases[2]	384 697	406 936
Research and development commitments	278 745	329 648
Other commitments	4 588	3 992
Total other commitments	**668 030**	**740 576**
Commitments receivable		
Research and development commitments	219 633	272 349
Other receivables	17 594	14 937
Total commitments receivable	**237 227**	**287 286**
Net commitments by type	**466 299**	**495 371**
By Maturity		
Capital commitments		
One year or less	31 261	22 699
From one to five years	4 235	19 382
Total capital commitments	**35 496**	**42 081**
Operating lease commitments		
One year or less	29 551	32 273
From one to five years	88 166	65 860
Over five years	266 980	308 803
Total operating lease commitments	**384 697**	**406 936**
Other Commitments		
One year or less	166 032	185 553
From one to five years	113 728	137 773
Over five years	3 573	10 314
Total other commitments	**283 333**	**333 640**
Commitments receivable	**(237 227)**	**(287 286)**
Net commitments by maturity	**466 299**	**495 371**

The above schedule should be read in conjunction with the accompanying notes. NB: Commitments are GST inclusive where relevant.

SCHEDULE OF COMMITMENTS (cont)

1. Outstanding contractual payments for buildings under construction.
2. Operating leases included are effectively non-cancellable and comprise:

Nature of lease	General description of leasing arrangement.
Leases for office accommodation	Lease payments are subject to annual increase in accordance with the terms of agreement eg upwards movements in the Consumer Price Index. The accommodation leases are still current and each may be renewed at the Organisation's option.
Leases for motor vehicles	No contingent rentals exist. There are no purchase options available to the Organisation.
Leases for computer equipment	Lessor provides computer equipment designated as necessary in the supply contract for a general period of 2–3 years.

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
SCHEDULE OF CONTINGENCIES
As at 30 June 2005

		Commonwealth Scientific and Industrial Research Organisation							
	Notes								
Contingent liabilities		Guarantees		Claims for Damages/Costs		Indemnities		Total	
		2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000
Balance from previous period		*86 855	84 376	1 100	980	–	–	87 955	85 356
New		44	2 479	525	–	–	–	569	2 479
Re-measurement		(86 857)	–	–	120	–	–	(86 857)	120
Liabilities crystallized		–	–	–	–	–	–	–	–
Obligations expired		–	–	(1 100)	–	–	–	(1 100)	–
Total contingent liabilities	23	#42	*86 855	525	1 100	–	–	567	87 955
Contingent assets		Guarantees		Claims for Damages/Costs		Indemnities		Total	
		2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000
Balance from previous period		86 855	84 376	–	–	–	–	86 855	84 376
New		–	2 479	–	–	–	–	–	2 479
Re-measurement		(86 855)	–	–	–	–	–	(86 855)	–
Assets crystallized		–	–	–	–	–	–	–	–
Expired		–	–	–	–	–	–	–	–
Total contingent assets	23	–	86 855	–	–	–	–	–	86 855
Net contingent liabilities	23	42	–	525	1 100	–	–	567	1 100

Details of each class of contingent liabilities and assets, including those not included above because they cannot be quantified, or are considered remote, are shown at Note 23, Contingent Liabilities and Assets.

*Contingent asset and liability for Australian Magnesium Corporation Ltd (AMC) which was previously reported in 2003–04 is now classified as less than remote.

#The Organisation has taken out a guarantee with Westpac for a tender arrangement.
The amount of the bank guarantee being USD 32 000 has been converted to Australian dollars at the exchange rate prevailing at 30 June 2005.

The above schedule should be read in conjunction with the accompanying notes.

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS
For the year ended 30 June 2005

Note 1 Summary of Significant Accounting Policies

1.1 Basis of accounting

The financial statements are required by clause 1(b) of Schedule 1 to the *Commonwealth Authorities and Companies Act 1997* and are a general purpose financial report.

The statements have been prepared in accordance with:

- Finance Minister's Orders (being the *Commonwealth Authorities and Companies Orders* (Financial Statements for the periods ending on or after 30 June 2005))
- Australian Accounting Standards and Accounting Interpretations issued by the Australian Accounting Standards Board
- Urgent Issues Group Abstracts.

The Organisation's Statements of Financial Performance and Financial Position have been prepared on an accrual basis and are in accordance with the historical cost convention, except for certain assets, which, as noted, are at valuation. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

Assets and liabilities are recognised in the Organisation's Statement of Financial Position when and only when it is probable that future economic benefits will flow and the amounts of the assets or liabilities can be reliably measured. Assets and liabilities arising under agreements equally proportionately unperformed are, however, not recognised unless required by an Accounting Standard. Liabilities and assets that are unrecognised are reported in the Schedule of Commitments and the Schedule of Contingencies (other than unquantifiable or remote contingencies, which are reported at Note 23).

Revenues and expenses are recognised in the Organisation's Statement of Financial Performance when and only when the flow or consumption or loss of economic benefits has occurred and can be reliably measured.

1.2 Change in accounting policy

The accounting policies used in the preparation of these financial statements are consistent with those used in 2003–04.

Property, plant and equipment assets have been revalued as explained in Note 1.12. Revaluations up to the 30 June 2002 were undertaken on a 'deprival' basis, all subsequent revaluations have now been undertaken on a fair value basis as at 30 June 2005. Revaluation increments and decrements in this year of the transition to fair value that would otherwise be accounted for as revenue and expenses are taken directly to accumulated results in accordance with transitional provisions of AASB 1041 *Revaluation of Non-Current Assets.*

1.3 Principles of Consolidation

The Organisation has investments in a number of companies (see Note 10) over which it has a controlling interest and/or significant influence. These companies have been established for the purpose of i) commercialisation of intellectual property, ii) to provide specific services and iii) for the purpose of participation in the Ensis joint venture.

The Organisation's policy is to only consolidate and/or equity account for these entities where there is a material impact on CSIRO's financial statements.

As none of these entities is assessed as having a material impact they have not been consolidated or equity accounted in the financial statements.

1.4 Revenue

The revenues described in this Note are revenues relating to the core operating activities of the Organisation.

Revenue from contract research and development activities is recognised by reference to the stage of completion of contracts. The stage of completion is determined according to costs incurred to date after taking into account the total contract values and the estimated total costs. The balances of contract research and development activities in progress are accounted as either contract research work in progress (Note 15) or contract research revenue received in advance (Note 21). Where necessary, a surplus or deficit is recognised progressively for each contract research and development activity.

Revenue from sale of other goods and services is recognised upon delivery of goods and services performed. Receivables for goods and services are recognised at the nominal amounts due less any provision for doubtful debts. Collectability of debts is reviewed at balance date. Provisions are made when collection of the debt is judged to be less rather than more likely.

Interest revenue is recognised on a proportional basis taking into account the interest rates applicable to the financial assets.

Licensing fees and royalties from the sale of products or technologies developed under agreements are brought to account when received. While this basis of accounting constitutes a departure from an accrual basis, the effect is not material to the financial statements.

Revenue from disposal of non-current assets is recognised when control of the assets has passed to the buyer or, in the case of the sale of property, has been recognised by applying the percentage of completion method to that proportion of the project represented by the individual units of property sold in accordance with *UIG 53 Pre-Completion Contracts for the Sale of Residential Development Properties.*

The full amount of the profit on sale has been recognised for the sale of the Lindfield Property in this financial year as it is substantially complete. The revenue can be reliably measured as all individual blocks available were sold at auction in February 2005. The Organisation is undertaking development works on behalf of the purchasers as a condition of the sale. The stage of completion has been determined by applying the method of the proportion of the contract costs incurred for the work performed to date against the estimated total contract costs. These costs can be reliably measured and have been supported by details provided by the Project Superintendent.

Revenue from Government – Output Appropriation

The full amount of the appropriation for departmental outputs for the year is recognised as revenue.

Resources Received Free of Charge

Services received free of charge are recognised as revenue when and only when a fair value

can be reliably determined and the services would have been purchased if they had not been donated. Use of those resources is recognised as an expense.

Contributions of assets at no cost of acquisition or for nominal consideration are recognised as revenue at their fair value when the asset qualifies for recognition.

1.5 Research and development expenditure and intellectual property

All research and development costs, including costs associated with protecting intellectual property (eg patents and trademarks) are expensed as incurred.

1.6 Employee benefits

Benefits

Liabilities for services rendered by employees are recognised at the reporting date to the extent that they have not been settled.

Liabilities for salaries and wages (including non-monetary benefits), severance pay and annual leave are measured at nominal amounts. Other employee benefits expected to be settled within 12 months of their reporting date are also measured at their nominal amounts.

The nominal amount is calculated with regard to the rates expected to be paid on settlement of the liability.

All other employee benefit liabilities are measured as the present value of the estimated future cash outflows to be made in respect of services provided by employees up to the reporting date.

Leave

The liability for employee benefits includes provisions for annual leave and long service leave. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave estimated to be taken in future years by employees of the Organisation is less than the annual entitlement for sick leave.

The leave liabilities are calculated on the basis of employees' remuneration, including the Organisation's employer superannuation contribution rates to the extent that the leave is likely to be taken during service rather than paid out on termination.

The liability for long service leave has been determined by reference to the work of an actuary as at 31 December 2003. The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

Separation and redundancy

Provision is made for separation and redundancy benefit payments in circumstances where positions have been identified as excess to requirements as a result of restructuring and relocation of Divisions, the Organisation has informed employees affected, and a reliable estimate of the amount payable can be determined.

Superannuation

Employees of the Organisation are either members of the Commonwealth Superannuation Scheme (CSS) or the Public Sector Superannuation Scheme (PSS). The liability for their

superannuation benefits is recognised in the financial statements of the Australian Government and is settled by the Australian Government in due course.

The Organisation makes contributions to the schemes at rates determined by regular actuarial review and calculated to cover existing and emerging obligations. In addition, a 3% Employer Productivity Superannuation Contribution is paid for CSS and PSS members. For term employees who have chosen not to join the CSS or PSS, a 9% employer productivity superannuation contribution is paid to the Australian Government Employees Superannuation Trust (AGEST) or other eligible superannuation funds.

The liability for superannuation recognised at the financial year end represents outstanding contributions for the final fortnight of the year.

1.7 Workers' compensation

The Organisation's workers' compensation liability is covered by the premium paid to the Commission for the Safety, Rehabilitation and Compensation of Commonwealth Employees 'Comcare' and no additional provision for liability is required.

1.8 Insurance

As part of its risk management strategy, the Organisation has insured for risks through the Commonwealth Government's insurable risk managed fund 'Comcover'.

1.9 Bad and doubtful debts

Bad debts are written off in the year in which they are identified. A provision is raised for doubtful debts based on a review of all receivables outstanding for more than 60 days at year-end and any other specific debt where the collection of the full amount is considered doubtful.

1.10 Cash

Cash means notes and coins held and any deposits held at call with a bank or financial institution. Cash is recognised at its nominal amount. Interest is credited to revenue as it accrues.

1.11 Investments

Australian Accounting Standard, AASB 1041 *Revaluation of Non-Current Assets* allows a choice to either adopt the cost method or the fair value method in the valuation of its investments. The Organisation has elected to value its investments at cost, where this is not in excess of their recoverable amounts. As at 30 June 2005, the Organisation's investment in the listed company, Australian Magnesium Corporation Ltd has been written down to its recoverable amount (Note 10(c)).

The Organisation reviewed its investments in unlisted companies established for the purpose of commercialisation of IP in accordance with the Australian Venture Capital Association Ltd Valuation Guidelines. These Guidelines identify companies as 'early stage' investment, 'mid/expansion stage' investment and 'later stage' investment. All of these companies have been identified as 'early stage' investment. The Organisation has fully or partially provided for diminution in value where the inherent business risk of these companies is high and it is doubtful that probable future economic benefit will flow from the companies. The total value of the provision for diminution in value is $8.9 million.

1.12 Property, plant and equipment

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost, except for purchases costing less than $3 000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total).

Revaluations

Revaluations of property, plant and equipment, including assets under finance leases, were undertaken as at 30 June 2005, using the fair value method. This is in accordance with the Finance Minister's Orders (FMOs) and AASB 1041. Prior revaluation was undertaken using the deprival valuation methodology. The Organisation's independent valuers have confirmed that there is no material difference as at 1 July 2004, between the deprival valuation methodology and the fair value valuation methodology.

Land, which will continue to be used for research activity, is valued by the Organisation's registered valuer at fair value, ie 'existing use value', and the valuation methodology has been endorsed by independent valuers. Existing use contemplates the continued use of the asset for the same application as at the date of valuation, having regard to the asset's capacity to continue contributing to the value of the Organisation but ignoring alternative uses.

Buildings and leasehold improvements, which will continue to be used for research activities, are valued adopting the fair value methodology. This valuation approach determines the depreciated replacement cost using current building prices to arrive at current gross replacement cost less accumulated depreciation having regard to the age, condition and suitability for research. Building valuations include plant, fit-outs, fixtures and fittings, which form an integral part of the building.

Land and buildings designated for possible sale are valued at market value by registered independent valuers.

All plant and equipment have been revalued by the Australian Valuation Office using the fair value methodology. Under both deprival and fair value, assets which would not be replaced, or are surplus to requirements, are valued at net realisable value.

Property, plant and equipment which are purchased from contract research funds and where the control and subsequent sale proceeds are refunded to the contributors under the terms of the agreements, are expensed during the year of purchase. Separate records for these assets are maintained and disclosed in Note 27.

Depreciation and Amortisation

Depreciation is calculated on a straight line basis so as to write-off each item of building, plant and equipment over its estimated useful life. Leasehold improvements are amortised on a straight-line basis over the lesser of the estimated useful life of the improvement or the unexpired period of the lease.

Depreciation/amortisation rates (ie useful lives) and methods are reviewed at each balance date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

Depreciation and amortisation rates applying to each class of depreciable assets are as follows:

• Building on freehold land	40 to 50 years
• Leasehold improvements	Lease term
• Passenger vehicles	5 years
• Agricultural and transport equipment	3 to 15 years
• Computing equipment	2 to 5 years
• Scientific equipment	5 to 25 years
• Furniture and office equipment	4 to 15 years
• Workshop equipment	20 years
• Research vessels	25 years
• Australia Telescope	12 to 55 years

The aggregate amount of depreciation and amortisation for the year is disclosed in Note 7.3.

Impairment of Non-Current Assets

Non-current assets carried at up-to-date fair values at the reporting date are not subject to impairment testing.

Non-current assets carried at cost and held to generate net cash inflows have been tested for their recoverable amounts at the reporting date. The test compared the carrying amounts against the net present value of the future net cash inflows. No write-down to recoverable amount was required.

Non-current assets carried at cost, which are not held to generate net cash inflows, have been assessed for indications of impairment. Where indications of impairment exist, the asset is written down to the higher of its net selling price and depreciated replacement cost.

1.13 Intangibles

Internally developed and externally acquired computer software with an estimated cost of more than a $250 000 threshold is carried at cost. Computer software is amortised on a straight-line basis over its remaining useful life of between 2 to 7 years.

As required by Schedule 1 of the Finance Minister's Orders, all software assets must be assessed for indications of impairment as at 30 June 2005. Where an asset has been impaired, the carrying amount of impaired assets must be written down to the higher of its net market-selling price or depreciated replacement cost.

1.14 Inventories

Inventories held at the reporting date represent books, CD-ROMs and videos of publishing and media products. They are held for resale and valued at the lower of cost and net realisable value.

1.15 Consumable stores

Stocks of consumable stores, which are not held for resale, are expensed during the year of purchase. These stores mainly consist of fuel and lubricants, chemical supplies, maintenance materials and stationery. The total value is not considered material in terms of total expenditure or total assets.

1.16 Leases

A distinction is made between finance leases, which effectively transfer from the lessor to the lessee substantially all the risks and benefits incidental to ownership of leased assets, and operating leases, under which the lessor effectively retains all such risks and benefits.

Where a non-current asset is acquired by means of a finance lease, the asset is capitalised at the present value of minimum lease payments at the inception of the lease and a liability for lease payments recognised at the same amount. The discount rate used is the interest rate implicit in the lease. Lease payments are allocated between the principal component and the interest expense. Leased assets are amortised over the period of the lease.

Operating lease payments are charged to the Statement of Financial Performance on a basis which is representative of the pattern of benefits derived from the leased assets.

1.17 Foreign currency transactions

Transactions denominated in a foreign currency are converted at the exchange rate prevailing at the date of the transaction. Foreign currency receivables and payables are also translated at the exchange rates prevailing at balance date. Associated currency gains and losses are brought to account in the Statement of Financial Performance. As at 30 June 2005, the Organisation had no specific forward exchange contracts.

1.18 Taxation/Competitive neutrality

In accordance with section 53 of the *Science and Industry Research Act 1949*, the Organisation is exempt from all forms of Australian taxation except fringe benefits tax and the goods and services tax. The Organisation pays applicable taxes in overseas countries.

Revenues, expenses and assets are recognised net of GST:

- except where the amount of GST incurred is not recoverable from the Australian Taxation Office
- except for receivables and payables.

Competitive neutrality

The Australian Government *Competitive Neutrality Guidelines for Managers* require that government bodies operate under a Taxation Equivalent Regime (TER) which requires the tax liability to be calculated in a comparable manner to competitors where commercial activities are above a $10 million threshold. It was agreed by Government that while each individual Division's consulting activities are less than $10 million turnover (the 'significant business' threshold), some form of Competitive Neutrality should be applied. Competitive Neutrality is applied within the Organisation by incorporating tax-equivalent (TER) and rate of return (RoR) components at the time the charges for consulting services are determined.

1.19 Rounding

Amounts are rounded to the nearest $1 000 except in relation to:

- remuneration of Board Members
- remuneration of Officers
- remuneration of auditors
- investment at cost in companies which are less than $1 000 (Note 10(b)).

1.20 Joint ventures

Joint venture operations

The proportionate interest in the assets, liabilities and expenses of the joint venture operations in Note 25 have been incorporated in the financial statements under appropriate headings. Details of specific 'joint venture operations' are disclosed in Note 25(a) to (d).

Joint venture entities – Unincorporated

Food Science Australia (FSA). The Organisation's 85% interest in FSA is not accounted for using the equity method because the carrying amount of the Organisation's investment in FSA has been reduced below zero due to its share of FSA's accumulated losses (Refer Note 25(e)). The share of FSA' s operating surplus for the year has been netted off against its share of its accumulated deficit and recognised as a liability in the Statement of Financial Performance.

Murray Darling Freshwater Research Centre (MDFRC). The Organisation's 50% interest in the MDFRC is accounted for using the equity method (Refer Note 25(f)). The share of operating surplus of MDFRC has been recognised as an investment asset in the Statement of Financial Performance.

Ensis. The Organisation's 50% interest in the joint venture entity Ensis, is via its fully owned subsidiary, CSIRO FFP Pty Ltd. The Organisation's 50% share of Ensis' gross margin for the year has been accounted for by CSIRO FFP Pty Ltd using the equity method. Details of CSIRO FFP Pty Ltd's share of Ensis gross profit margin are disclosed in Note 10 and Note 25 (g).

Joint venture entities – Incorporated

The Organisation has interests in (5) incorporated CRCs. The equity method to account for these interests has not been applied as they are not considered material. The Organisation's interests in these incorporated CRCs have been accounted for as joint venture operations. Should the Organisation's interest in these incorporated CRCs become material, the equity accounting method will be adopted. (See Note 25(a)).

1.21 Financial instruments

Accounting policies for financial instruments are stated in Note 36 (a).

1.22 Unrecognised liabilities and assets

The Organisation may provide certain indemnities, guarantees, letters of comfort and warranties ('contingent liabilities') as part of its business activities. These contingent liabilities cover potential losses or damages for which the Organisation may be liable.

These contingent liabilities are considered remote and consequently are detailed in Note 23 Contingent Liabilities and Assets. At the time of completion of the financial statements, there was no reason to believe that the contingent liabilities provided by the Organisation would be called upon, and recognition of the liability was therefore not required.

The expected fair value of the guarantees are shown in the financial instrument Note 36 (a).

1.23 Comparative figures

Where necessary, comparative figures have been adjusted to conform to changes in presentation in these financial statements.

Note 2 Adoption of Australian Equivalents to International Financial Reporting Standards from 2005–06

The Australian Accounting Standards Board has issued replacement Australian Accounting Standards to apply from 2005–06. The new standards are the Australian Equivalents to International Financial Reporting Standards (AEIFRS) which are issued by the International Accounting Standards Board. The new standards cannot be adopted early. The standards being replaced are to be withdrawn with effect from 2005–06, but continue to apply in the meantime, including reporting periods ending on 30 June 2005.

AEIFRS contains certain additional provisions which will apply to not-for-profit entities, including this Organisation. Some of these provisions are in conflict with the International Financial Reporting Standards (IFRS) and therefore, the Organisation will only be able to assert that the financial report has been prepared in accordance with Australian Accounting Standards.

AAS 29 *Financial Reporting by Government Departments* will continue to apply under AEIFRS.

Accounting Standard AASB 1047 *Disclosing the Impact of Adopting Australian Equivalents to International Financial Reporting Standards* requires that the financial report for 2004–05 disclose:

- an explanation of how the transition to AEIFRS is being managed
- narrative explanations of the key policy differences arising from the adoption of AEIFRS
- any known or reliably estimable information about the impacts on the financial report had it been prepared using AEIFRS
- if the impacts referred to above are not known or reliably estimable, a statement to that effect.

The purpose of this Note is to make these disclosures.

Management of the transition to AASB Equivalents to IFRS

The Organisation's Audit Committee is tasked with the oversight of the transition to and implementation of the Australian Equivalents to IFRS. A project team has been established to implement a 3-phased approach to implementation of AEIFRS. The Chief Finance Officer reports regularly to the Audit Committee on progress against the implementation plan which has the following key steps:

- Phase 1. Review and identify IAS standards which:
  - are applicable to CSIRO
  - contain differences from the current AASB
  - may impact on CSIRO's financial statements and require system changes.
- Phase 2. Undertake a detailed analysis and assess the impact of the changes on CSIRO, including possible system implications. Develop AEIFRS implementation strategies.
- Phase 3. Implement AEIFRS, with external quality assurance.

A transitional balance sheet as at 1 July 2004 under AEIFRS was completed and presented to the Audit Committee. An audit opinion was provided by ANAO on the opening balance sheet and accounting policy and a copy of this was provided to the Department of Finance and Administration (DOFA) together with the balance sheet.

An AEIFRS compliant balance sheet was also prepared during the preparation of the

2004–05 statutory financial reports and the 2004–05 balance sheet under AEIFRS will be reported to DOFA in line with their reporting deadlines.

The Organisation has engaged an external consultant to independently review the balance sheets and assist with the implementation plan where necessary.

The Organisation completed transitioning its accounting policies and financial reporting from current Australian Standards to Australian Equivalents of IFRS. A detailed analysis of the differences between the current Australian Standards and the new international standards was undertaken and quality assured by external consultants. The analysis included a risk assessment and an assessment of potential system changes. The results of the analysis are summarised below. Of the current Australian Equivalents of IFRS, which are applicable to the Organisation, most are substantially similar due to previous harmonisation work of the AASB.

The major changes identified are contained within the following accounting standards:

- Intangibles
- Property, Plant and Equipment
- Impairment of Assets
- Employee Benefits
- Financial Instruments.

Although the changes are considered to be major with regard to the harmonisation with the Australian Equivalent of IFRS, only the standard on 'Intangibles' has the potential to have major implications for the Organisation if the Organisation were to capitalise 'development' costs of intellectual property. There is no intention to make such a change in accounting policy. The necessary adjustments have been made in the Organisation's business systems and processes to accommodate the required changes as a result of the impacts of AEIFRS.

Major changes in accounting policy

Changes to major accounting policies are discussed in the following paragraphs.

The Organisation believes that the first financial report prepared under AEIFRS ie 30 June 2006, will be prepared on the basis that the Organisation will be a first-time adopter under AASB 1 *First-time Adoption of Australian Equivalents to International Financial Reporting Standards.* Changes in accounting policies under AEIFRS are applied respectively ie as if the new policy had always applied except in relation to exemptions available and prohibitions under AASB 1. This means that an AEIFRS compliant balance sheet has been prepared as at 1 July 2004. This will enable the 2005–06 financial statements to report comparatives under AEIFRS.

A first-time adopter of AEIFRS may elect to use exemptions under paragraph 13 to 25E. When developing the accounting policies applicable to the preparation of the 1 July opening balance sheet, no exemptions were applied by this Organisation.

Management's review of the quantitative impacts of AEIFRS represents the best estimates of the impacts of the changes as at the reporting date. The actual effects of the impacts of AEIFRS may differ from these estimates due to:

- continuing review of the impacts of AEIFRS on the Organisations' operations
- potential amendments to AEIFRS and AEIFRS interpretations
- emerging interpretations as to accepted practice in the application of AEIFRS and AEIFRS Interpretations.

Property, Plant and Equipment

The Finance Minister's Orders require property, plant and equipment assets carried at valuation in 2003–04 to be measured at up-to-date fair value from 30 June 2005 onwards. This differs from the accounting policies currently in place for these assets which, up to and including 2003–04, have been revalued every 3 years at deprival value. As discussed at Note 1.12 a revaluation was conducted during 2004–05.

It is expected that 2005–06 Finance Minister's Orders will continue to require property plant and equipment assets to be valued at fair value in 2005–06.

It is understood that the FMOs for 2005–06 will elect to expense all borrowing costs under the new Australian Equivalent standard. Accordingly, borrowing costs capitalised as at 1 July 2004 will be written-off to accumulated results. The Organisation had no borrowing costs capitalised at 1 July 2004. Therefore no adjustment is required in relation to capitalised borrowing costs.

Intangible Assets

The Organisation currently recognises internally-developed software assets on the cost basis. The carrying amounts include amounts that were originally measured at deprival valuation and subsequently deemed to be cost under transitional provisions available on the introduction of AAS 38 *Revaluation of Non-current Assets* in 2000–01 and AASB 1041 of the same title in 2001–02.

The new standard, AASB 138, *Intangibles* does not permit intangibles to be measured at valuation unless there is an active market for the intangible. The Organisation's internally-developed software is specific to the needs of the Organisation and is not traded. Accordingly, the Organisation will derecognise the valuation component of the carrying amount of these assets (being $1.5 million at 1 July 2004 and $623K at 1 July 2005), on adoption of the new Australian Equivalent.

An assessment of the intangible assets has been completed with the adjustments to original cost reversed along with the differences in amortisation in using deemed rather than original cost. This amount will be adjusted against intangibles and retained earnings. Amortisation of intangibles is expected to decrease by $892K for 2004–05.

Investment Property

Investment property is property held to earn rentals or for capital appreciation or both. While investment property can be held at either cost or fair value, the FMOs are expected to require investment properties to be measured at fair value, with changes in fair value recognised each period as gains or losses in the income statement. The Organisation has identified one investment property 'The Village' at North Ryde which will be separately disclosed. As at 30 June 2005, the property has been revalued to a fair value of $5.7 million (comprising Land of $3.25 million and Buildings of $2.45 million). From 1 July 2004 the Building will no longer be depreciated. The accumulated depreciation on the building of

$3 million (as at 1 July 2004) will be reversed against accumulated surpluses at the date of transition to AEIFRS and the fair value of the investment property will be recognised at this date. The impact of the change will have the effect of reducing the asset revaluation reserve by $1.8 million and reducing the depreciation by $142K. The gain on the fair value of investment property of $1.6 million will be recognised against retained surpluses.

Impairment of Non-Current Assets

The Organisation's policy on impairment of non-current assets is at note 1.12.

Under the new Australian Equivalent Standard, these assets will be subject to assessment for impairment and, if there are indications of impairment, measurement of any impairment must be completed irrespective of any indications of impairment, for intangible assets not yet available for use. The impairment test is that the carrying amount of an asset must not exceed the greater of (a) its fair value less costs to sell and (b) its value in use. 'Value in use' is the net present value of net cash inflows for for-profit assets of the Organisation and depreciated replacement cost for other assets which would be replaced if the Organisation were deprived of them.

The most significant changes are that, for the Organisation's for-profit assets, the recoverable amount is only generally to be measured where there is an indication of impairment. Previously all assets' recoverable amounts were required to be tested.

Inventory

The Organisation recognises inventory not held for sale at cost, except where no longer required, in which case net realisable value is applied.

The new Australian Equivalent standard will require inventory held for distribution for no consideration or at a nominal amount to be carried at the lower of cost or current replacement cost. The Organisation does not hold any inventory for distribution. Therefore no adjustment is required.

Employee Benefits

The provision for long service leave is measured at the present value of estimated future cash outflows using market yields as at the reporting date on national government bonds. Under the new Australian Equivalent standard, the same discount rate will be used unless there is a deep market in high-quality corporate bonds, in which case the market yield on such bonds must be used. The AASB has recently announced that since there is no deep market in high-quality corporate bonds in Australia, the national government bond rate will be used. In addition, AEIFRS requires that annual leave that is not expected to be taken within 12 months of balance date is to be discounted. After assessing the staff leave profile, the Organisation's non-current portion of recreation leave will be discounted to its present value resulting in a reduction in employee benefits of approximately $1.2 million as at 1 July 2004 and $1.16 million as at 1 July 2005. The effect of the change in movement of the provision will result in an increase to employee expense of $40K.

Financial Instruments

AEIFRS include an option for entities not to restate comparative information in respect of financial instruments in the first AEIFRS report. It is expected that the Finance Minister's

Orders will require entities to use this option. Therefore, the amounts for financial instruments present in the Organisation's 2004–05 primary financial statements are not expected to change as a result of the adoption of AEIFRS.

The Organisation will be required to restate opening balances for 2005–06 in respect of financial instruments to align with the accounting policies required by AEIFRS.

Financial assets and liabilities are likely to be accounted for as either 'held at fair value through profit and loss' or 'available-for-sale' where the fair value can be reliably measured (in which case, changes in value are initially taken to equity as at 1 July 2005). Fair values will be published prices where an active market exists or by market based appraisal. Changes in fair values will be recorded as income or expense. Such instruments that fall within that category are shares in listed companies held by the Organisation. In respect of the shares in the listed companies there would be for 2004–05 no change in the carrying amount as at 1 July 2004, and therefore no adjustments were required to retained earnings or the Income Statement.

Cash and receivables are expected to continue to be carried at amortised cost. Financial assets, except those classified as 'held at fair value through profit and loss' will be subject to impairment testing. Financial liabilities will also continue to be measured at amortised cost.

Under AEIFRS the term 'impairment losses' replaces references to provisions for doubtful debts. Impairment losses are recognised under AEIFRS only when there is objective evidence that a financial asset or group of assets is impaired. Currently the Organisation records a provision for doubtful debts when the collection of the debt or partial debt is judged to be less rather than more likely. The Organisation has reviewed financial assets with the impairment provisions of AASB 139 and has determined that no adjustments to carrying amounts are required.

Provision for Decommissioning, Restoration and Make-Good and Provision for Decontamination

The Organisation has assessed whether the value of fixed assets held as at 1 July 2004 should be adjusted for recognition of obligations for decommissioning, restoration and make-good. Under AASB 116 *Property, Plant and Equipment,* these obligations would be included in the initial cost price of assets where the Organisation has limited discretion but to settle the obligations at the end of the assets life and a matching amount would be provided for under AASB 137 *Provisions, Contingent Liabilities and Contingent Assets.* The Organisation concluded that there were no obligations under leases for make-good and no adjustment was required.

The existing provision of $600K for decontamination is considered to be adequate and as such no further adjustment will be made to this provision at this stage. The Organisation will continue to assess this.

Reconciliations of impacts – AGAAP to AEIFRS

	30 June 2005 $'000	30 June 2004 $'000
Reconciliation of Consolidated Equity		
Total Equity under AGAAP	1 165 073	944 933
Adjustments to accumulated results	2 319	(313)
Adjustments to other reserves	(1 780)	-
Total Equity under AEIFRS	**1 165 612**	**944 620**
Reconciliation of Accumulated Results		
Total Accumulated Results under AGAAP	452 817	463 682
Adjustments:		
Land and buildings	(5 699)	(4 031)
Investment property	5 699	4 031
Derecognise depreciation on investment property	142	–
Write-down intangibles	(623)	(1 515)
Provision for employee expenses	1 162	1 202
Gain on Fair Value of Investment Property	1 638	–
Total Accumulated Results under AEIFRS	**455 136**	**463 369**
Reconciliation of Reserves		
Total Reserves AGAAP	712 256	481 251
Adjustments:		
Asset revaluation Reserve	(1 780)	–
Total Surplus/(Deficit) under AEIFRS	**710 476**	**481 251**
Reconciliation of Net Profit		
Net Profit under AGAAP	(9 217)	(5 326)
Adjustments:		
Amortisation of intangibles	892	–
Provision of employee expenses	(40)	–
Depreciation of investment property	142	–
Gain on Fair Value of Investment Property	1 638	–
Net Profit under AEIFRS	**(6 585)**	**(5 326)**

Note 3 Economic Dependency

The Organisation was established by the *Science and Industry Research Act 1949* and is controlled by the Commonwealth of Australia. It receives approximately two thirds of its funding from Commonwealth Parliamentary appropriations. The current triennium funding agreement with the Commonwealth Government covers the period 2004–05 to 2006–07.

The Organisation is dependent on appropriations from the Parliament of the Commonwealth of Australia for its continued existence and ability to carry out its normal activities.

Note 4 Segment Reporting

The Organisation principally operates in the field of scientific and industrial research and development in Australia with a small overseas presence related to specific Australian research objectives. It is therefore considered that for segment reporting, it operates in one industry (scientific research and development) and principally one geographical location (Australia).

Note 5 Events Occurring After Reporting Date

At the time of completion of this note, the Organisation was not aware of any events occurring after reporting date.

		Notes	2005 $'000	2004 $'000
Note 6	**Operating Revenues**			
6.1	**Revenues from Government**			
	Appropriations – departmental outputs	38	**577 138**	**568 646**
6.2	**Sales of goods and services** (a) and (b)			
	Strategic R&D – co-investment activities		199 660	195 435
	Services and consulting		60 868	78 690
	Intellectual property revenues including net gains from sale of equity investment (c)		20 365	22 026
			280 893	**296 151**
	Sales of goods and services			
	Goods		6 892	7 155
	Services		274 001	288 996
			280 893	**296 151**
	Provision of goods to:			
	Related entities		3	3
	External entities		6 889	7 152
			6 892	**7 155**
	Rendering of services to:			
	Related entities		86 264	48 876
	External entities		187 737	240 120
			274 001	**288 996**
	Cost of goods sold – inventory items only		**941**	**684**

Note 6 Operating Revenues (cont)

(a) The CSIRO Division of Food Science and Technology forms an 85% share in a joint venture with the Victorian Government. The Food Science Australia (FSA) joint venture earned external revenue of $14 million (2004 $15.73 million). Due to the joint venture accounting requirements, external revenues earned by FSA are not included in the Statement of Financial Performance (Note 25 (e)).

(b) The Division of Forestry and Forest Products forms a 50% share in an unincorporated joint venture named Ensis between the Organisation and the New Zealand Forest Research Institute. Ensis joint venture earned external revenue of $11.8 million. Due to the joint venture accounting requirements, external revenues earned by Ensis are not included in the Statement of Financial Performance (Note 25 (g)).

	2005 $'000	2004 $'000
(c) Net gains from sale of equity investment are included in intellectual property revenue (Note 6.2)		
Proceeds from sale	8 879	4 007
Less: Cost of equity investment	(3 572)	(359)
Net gains included in IP revenue	**5 307**	**3 648**

		Notes	2005 $'000	2004 $'000
Note 6	**Operating Revenues (cont)**			
6.3	**Interest**			
	Bank and term deposits		**7 884**	**7 498**
6.4	**Revenue from sale of assets**			
	Land and buildings			
	Proceeds from sale		28 730	12 780
	Less: Net book value		(14 447)	(4 800)
	Net gain from disposal of land and buildings		14 283	7 980
	Plant and equipment			
	Proceeds from sale		1 860	2 501
	Less: Net book value		(1 923)	(5 532)
	Net (loss) from disposal of plant and equipment		(63)	(3 031)
	Total proceeds from disposals		**30 590**	**15 281**
	Total value of assets disposed		**16 370**	**10 332**
6.5	**Reversals of previous asset write-downs**			
	Decrease in provision for doubtful debts		1 981	–
	Decrease in provision for diminution in value of investment		1 065	–
			3 046	–
6.6	**Contributions**			
	Donations		**160**	**273**
6.7	**Other revenues**			
	Vehicle contributions – staff		89	114
	Rental		5 497	3 394
	Sale of primary produce		1 364	1 376
	Share of FSA Surplus for 2004–05	25(e)	967	67
	CSIRO FFP Pty Ltd research support cost recovery		1 556	–
	CSIRO FFP Pty Ltd direct cost recovery		3 807	–
	Other		12 373	11 131
			25 653	**16 082**

		Notes	2005 $'000	2004 $'000
Note 7	**Operating Expenses**			
7.1	**Employee expenses**			
	Wages and salaries		427 410	405 809
	Superannuation		62 845	51 365
	Leave and other entitlements		60 452	64 952
	Separation and redundancy		8 017	11 776
	Workers' compensation		2 891	3 182
			561 615	537 084
	Less: Recovery of employee expenses from Food Science Australia (FSA)		(18 161)	(15 345)
	Less: Recovery of employee expenses from Ensis via CSIRO FFP Pty Ltd		(8 286)	–
			535 168	**521 739**
7.2	**Supplier expenses**			
	Goods from related entities		169	203
	Goods from external entities		65 064	65 392
	Services from related entities		12 148	16 308
	Services from external entities		211 899	193 704
	Operating lease rentals		10 017	13 328
			299 297	**288 935**
7.3	**Depreciation and amortisation**			
	Buildings and leasehold improvements		39 593	39 175
	Plant and equipment		37 310	39 300
	Intangibles		1 168	1 011
			78 071	**79 486**
7.4	**Write-down of assets**			
	Bad debts		2 010	206
	Increase in provision for doubtful debts		–	172
	Increase in provision for diminution in value of investments		–	5 336
	Write-down of investments to recoverable amount		35	132
			2 045	**5 846**
7.5	**Net foreign exchange losses**			
	Non-speculative		**163**	**374**
7.6	**Borrowing costs expense**			
	Finance charges on lease liabilities		**3 481**	**3 047**

		Notes	2005 $'000	2004 $'000
Note 8	**Cash** (current)			
	Cash at bank and on hand		23 675	28 998
	Deposits at call		135 000	150 000
	Total Cash*		**158 675**	**178 998**
	*Total cash includes deposits held on behalf of third parties totalling $15 118 353 (2004: $18 428 404)	17		
Note 9	**Receivables** (current)			
	Goods and services		47 831	43 579
	Provision for doubtful debts		(637)	(2 619)
			47 194	40 960
	Property sales		28 436	–
	Net GST receivable		1 014	899
	Interest receivable		549	1 024
	Loans receivable		1 425	2 436
	Other		5 922	4 744
	Total net receivables		**84 540**	**50 063**
	Gross receivables are aged as follows:			
	Not overdue		**69 514**	**37 076**
	Overdue by:			
	Less than 30 days		9 085	8 217
	30 to 60 days		1 959	1 795
	60 to 90 days		1 085	862
	More than 90 days		3 534	4 732
			15 663	**15 606**
	Total gross receivables		**85 177**	**52 682**
	Provision for doubtful debts is aged as follows:			
	Overdue by:			
	Less than 30 days		–	15
	30 to 60 days		36	20
	60 to 90 days		–	47
	More than 90 days		601	2 537
	Total provision for doubtful debts		**637**	**2 619**

		% CSIRO Interest	Notes	2005 $'000	2004 $'000
Note 10	**Investments** (non-current) – **Part A**				
	Investments accounted for under the equity method				
	Joint venture in MDFRC	50.0	25(f)	**516**	**502**
	Investments-other				
	(a) Unlisted companies – at cost				
	AARNet Pty Ltd	2.6		1	1
	Advanced Polymerik Pty Ltd	18.7		251	–
	Ausmodel Pty Ltd	17.0		–	–
	Australian Wool Innovation Ltd	0.8		–	–
	Carbon Management Group Pty Ltd*	–		–	400
	Ceram Polymerik Pty Ltd	16.6		484	–
	CO2 CRC Management Pty Ltd	7.7		–	–
	ComEnergy Pty Ltd	50.0		250	250
	Dunlena Pty Ltd	47.0		5	5
	EpiTactix Pty Ltd	16.7		255	–
	EvoGenix Pty Ltd~	1.9		181	181
	Gene Shears Pty Ltd	50.0		580	580
	HRZ Wheats Pty Ltd	24.6		568	316
	Innovative Carbon Technologies Pty Ltd	16.5		–	–
	Plantic Technologies Ltd^	–		–	594
	PolyNovo Biomaterials Pty Ltd	50.0		5 100	5 100
	Provisor Pty Ltd	41.4		2 470	2 470
	Quickstep Holdings Pty Ltd	20.2		490	480
	SciVentures Investment Pty Ltd	3.4		210	144
	Synchroton Beamline Trust Fund	–		2 500	–
	VacTX Pty Ltd	14.0		689	689
	VERNet Pty Ltd	13.7		578	–
	Windlab Pty Ltd	35.9		2 700	2 700
	WQI Pty Ltd	10.6		–	–
	XRT Ltd	25.1		1 390	1 390
				18 702	15 300
	Provision for diminution in value			(6 137)	(7 925)
				12 565	**7 375**

		% CSIRO Interest	Notes	2005 $'000	2004 $'000
Note 10	**Investments** (non-current) – **Part A (cont)**				
	(b) Unlisted controlled and subsidiary companies		1.3		
	– at cost				
	Ascentia Pty Ltd	90.0		–	4 470
	Betabiotics Pty Ltd	93.9		596	273
	CSIRO Bioinformatics Pty Ltd*	–		–	–
	CSIRO FFP Pty Ltd	100		–	–
	R&D Syndication Companies	100	10(b) Part B	–	–
	Intellection Pty Ltd	100		4 450	4 450
	WLAN Services Pty Ltd	100		–	–
				5 046	9 193
	Provision for diminution in value			(2 797)	(6 943)
				2 249	**2 250**
	(c) Listed companies				
	– at cost				
	Ceramic Fuel Cells Ltd #^	–		–	1 879
	Gropep Ltd^	–		–	186
	Xceed Biotechnology Ltd^	–		–	465
	– at recoverable amount				
	Ambri Ltd^	–		–	424
	Australian Magnesium Corporation Ltd	0.17		3	6
				3	**2 960**
	Total investments – other			**14 817**	**12 585**

Listed during 2004–05
~ Listed on 11 August 2005
* Deregistered during the year
^ Sold during the year

Note 10 Investments – Part A (cont)

	2005 $'000	2004 $'000
Investments accounted for under the equity method	516	*502
Investments – other	14 817	*12 585
Total Investments	15 333	13 087

*Comparative adjusted to reflect separate classification of investments.

Note 10 Investments – Part B

(a) Unlisted Companies/Funds

Names	Principle Activities
AARNet Pty Ltd	To provide high-capacity, cost-effective internet services to the education and research communities and their research partners.
Advanced Polymerik Pty Ltd	A CRC company established by CRC for Polymers to commercialise its intellectual property. This company holds a 65% interest in Ceram Polymerik Pty Ltd in trust for the CRC participants including CSIRO.
Ausmodel Pty Ltd	A CRC company established by Predictive Minerals Discovery CRC to commercialise its intellectual property relating to ore discovery. The cost of CSIRO's investment in the company is $1.00 and it has been fully provided for diminution in value.
Australian Wool Innovation Ltd	To initiate research, development and innovation that will increase the long-term profitability of Australian woolgrowers. The cost of CSIRO's investment in the company is $306.00 and it has been fully provided for diminution in value.
Carbon Management Group Pty Ltd	A consulting company in the field of management of greenhouse gas emissions. The company was wound up and deregistered during the financial year.
Ceram Polymerik Pty Ltd	The company was spun out of Advanced Polymerik Pty Ltd to commercialise the ceramifying polymer technology in non-cable applications.
CO2 CRC Management Pty Ltd	A centre agent management company for a CRC. The cost of CSIRO's investment in the company is $1.00 and it has been fully provided for diminution in value.

Note 10 Investments – Part B (cont)

ComEnergy Pty Ltd	To utilise technology that generates electricity from coal waste and mine drainage gases. Primary objective is to build a 10MW pilot plant and to license the heat exchange technology to electricity project developers with the intention to sell hardware and software.
Dunlena Pty Ltd	A trustee company for intellectual property generated by Dupont/CSIRO joint venture research.
EpiTactix Pty Ltd	A semi-conductor business with SciVentures, Seaspin, Epicorp and the Organisation as contributors.
Evogenix Pty Ltd	A CRC company established to commercialise technologies developed by the CRC for Diagnostic Technologies, of which the Organisation is a partner.
Gene Shears Pty Ltd	Conduct research projects based on the Ribozyme technology and investigate licensing and development of its commercial applications hereof.
HRZ Wheats Pty Ltd	Design profitable new milling wheat varieties for farmers in the high rainfall zone in Australia and overseas.
Innovative Carbon Technologies Pty Ltd	A CRC company established to commercialise technologies arising from Australian Petroleum CRC.
PolyNovo Biomaterials Pty Ltd	To commercialise biomaterials technology platform to improve biomedical and surgical outcomes.
Provisor Pty Ltd	Provide world-class research facilities to the Australian grape and wine industry.
Quickstep Holdings Pty Ltd	Manufactures process plants for supply under licence using the Quickstep™ process manufacturing technology. Also undertakes development work and provides tooling and technical support services in the aerospace and automotive industries.
SciVentures Pre-Seed Fund	A private sector venture capital fund, established and managed by SciVentures Investments Pty Ltd, primarily targeting commercially promising R&D opportunities at the pre-seed stage within public sector agencies.
Synchrotron Beamline Trust Fund	The Organisation has committed to contribute $5 million towards the establishment of Synchrotron in Victoria. As at 30 June 2005, $2.5 million was paid and the balance was taken up as an outstanding investment commitment. When the funding for the synchrotron is finalised it is anticipated that a company will be incorporated and contributors will be issued shares in the company based on their contributions.

Note 10 Investments – Part B (cont)

VacTX Pty Ltd	A CRC company to commercialise peptide vaccine technologies that have potential application for treatment of infectious diseases, cancer and allergies. The shares are held by the Queensland Institute of Medical Research in trust for the CRC participants including CSIRO.
VERNet Pty Ltd	A collaborative initiative between the Universities and TAFE institutions in Victoria and the Organisation to establish and implement intra-state connections for an advanced broadband network to support education and research in Victoria.
Windlab Pty Ltd	Develop and market 'Windscape' technology which allows developers and investors to find the best wind farm sites faster.
WQI Pty Ltd	To commercialise new technologies and knowledge that improve wood quality. The Organisation has a 12.82% interest in the company at the cost of $109 and it has been fully provided for diminution in value.
XRT Ltd	Builds X-ray Utramicroscopes and licences its portfolio of IP in X-ray phase contrast imaging technology to manufacturers of X-ray imaging equipment.
Ambri Ltd, Gropep Ltd, Plantic Technologies Ltd, Xceed Biotechnology Ltd and Ceramic Fuel Cells Ltd	The Organisation's equity interests in these five companies were sold during the financial year.

(b) Unlisted controlled and Subsidiary Companies

Ascentia Pty Ltd	Develop value added foods utilising a new cereal with nutritional and functional characteristics. The Organisation's investment in the company was written off against its provision for diminution in value following the execution of a 'Deed of Termination and Assignment' on 28 June 2005 by the shareholders. The company will be wound up early in 2005–06 and will be replaced by a collaborative agreement where any commercialisation return from its technology will be shared by the participants.
Betabiotics Pty Ltd	To develop a new class of antibiotics.
CSIRO Bioinformatics Pty Ltd	The company was wound-up and deregistered during the year.
CSIRO FFP Pty Ltd	A fully owned subsidiary company established by the Organisation to enter into an unincorporated

Note 10 Investments – Part B (cont)

	joint venture named Ensis between the Organisation and the New Zealand Forest Research Institute Ltd. The cost of the Organisation's investment in the company is $1.00 being the issued and paid-up capital of the company, and it has been fully provided for diminution in value. The Organisation's 50% interest in Ensis gross profit margin of $3.148 million (unaudited) has been accounted for using the equity method by CSIRO FFP Pty Ltd. The net operating surplus of the company for the year was $1K. Refer Note 25(g).
Intellection Pty Ltd	Production and sale of complete systems that are used for process improvement in large mineral processing operations.
WLAN Services Pty Ltd	A fully owned subsidiary established to provide specific services to the Organisation on the Wireless LAN project. The issued and paid-up capital of the company is $1.00 and it has been fully provided for diminution in value.
R&D Syndication Companies	The following 7 companies were acquired prior to 2001–02 when investors in the Syndication exercised their put options under the agreements. They have not traded since acquisition and are currently in the process of being wound-up.
	Exsynd 1 Pty Ltd
	Exsynd 2 Pty Ltd
	Exsynd 3 Pty Ltd
	Exsynd 4 Pty Ltd
	Exsynd 5 Pty Ltd
	Exsynd 6 Pty Ltd
	Exsynd 7 Pty Ltd

(c) Listed Companies

The quoted market values of the following listed companies as at 30 June 2005 were:

	2005 $000	2004 $000
Ambri Ltd	–	424
Australian Magnesium Corporation Ltd	3	6
Gropep Ltd	–	2 190
Xceed Biotechnology Ltd	–	639
	3	**3 259**

		Notes	2005 $'000	2004 $'000
Note 11	**Land and Buildings** (non-current)			
	Land			
	At cost		–	5 555
	At 2004–05 gross valuation (at fair value)	1.12	192 650	127 159
			192 650	**132 714**
	Buildings			
	At cost		–	28 089
	At 2004–05 gross valuation (at fair value)	1.12	1 532 280	1 262 418
			1 532 280	1 290 507
	Accumulated depreciation		(910 760)	(788 487)
			621 520	502 020
	Capital works in progress – at cost		29 965	18 928
			651 485	**520 948**
	Leasehold improvements			
	At cost		–	52 775
	At 2004–05 gross valuation (at fair value)	1.12	150 951	77 393
			150 951	130 168
	Accumulated amortisation		(52 918)	(41 148)
			98 033	**89 020**
	Buildings under finance lease			
	At cost		–	37 516
	At 2004–05 gross valuation (at fair value)	1.12	130 598	71 537
			130 598	109 053
	Accumulated amortisation		(27 452)	(17 804)
			103 146	**91 249**
	Total land and buildings		**1 045 314**	**833 931**

Plant and equipment under finance lease are subject to revaluation. The carrying amount is included in the valuation figures above and is separately disclosed in Note 12 (c).

All revaluations are conducted in accordance with the revaluation policy stated in Note 1.12.

		Notes	2005 $'000	2004 $'000
Note 12	**Plant and Equipment** (non-current)			
	Plant and equipment			
	At cost		–	112 428
	Work in progress – at cost		3 558	*5 852
	At 2004–05 gross valuation (at fair value)	1.12	521 588	479 595
			525 146	597 875
	Accumulated depreciation		(318 395)	(387 747)
			206 751	**210 128**
	Research vessels			
	At cost		–	4 592
	At 2004–05 gross valuation (at fair value)	1.12	13 800	8 932
			13 800	13 524
	Accumulated depreciation		(7 771)	(3 124)
			6 029	**10 400**
	Plant and equipment under finance lease			
	At cost		–	7 620
	At 2004–05 gross valuation (at fair value)	1.12	8 001	3 786
			8 001	11 406
	Accumulated amortisation		(3 451)	(3 696)
			4 550	**7 710**
	Total plant and equipment		**217 330**	**228 238**

* Comparative adjusted to reflect the work in progress.

Note 12 Plant and Equipment (cont)

(a) Reconciliation of opening and closing balances for property, plant and equipment and intangibles

Item	Land $'000	Buildings $'000	Plant and equipment $'000	Computer software (Note 13) $'000	Total $'000
As at 1 July 2004					
Gross book value	132 714	1 548 656	622 806	22 244	2 326 420
Accumulated depreciation/ amortisation	–	(847 439)	(394 567)	(14 058)	(1 256 064)
Net book value	**132 714**	**701 217**	**228 239**	**8 186**	**1 070 356**
Additions:					
by purchase	4 317	25 736	31 611	1 013	62 677
by finance lease	–	2 153	–	–	2 153
Net revaluation adjustment	69 944	163 273	4 362	–	237 579
Depreciation/ amortisation expense	–	(39 593)	(37 310)	(1 168)	(78 071)
Disposals:					
Transfer due to restructuring	–	–	(7 649)	–	(7 649)
Other disposals	(14 325)	(122)	(1 923)	–	(16 370)
As at 30 June 2005					
Gross book value	192 650	1 843 794	546 947	23 257	2 606 648
Accumulated depreciation/ amortisation	–	(991 130)	(329 617)	(15 226)	(1 335 973)
Net book value	**192 650**	**852 664**	**217 330**	**8 031**	**1 270 675**

Note 12 Plant and Equipment (cont)

(b) Assets at valuation

Item	Land $'000	Buildings $'000	Plant and equipment $'000	Computer software $'000	Total $'000
As at 30 June 2005					
Gross value	192 650	1 813 829	543 389	–	2 549 868
Accumulated depreciation/amortisation	–	(991 130)	(329 617)	–	(1 320 747)
Net book value	**192 650**	**822 699**	**213 772**	–	**1 229 121**
As at 30 June 2004					
Gross value	127 159	1 411 348	492 313	–	2 030 820
Accumulated depreciation/amortisation	–	(842 735)	(368 438)	–	(1 211 173)
Net book value	**127 159**	**568 613**	**123 875**	**–**	**819 647**

(c) Assets held under finance lease

Item	Land $'000	Buildings $'000	Plant and equipment $'000	Computer software $'000	Total $'000
As at 30 June 2005					
Gross value	–	130 598	8 001	–	138 599
Accumulated depreciation/amortisation	–	(27 452)	(3 451)	–	(30 903)
Net book value	–	**103 146**	**4 550**	–	**107 696**
As at 30 June 2004					
Gross value	–	109 053	11 406	–	120 459
Accumulated depreciationamortisation	–	(17 804)	(3 696)	–	(21 500)
Net book value	–	**91 249**	**7 710**	–	**98 959**

(d) Assets under construction

Item	Land $'000	Buildings $'000	Plant and equipment $'000	Computer software $'000	Total $'000
Gross value at 30 June 2005	–	**29 965**	**3 558**	**5 804**	**39 327**
Gross value at 30 June 2004	–	**18 928**	**5 852**	**5 212**	**29 992**

(e) Total property, plant, equipment and intangibles classified by title, specific uses and zoning

Description	Land $'000	Buildings $'000	Plant and equipment $'000	Intangibles $'000	Total 2005 $'000	Total 2004 $'000
Freehold	173 450	769 333	–	–	942 783	735 385
Commonwealth Crown Leases	8 400	224 964	–	–	233 364	184 676
Leasehold	–	150 951	–	–	150 951	130 168
National facilities	10 800	537 983	153 270	–	702 053	688 696
Finance lease	–	130 598	8 001	–	138 599	120 459
Designated for sale	–	–	–	–	–	28 827
Capital works in progress	–	29 965	3 558	5 804	39 327	18 928
	192 650	1 843 794	164 829	5 804	2 207 077	1 907 139
Plant and equipment	–	–	382 117	–	382 117	397 036
Intangibles	–	–	–	17 453	17 453	22 244
Gross value	192 650	1 843 794	546 946	23 257	2 606 647	2 326 419
Accumulated depreciation/ amortisation	–	(991 130)	(329 616)	(15 226)	(1 335 972)	(1 256 064)
Net book value as at 30 June 2005	**192 650**	**852 664**	**217 330**	**8 031**	**1 270 675**	**1 070 355**

Note 12 Plant and Equipment (cont)

Freehold	Held in Fee Simple – however, the majority of freehold properties are zoned 'Public Purpose Commonwealth' which restricts sale potential.
Commonwealth Crown Leases	Represents ACT sites that are held on 99 year leases with a restricted purpose clause 'Scientific Research Purposes'.
Leasehold	Property covered by various lease arrangements with Universities, State Governments and other entities.
National facilities	Represents Australian Animal Health Laboratory, Australia Telescope and the Oceanographic Research Vessel *Southern Surveyor* managed by the Organisation on behalf of the Commonwealth Government. The National Measurement Laboratory (NML) previously part of National facilities was transferred to National Measurement Institute (NMI) on 1 July 2004.
Designated for sale	Properties identified for sale due to rationalisation and consolidation of research sites and a joint property review by the Organisation and the Department of Finance and Administration.
Finance leases	Represents land and buildings subject to finance lease arrangements with State Governments.
Capital works in progress	Relates to building works currently under construction.

The specialised nature of the Organisation's buildings and the zoning restrictions on land use, and the consequent low-levels of demand for such properties, mean that the market values of the properties may be significantly lower than the 'existing use value' to the Organisation. Where this is the case the property is valued at 'existing use value'.

(f) National facilities

The Australian Animal Health Laboratory (AAHL), the Australia Telescope (AT), and the Oceanographic Research Vessel (ORV) *Southern Surveyor* have been established by the Commonwealth Government as National facilities to satisfy an identified national research need. The term 'National facility' denotes substantial instrumentation, equipment and costs of such magnitude that the expense can only be justified on the basis of shared use by researchers from several organisations. The primary criteria require that the facilities are specifically designated for national use and that they are made available to scientists according to the merit of their proposals. These facilities are controlled and administered by the Organisation on behalf of the Commonwealth Government.

Note 12 Plant and Equipment (cont)

Details of National facilities included in the above totals of Land and Buildings and Plant and Equipment are as follows:

	AAHL $'000	AT $'000	ORV $'000	NML $'000	Total $'000
Land	**10 800**	–	–	–	**10 800**
Buildings	537 983	–	–	–	537 983
Accumulated depreciation	(237 151)	–	–	–	(237 151)
	300 832	–	–	–	**300 832**
Plant and equipment	7 773	131 697	13 800	–	153 270
Accumulated depreciation	(4 658)	(70 380)	(7 771)	–	(82 809)
	3 115	**61 317**	**6 029**	–	**70 461**
Net book value as at 30 June 2005	**314 747**	**61 317**	**6 029**	–	**382 093**
Net book value as at 30 June 2004	**221 476**	**70 643**	**10 400**	**7 649**	**310 168**

The operating expenses for the above National facilities for the financial year amounting to $70 539 276 (2004 $83 820 803) are included in the Organisation's Statement of Financial Performance. The NML was transferred to NMI on 1 July 2004. Refer to Note 22B for further details.

Note 13 Intangibles (non-current)

	Notes	2005 $'000	2004 $'000
Computer software – at cost	1.13		
Internally developed and externally acquired software		17 453	17 032
Accumulated amortisation		(15 226)	(14 058)
		2 227	2 974
Internally developed and externally acquired software – in progress			
– CSIRO Live software		5 583	4 791
– CSIRO Fast Track software		–	421
– Video conferencing (externally acquired)		221	–
		5 804	5 212
Total intangibles – net book value		**8 031**	**8 186**

Refer also to Note 12(a) reconciliation of the opening and closing balances of property, plant and equipment and intangibles.

		Notes	2005 $'000	2004 $'000
Note 14	**Inventories Held for Resale** (current)			
	Books, CDs, videos of publishing and media products – at lower of cost and net realisable value	1.14	**966**	**796**
Note 15	**Other Non-financial Assets** (current)			
	Contract research work in progress – at cost	1.4	17 404	26 958
	Prepaid property rentals		1 530	2 660
	Other prepayments		1 311	1 976
	Total other non-financial assets		**20 245**	**31 594**
Note 16	**Leases**			
	Finance lease commitments:			
	Payable			
	Within one year		7 494	8 469
	In one to five years		30 561	28 365
	In more than five years		76 087	85 964
	Minimum lease payments		114 142	122 798
	Less: Future finance charges		(34 325)	(37 766)
	Total finance lease liability		**79 817**	**85 032**
	Lease liability is categorised as follows:			
	Current		4 316	5 083
	Non-current		75 501	79 949
			79 817	**85 032**

Finance leases exist in relation to certain buildings and major equipment assets. The leases are non-cancellable and for fixed terms ranging from 2 to 25 years. The Organisation guarantees the residual values of all assets leased. There are no contingent rentals. The interest rate implicit in the leases averaged 4% (2004 4%). The lease liabilities are secured by the lease assets.

		Notes	2005 $'000	2004 $'000
Note 17	**Deposits** (current)			
	Deposits		**15 118**	**18 428**
	Represents monies held on behalf of third parties:			
	Cooperative Research Centres (CRCs)		6 722	7 904
	National Aeronautical Space Agency (NASA)		2 908	7 569
	Energy Solutions for a Sustainable Future (R2D3)		3 236	–
	Department of Communications, Information Technology and the Arts		–	2 056
	The Australian National Wildlife Collection Foundation		316	415
	Lower Emissions Energy Centre		1 451	–
	Others		485	484
			15 118	**18 428**
Note 18	**Employee Provisions**			
	Accrued wages and salaries		2 570	76
	Annual leave		53 510	55 184
	Long service leave		112 171	115 622
	Severance pay		6 394	6 114
	Redundancy		4 934	2 859
	Total aggregate employee benefit liability and related costs		**179 579**	**179 855**
	Employee provisions are categorised as follows:			
	Current		51 303	48 025
	Non-current		128 276	131 830
			179 579	**179 855**
Note 19	**Other Provisions** (non current)			
	Provision for litigation		500	500
	Provision for clean-up		600	600
			1 100	**1 100**

	Notes	2005 $'000	2004 $'000
Note 20 Supplier Payables (current)			
Trade creditors		**38 743**	**40 659**
Note 21 Other Payables (current)			
Contract research revenue received in advance		45 772	45 627
Other creditors		24 772	27 833
Amount owing to FSA	25(e)	460	1 426
Total other payables		**71 004**	**74 886**

Note 22A Equity – Analysis of Equity

Description	Accumulated Surplus		Asset Revaluation Reserve		Total Equity	
	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000
Balance as at 1 July	463 682	469 008	481 251	481 251	944 933	950 259
Net surplus/(deficit)	(9 217)	(5 326)		–	(9 217)	(5 326)
Net revaluation increase	–	–	237 579	–	237 579	–
Transfer from asset revaluation reserve to accumulated surplus on realisation of NML assets	6 574	–	(6 574)	–	–	–
Distributions to owners:						
Transaction with owners restructuring (Note 22B)	(8 222)	–	–	–	(8 222)	–
Closing balance as at 30 June 2005	**452 817**	**463 682**	**712 256**	**481 251**	**1 165 073**	**944 933**
Less outside equity interest	–	–	–	–	–	–
Total equity attributable to Australian Government	**452 817**	**463 682**	**712 256**	**481 251**	**1 165 073**	**944 933**

Note 22B Equity – Distributions to Owners (Restructuring)

The Government announced the establishment of the National Measurement Institute in the 2003–04 Budget, merging the National Standards Commission, the National Measurement Laboratory and the Australian Government Analytical Laboratories into a single organisation.

As a result of this decision, the National Measurement Laboratory was transferred from the Organisation to the Department of Industry, Tourism and Resources on 1 July 2004.

Details at the date of transfer are as follows:

	Notes	2005
		$'000
Financial assets		
Cash		3 903
Receivables		443
Total financial assets		**4 346**
Non-financial assets		
Plant and Equipment		7 649
Other		193
Total non-financial assets		**7 842**
Liabilities		
Employee provisions		3 903
Supplier payables		63
Total liabilities		**3 966**
Net assets transferred		**8 222**

Note 23 Contingent Liabilities and Assets

	Notes	2005 $'000	2004 $'000
Contingent liabilities			
Loan payable to the Commonwealth Government*		–	70 000
Loan payable to the Queensland Government*		–	5 000
Interest payable on the Commonwealth Government loan*		–	11 855
Bank Guarantee#		42	–
Estimated legal claims arising from employment, motor vehicle accidents, commercial and patent disputes. The Organisation has denied liability and is defending the claims. The estimate is based on precedent in such cases.		525	1 100
Total contingent liabilities		**567**	***87 955**
Contingent assets			
Receivable from AMC*		–	75 000
Royalties receivable from AMC*		–	11 855
Total contingent assets		–	**86 855**
Net contingent liabilities		**567**	**1 100**

* Contingent asset and liability for Australian Magnesium Corporation Ltd (AMC) which was previously reported in 2003–04 is now classified as less than remote.

The Organisation has taken out a bank guarantee with Westpac for a tender arrangement.

The amount of the guarantee being USD 32 000 has been converted to Australian dollars at the exchange rate prevailing at 30 June 2005.

Note 23 Contingent Assets and Liabilities

Contingent asset

On 8 December 2003, CSIRO, the State of Queensland (acting through its Department of Primary Industries and Fisheries (QDPIE) and Benitec Ltd and its subsidiaries (Benitec) entered into agreements relating to the ownership of certain gene silencing technology and the sharing of the proceeds of future commercialisation of the technology. Under the agreements, Benitec will focus on commercialising the technology for human applications and CSIRO will focus on commercialising non-human applications of the technology. It is impossible to quantify the total value of CSIRO's entitlements under the settlement agreements as a whole at this time. The current likelihood of CSIRO receiving any payment under the settlement agreements is considered less than probable but higher than remote.

Note 23 Contingent Assets and Liabilities (cont)

Unquantifiable Contingencies

CSIRO is currently involved in several legal proceedings in the US related to a wireless local area network (WLAN) patent which it owns and wishes to license broadly. The proceedings include an infringement action against two companies, and two actions brought against CSIRO under which they have sought declarations of non-infringement and patent invalidity. These proceedings are in various preliminary phases. If successful, CSIRO expects to earn significant revenue from royalty payments which would exceed the associated legal costs over time. At this stage, the revenue or costs are considered unquantifiable.

At 30 June 2005, the Organisation had a number of legal claims arising from employment, motor vehicle accidents, commercial and patent disputes. The Organisation has denied liability and is defending the claims. An estimate has been included in the contingency note. In some cases it is not possible to estimate the amounts of any eventual payments that may be required in relation to these claims.

Remote Contingencies

The Organisation provides certain indemnities and warranties as part of its business activities. The Organisation would not under normal business arrangements generally provide guarantees or letters of comfort.

The Organisation has implemented comprehensive procedures in 2004–05 to capture all contracts likely to contain warranties, indemnities, guarantees and letters of comfort which may create a liability for the Organisation and to determine the extent and materiality of any such undertakings.

Of the contracts captured to date, approximately 10-20% contain an indemnity or warranty issued by the Organisation. Of these, most are warranties which do not extend the Organisation's liability beyond that at common law or statute. That is, if they were to be triggered by an event of default, the Organisation's legal liability would generally be the same as if the warranty had not been given because it is implied by the general law or statute in any case. The Organisation considers that there is a remote chance of one or more events occurring under these warranties that would result in a liability being recognised. Due to the inherent uncertainty of the basis of the claims, the warranties are assessed as being not material.

Of the indemnities issued by the Organisation, the majority relate to liabilities for which the Organisation would otherwise be liable in the absence of the indemnity (either under common law or statute). One indemnity issued by the Organisation is capped at $10 million. The Organisation considers that there is a remote chance of one or more events occurring under these indemnities that would result in a liability being recognised. Due to the inherent uncertainty of the basis of the claims, the indemnities are assessed as being not material.

The Organisation had insurance coverage for indemnities and warranties in 2004–05. The Organisation has renewed its insurance coverage with Comcover for 2005–06. This includes coverage for indemnities and warranties on a case-by-case basis in accordance with the terms of the policy.

		Notes	2005 $'000	2004 $'000
Note 24	**Cash Flow Reconciliation**			
	(a) Reconciliation of operating deficit to net cash from operating activities			
	Operating surplus/(deficit)		**(9 217)**	**(5 326)**
	Non – cash items			
	Depreciation and amortisation of property, plant and equipment	7.3	76 903	78 475
	Amortisation of intangibles	7.3	1 168	1 011
	Increase write-down to recoverable amount	7.4	35	132
	(Profit)/loss on disposal of property, plant and equipment	6.4	(14 220)	(4 949)
	(Profit)/loss on disposal of shares	6.2	(5 307)	(10 031)
	Changes in assets and liabilities			
	(Increase)/decrease in receivables	9	(7 134)	(52)
	(Increase)/decrease in inventories	14	(170)	(26)
	Increase/(decrease) in provision for diminution in value	7.4	(1 065)	4 765
	(Increase)/decrease in investment in joint venture	25	(966)	(1 542)
	Increase/(decrease) in other assets	15	11 106	(4 373)
	Increase/(decrease) in employee liabilities	19	(849)	(7 520)
	Increase/(decrease) in liability to suppliers	20	17 935	(11 264)
	Increase in other liabilities	21	(22 132)	39 738
	Increase/(decrease) in GST receivable	9	(114)	(113)
	Increase/(decrease) in deposits – liabilities	17	(3 310)	(19 268)
	Net cash from operating activities		**42 663**	**59 657**
	(b) Reconciliation of cash			
	Cash balance comprises:			
	Cash at bank and on hand	8	23 675	28 998
	Deposits – at call*	8	135 000	150 000
	Balance of Cash as at end of period shown in the Statement of Cash Flows		**158 675**	**178 998**

***Deposits – at call** – Temporarily surplus funds, mainly from monthly draw downs of appropriations, are placed in term deposits with approved banks and earn an effective rate of interest payable on maturity.

Note 25 Joint Ventures

The Organisation participates in a number of joint ventures. In accordance with AASB 1006, these are separated into joint venture operations and joint venture entities.

(a) Joint Venture Operations – Cooperative Research Centres (CRCs)

The CRC Program, launched in May 1990 by the Commonwealth Government, was established to assist two or more collaborators to carry out research contributing to the development of internationally competitive industry sectors. The Program supports long-term, high-quality research, improved links between research and application, and stimulation of education and training.

The CRCs listed below have the characteristics of joint venture operations and are reported as such. The CRCs denoted with an asterisk (*) are incorporated bodies.

A CRC Board is established by the Centre Management Agreement for each CRC. The Board is responsible to the Commonwealth and the participants for the performance of the CRC and controls the policy, practices and general management and operations of the CRC. In most instances CSIRO has representation on the CRC Boards. CRCs are subject to annual independent audit and they report to the Department of Education, Science and Training.

The Organisation has interests in five (5) incorporated CRCs, and their financial statements as at 30 June 2005 were not available. The net assets of these entities at 30 June 2004 were $5.6 million and the Organisation's equity in these entities amounted to $433K. While they are joint venture entities, the equity method to account for interest in incorporated CRCs has not been applied as they are not considered material and they have been accounted for as joint venture operations. Should CSIRO's interest in these incorporated CRCs become material, the equity accounting method will be adopted.

During this financial year, the Organisation's total actual 'in kind' and cash contributions to CRCs from its own resources were $64.1 million; together with monies from the Commonwealth Government and external sources specifically for the CRCs, the total expended was $102.3 million. The Organisation's contributions and expenses are included in the Statement of Financial Performance. The Organisation's total actual contributions to date, including funding from Commonwealth Government and external sources, for CRCs listed below amounted to $445.2 million. As the success of CRCs is dependent on uncertain R&D outcomes, the value of CSIRO's contributions does not necessarily represent equity value.

Approximately $24.3 million or 11% of CSIRO's total plant and equipment assets are used for CRC activities.

At 30 June 2005, CSIRO was a core participant in 47 CRCs and CSIRO's interest in each of the CRCs is determined by the individual CRC agreement. These are:

Names of CRCs	CSIRO's Equity Interest (%) (excluding Commonwealth contributions)	Actual Cash and In-kind Contributions 2004–05 $'000	Termination Date
AGRICULTURE AND RURAL BASED MANUFACTURING			
Australian Biosecurity: Emerging Infectious Diseases	40	3 812	30 Jun 2010
Australian Cotton[1]	26	1 071	30 Jun 2005
Australian Sheep Industry	34	3 633	30 Jun 2008
Cattle and Beef Quality[2]	21	2 101	30 Jun 2005
Innovative Dairy Products	7	1 044	30 Jun 2008
Sugar Industry Innovation Through Biotechnology	19	1 772	30 Jun 2010
Sustainable Aquaculture of Finfish	14	798	30 Jun 2008
Sustainable Production Forestry[1]	32	1 370	30 Jun 2005
Sustainable Rice Production[3]	16	168	30 Jun 2005
Australian Poultry Industries[4]	–	–	30 Jun 2010
Tropical Plant Protection	27	827	30 Jun 2006
Viticulture II	24	1 180	30 Jun 2006
ENVIRONMENT			
Antarctic Climate and Ecosystems	13.7	1 390	30 Jun 2010
Australian Weed Management	14	1 103	30 Jun 2008
Bushfire*	12	1 912	30 Jun 2010
Biological Control of Pest Animals[1]	57	1 572	30 Jun 2005
Catchment Hydrology II [1]	29	869	30 Jun 2005
Coastal Zone, Estuary and Waterway Management	27	1 141	30 Jun 2006
Desert Knowledge Australia	8	630	30 Jun 2010
Freshwater Ecology II [1]	9	370	30 Jun 2005
Great Barrier Reef World Heritage Area*	4	803	30 Jun 2006
Greenhouse Accounting	16	296	30 Jun 2006

Note 25 Joint Ventures (cont)

Names of CRCs	CSIRO's Equity Interest (%) (excluding Commonwealth contributions)	Actual Cash and In-kind Contributions 2004–05 $'000	Termination Date
ENVIRONMENT (Cont)			
Irrigation Futures	16	935	30 Jun 2010
Plant-based Management of Dryland Salinity	7	705	30 Jun 2008
Tropical Rainforest Ecology and Management II	37	1 362	30 Jun 2006
Tropical Savannas Management	19	1 199	30 Jun 2008
Water Quality and Treatment	8	633	30 Jun 2008
INFORMATION AND COMMUNICATION TECHNOLOGY			
Australian Telecommunications	3	–	30 Jun 2006
Enterprise Distributed Systems Technology*	–	–	30 Jun 2006
Satellite Systems	25	633	31 Dec 2005
MANUFACTURING TECHNOLOGY			
Advanced Composite Structures II*	6	595	30 Jun 2010
Bioproducts	18	360	30 Jun 2006
Cast Metals Manufacturing[1]	47	4 280	30 Jun 2005
Construction Innovation	22	1 724	30 Jun 2008
Functional Communication Surfaces	29	1 433	30 Jun 2008
Intelligent Manufacturing Systems and Technologies II*	7	1 094	30 Jun 2006
Polymers II [1]	19	806	30 Jun 2005
Welded Structures*	14	556	30 Jun 2006
Wood Innovations	5	703	30 Jun 2008
MEDICAL SCIENCE AND TECHNOLOGY			
Diagnostics	23	1 848	30 Jun 2008
Vaccine Technology II	26	503	30 Jun 2006
The Vision[4]*	–	–	30 Jun 2010

Note 25 Joint Ventures (cont)

Names of CRCs	CSIRO's Equity Interest (%) (excluding Commonwealth contributions)	Actual Cash and In-kind Contributions 2004–05 $'000	Termination Date
MINING AND ENERGY			
A J Parker CRC for Hydrometallurgy II [1]	51	7 320	30 Jun 2005
Greenhouse Gas Technologies[5]	53	639	30 Jun 2010
Clean Power from Lignite	15	575	30 Jun 2006
Coal in Sustainable Development	14	1 895	30 Jun 2008
Landscape Environments and Mineral Exploration	28	3 174	30 Jun 2008
Predictive Mineral Discovery[6]	16	2 284	30 Jun 2008
Sustainable Resources Processing	23	1 005	30 Jun 2010
Total actual Cash and In-kind contributions 2004–05		**64 123**	

1 Current CRC ceases operations on 30 June 2005 and a new CRC will begin operations 1 July 2005. CSIRO will be a core participant in the new CRC.

2 Current CRC ceases operations on 30 June 2005 and a new CRC will begin operations 1 July 2005. CSIRO will be a supporting participant in the new CRC.

3 CRC ceases operations on 30 June 2005.

4 CSIRO is a supporting participant only in this CRC.

* CRC is an Incorporated Joint Venture.

5 The Organisation is a participant in the Greenhouse Gas Technologies CRC (formally APCRC), which has a beneficial interest in APCRC Commercial Ventures Pty Ltd.

6 The Organisation is a participant in the CRC for Predictive Mineral Discovery, which has a beneficial interest in Ausmodel Pty Ltd.

(b) Joint Venture Operations – High Performance Computing and Communication Centre (HPCCC)

The Organisation ceased its participation in a joint venture operation with the Bureau of Meteorology (BOM) at the end of 2003–04. The Organisation has entered into a Memorandum of Understanding for the continuation of the HPCCC arrangements and the Organisation will contribute to the operation of the facility for the life of the agreement.

(c) Joint Venture Operations– Graingene

The Organisation has approximately 28.5% interest in the joint venture Graingene with the Grains Research and Development Corporation, the Australian Wheat Board Ltd and Syngenta Ltd. Graingene is a collaborative research and development venture where research and industry participants work together to identify, develop and bring to market grains technology. The Organisation's share of operating expenses of Graingene is included in the Organisation's Statement of Financial Performance.

Note 25 Joint Ventures (cont)

(d) Joint Venture Operations – Other

In addition, the Organisation has collaborative arrangements with other parties to perform research and share in the outputs (ie intellectual property) in proportion to each participant's research input, initial intellectual property or cash contributions. These collaborative arrangements share the characteristics of joint venture operations. The principal activities of these collaborative arrangements are scientific research and development with the ultimate aim of sharing in the output (ie intellectual property). The numbers of these arrangements make it impractical to list these separately. The Organisation's revenues and expenses related to these collaborative arrangements are included in the Organisation's Statement of Financial Performance.

(e) Joint Venture Entity – Food Science Australia (FSA)

FSA undertakes both strategic and applied research, helping the food industry to develop, package, preserve and transport food products.

The carrying amount of the Organisation's 85% (2004 50%) investment in FSA has been reduced below zero in prior years and the equity accounting method has been discontinued. The discontinuation of equity accounting will remain until FSA's accumulated deficits have been fully offset by its operating surpluses. During the year, FSA incurred an operating surplus (unaudited) of $1 137K (2004 $46K). In accordance with the joint venture agreement the operating surplus/deficit of FSA is shared 85/15 between the joint venture parties. The Organisation's share of the operating surplus was $967K (2004 $23K surplus).

Movements in carrying amounts of investments/(liability) in joint venture entity, FSA is as follows:

	2005 $'000	2004 $'000
Carrying amount at beginning of the financial year	(1 426)	(1 493)
Adjustment to 2002–03 share of FSA's operating deficit based on its audited accounts	–	44
Share of FSA's net operating surplus/(deficit) for the year	967	23
(Liability to) FSA at 30 June 2005	**(459)**	**(1 426)**

(f) Joint Venture Entity – Murray-Darling Fresh Water Research Centre (MDFRC)

MDFRC is a collaborative joint venture for the purpose of Murray-Darling Basin freshwater research and the generation of knowledge required to ensure the sustainable management of water and associated environmental resources of the Murray-Darling Basin.

The Organisation's 50% investment in MDFRC is accounted using the equity method. During the year, MDFRC incurred an operating surplus (unaudited) of $28K (2004 $54K deficit). In accordance with the joint venture agreement the operating surplus of MDFRC is shared 50/50 between the joint venture parties. The Organisation's share of MDFRC's operating surplus was $14K (2004 $27K deficit).

Note 25 Joint Ventures (cont)

Movements in carrying amounts of investments in joint venture entity, MDFRC is as follows:

	2005 $'000	2004 $'000
Carrying amount at beginning of the financial year	502	529
Share of MDFRC's net operating surplus/(deficit) for the year	14	(27)
Investment in MDFRC at 30 June 2005	**516**	**502**

(g) Joint Venture Entity – Ensis

Ensis is a joint venture which conducts research and development into forestry, wood and paper science.

On 1 July 2004, the Organisation established a fully owned subsidiary, CSIRO FFP Pty Ltd to enter into an unincorporated joint venture named Ensis between the Organisation and New Zealand Forest Research Institute. The participants have 50/50 interest in the joint venture. All the Organisation contributions and direct costs attributable to Ensis are charged to Ensis via CSIRO FFP Pty Ltd. Ensis' gross profit margins for the year of $6.296 million (unaudited) are shared 50/50 by the participants. CSIRO FFP Pty Ltd adopts the equity method to account for its 50% share in Ensis' gross profit margin and that amounted to $3.148 million. This is offset by the Organisation's research support and overhead charges totalling $3.147 million, leaving a net operating surplus of $1K.

Details of the Organisation's interest in Ensis through its 100% owned CSIRO FFP Pty Ltd is as follows:

	2005 $'000
CSIRO FFP Pty Ltd's 50% share of Ensis' gross profit margin	3 148
Less the Organisation's research support and overhead costs relating to Ensis	(3 147)
Net operating surplus of CSIRO FFP Pty Ltd for the year ended 30 June 2005	**1**

Note 26 Related Entities

Biomolecular Research Institute Ltd (BRI) is principally a research and development company involved in the development of pharmaceutical and biological products. It is a company limited by guarantee. The Organisation's cumulative in-kind contributions to 30 June 2003 amounted to $34.9 million. During the financial years 2003–04 and 2004–05, the Organisation did not provide any in-kind contributions in the form of scientific staff and research facilities to BRI, but made a contribution to legal and administrative expenses of BRI. Contributions in accordance with formal agreements between the Organisation and BRI are accounted for as expenses in CSIRO's Statement of Financial Performance. As at 30 June 2005, the Organisation had a 63.5% interest in any repayments that may, under certain circumstances, be made by the company to the Organisation and Strategic Industry Research Foundation Ltd (SIRF).

Note 27 Resources made available to the Organisation and not included in the Statement of Financial Position

	Land $'000	Buildings $'000	Plant and equipment $'000	Total $'000
At valuation or cost	3 860	908	30 700	35 468
Accumulated depreciation	–	(908)	(27 147)	(28 055)
Net value as at 30 June 2005	**3 860**	**–**	**3 553**	**7 413**
Net value as at 30 June 2004	**3 181**	**310**	**2 414**	**5 905**

The above assets are made available to the Organisation at little or no cost in accordance with formal agreements with contributors. They have either been purchased out of contract research monies and expensed in the year of purchase in accordance with accounting policy Note 1.5, or made available to the Organisation at little or no cost.

These assets are controlled and accounted for in the contributors' books and any proceeds from their disposal are refundable to the contributors in accordance with formal agreements on equity share. The fair value of in-kind contributions of these assets could not be reliably determined and, therefore, not brought to account in the Statement of Financial Performance. Although a valuable resource, these assets can be a constraint to management decision making in that they must be operated in accordance with the terms of their provision to the Organisation.

The major contributor of the above assets is Australian Wool Innovation Ltd.

Note 28 Monies Held in Trust

	2005 $'000	2004 $'000
Monies held in trust represented by cash, deposits and investments for the benefit of the Organisation, which are not included in the Statement of Financial Position, are:		
Sir Ian McLennan Achievement for Industry Award – established to award outstanding contributions by the Organisations' scientists to national development	237	213
The Ken and Yasuko Myer Plant Science Research Fund – established to fund plant science research.	–	98
The Elwood and Hannah Zimmerman Trust Fund – established to fund weevil research and the curation of the Australian National Insect Collection (ANIC) weevil collection.	1 647	1 370
The Schlinger Trust – established to research the taxonomy, biosystematics, general biology and biogeography of Australasian Diptera conducted by the Australian National Insect Collection.	787	–
Total monies held in trust as at 30 June 2005	**2 671**	**1 681**

The comparative has been adjusted to exclude the ANWC figure of $415K.

Note 28 Monies Held in Trust (cont)

Movements of trust funds summary

	McLennan $'000	Myer $'000	Zimmerman $'000	Schlinger $'000	Total $'000
Balance at 1 July 2004	213	98	1 370	–	1 681
Receipts during year	–	–	–	787	787
Interest and dividends	24	13	277	–	314
Expenditure	–	(111)	–	–	(111)
Balance at 30 June 2005	**237**	–	**1 647**	**787**	**2 671**

Note 29 Collections

The Organisation owns several collections used for scientific research. The Organisation's collections have been established over time and cover an extensive range of evolution and change in species. The collections are irreplaceable, bear scientific and historical value and are not reliably measurable in monetary terms. Therefore, the Organisation has not recognised them as an asset in its financial statements. The main collections held by the Organisation are:

Australian National Herbarium (ANH) – The ANH is one of the largest plant collections in Australia with approximately one million preserved plant specimens. It is unique among the Australian Herbaria in having a national focus for its collections, acquisition and research programs.

Australian National Insect Collection (ANIC) – The ANIC has over 11 million specimens and is the largest research collection of Australian insects and related organisms in the world.

Australian National Wildlife Collection (ANWC) – The ANWC, with over 80 000 specimens, holds land vertebrate collections, including the most comprehensively documented collections of Australian-New Guinean birds in the world.

CSIRO National Fish Collection (ANFC) – CSIRO's ANFC, also known as the 'ISR Munro Ichthyological Collection', houses more than 80 000 registered adult and 40 000 registered larval specimens of almost 3 000 species from Australasia, Asia, Antarctica, and the Sub Antarctic Islands. It is among Australia's most diverse ichthyological collections and contains one of the largest collections of sharks, rays and deepwater fishes in the Southern Hemisphere.

Other Collections – These include the Australian Tree Seed Collection, CSIRO's Dadswell wood collection, CSIRO collection of living microalgae and wood inhabiting fungi collection.

	2005 $	2004 $
Note 30 Remuneration of Auditors		
Remuneration to the Auditor-General for auditing the financial statements for the reporting period.		
The fair value of services provided was:	**224 000**	**219 000**

No other services were provided by the Auditor-General during the reporting period.

Note 31 Remuneration of Board Members

	2005 $	2004 $
Remuneration and superannuation benefits received or due and receivable by Executive and non-Executive Board Members excluding the Chief Executive Officer were:		
Board Members' remuneration	376 028	246 025
Payments to superannuation funds for Board Members	29 201	21 650
	405 229	**267 675**

The Chief Executive Officer, a member of the Organisation's Board, is reported under Note 32 Remuneration of Officers.

The number of Board Members whose total remuneration fell within the following bands were:

$			2005 Number	2004 Number
Nil	–	10 000	2	3
20 001	–	30 000	–	4
30 001	–	40 000	–	3
40 001	–	50 000	6	–
50 001	–	60 000	1	–
60 001	–	70 000	–	1
80 001	–	90 000	1	–
Total			**10**	**11**

Note 32 Remuneration of Officers

	2005 $	2004 $
Aggregate amount of remuneration for Officers shown below	10 798 001	8 652 435
Aggregate amount of separation/termination benefit payments during the year to Officers shown below	–	56 912
	10 798 001	**8 709 347**

Note 32 Remuneration of Officers (cont)

The number of Officers, who received or were due to receive total remuneration of $100 000 or more:

$			2005 Number	2004 Number
100 001	–	110 000	1	–
110 001	–	120 000	–	1
120 001	–	130 000	–	1
130 001	–	140 000	–	1
140 001	–	150 000	1	–
150 001	–	160 000	–	1
160 001	–	170 000	–	2
170 001	–	180 000	1	–
180 001	–	190 000	1	–
190 001	–	200 000	1	2
200 001	–	210 000	–	3
210 001	–	220 000	–	1
220 001	–	230 000	2	3
230 001	–	240 000	1	4
240 001	–	250 000	6	4
250 001	–	260 000	3	2
260 001	–	270 000	9	2
270 001	–	280 000	3	–
280 001	–	290 000	1	3
290 001	–	300 000	–	1
300 001	–	310 000	1	–
320 001	–	330 000	1	2
330 001	–	340 000	3	–
340 001	–	350 000	1	–
350 001	–	360 000	2	1
360 001	–	370 000	1	–
380 001	–	390 000	–	1
420 001	–	430 000	–	1
470 001	–	480 000	1	–
Total			**40**	**36**

The Remuneration of Officers table includes all officers concerned with taking part in the management of the Organisation.

During 2004–05 those positions were: the Chief Executive and other members of the Executive Team (11), Chiefs of Divisions (20), joint venture Chief Executive Officers (2) and Flagship Directors (6), a total of 39 positions. During 2003–04 there were 38 positions, the difference being the establishment of an additional position associated with Ensis, a new joint venture in 2004–05.

Note 32 Remuneration of Officers (cont)

The actual position numbers can vary from the nominal position numbers. The timing of appointments (or cessations) to these positions can result in both a temporary and a substantive occupant of the same position being in excess of the $100 000 threshold within a given year, or the exclusion of an officer below the $100 000 threshold where the Officer did not occupy the position for the full reporting period.

The remuneration increase approved for Officers in 2004–05 was consistent with the level granted to CSIRO staff generally. However, the table is not confined to payroll expenditures only and reflects additional items that come within the accounting definition of remuneration. These items, for example, accrued annual leave, can lead to variability in remuneration from year to year.

Note 33 Meetings of the CSIRO Board and Board Committees

During the financial year, seven Board meetings, four Board Audit Committee, five Board Remuneration Committees and nine Board Commercial Committee meetings were held. The number of meetings attended by each of the Board members was as follows:

	Board		Board Audit Committee		Board Remuneration Committee		Board Commercial Committee	
	Number eligible to attend as a member	Number attended	Number eligible to attend as a member	Number attended	Number eligible to attend as a member	Number attended	Number eligible to attend as a member	Number attended
C B Livingstone (Chairman)	7	7	4	4	5	5	9	9
G G Garrett	7	7	4	4	–	–	9	9
S Cory	7	7	–	–	–	–	–	–
T A Cutler	7	7	4	4	5	5	–	–
P J B Duncan	7	6	–	–	5	3	9	5
B F Keane	7	7	–	–	5	4	9	8
D M O'Toole	7	6	4	4	–	–	–	–
J A Harmer (resigned 27 October 2004)	2	1	–	–	–	–	–	–
L Paul (appointed 16 December 2004)	4	2	–	–	–	–	–	–
A D Robson	7	6	–	–	–	–	–	–
The Late E D Tweddell (deceased 4 August 2005)	7	7	4	4	–	–	9	9

Note 34 Related Party Disclosures

Board Members – The Board Members of the Organisation during the financial year were:

C B Livingstone (Chairman)	S Cory
T A Cutler	P J B Duncan
G G Garrett (Chief Executive)	J Harmer (resigned 27 October 2004)
B F Keane	L Paul (appointed 16 December 2004)
D O'Toole	A D Robson

The Late E D Tweddell (deceased 4 August 2005)

Remuneration – The aggregate remuneration of Board Members is disclosed in Note 31.

Board Members' interest in contracts

Since 1 July 2004 no Board Member of CSIRO has received or become entitled to receive a benefit, other than a benefit included in the aggregate amount of remuneration received or due and receivable shown in Note 31 by reason of a contract made by CSIRO with the Board Member or with a firm of which the Board Member is a member or with a company in which the Board Member has a substantial financial interest.

Other transactions of Board Members – related entities

Ms C B Livingstone is a Director of Telstra Corporation Ltd, Macquarie Bank Ltd and Chairman of The Australian Business Foundation. Ms Livingstone is also a member of the Advisory Board of the Department of Accounting and Finance at Macquarie University and of the Sydney Institute Board. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions, and there is no personal benefit to Ms Livingstone.

Professor S Cory is Director of The Walter and Eliza Hall Institute of Medical Research and Professor of Medical Biology of the University of Melbourne. She is also a Director of Bio21 Australia Ltd, a member of the Council of The Cancer Council Victoria, a member of the Advisory Board of The Committee for Melbourne, and a member of the Council of the Australian Academy of Science. All contracts and transactions between these entities and CSIRO, if any, are based on normal commercial terms and conditions, and there is no personal benefit to her.

Dr T A Cutler is the Principal of Cutler & Company, a consultancy in information and communications technology. He is also Chairman of the CRC for Interaction Design, President of the Australian Centre for the Moving Image, and a Director of Universiti Telekom Sdn Bhd Malaysia. He is also a member of the International Advisory Panel for Malaysia's Multimedia Supercorridor and the Council of the Queensland University of Technology (QUT). All contracts and transactions with these entities, if any, are based on normal commercial terms and conditions, and there is no personal benefit to him.

Mr P J B Duncan is a Director of Orica Ltd, National Australia Bank and GasNet. He is the Chairman of Scania Australia. All contracts and transactions with these entities, if any, are based on normal commercial terms and conditions, and there is no personal benefit to him.

Dr J Harmer was the Secretary of the Department of Education, Science and Training until October 2004. All contracts and transactions with the Department are based on normal commercial terms and conditions, and there is no personal benefit to him.

Note 34 Related Party Disclosures (cont)

Mr B F Keane is a Director of Aurora Energy Pty Ltd, Lawcover Pty Ltd, Medibank Private Ltd and RAC Insurance Ltd. Mr Keane is also a member of the Australian Competition Tribunal. He was also CEO of AAMI Ltd from 1983 until 2002 and is a fellow of the AICD. Mr Keane was appointed to the Board of CSIRO in July 2003. All contracts and transactions with this entity, if any, are based on normal commercial terms and conditions, and there is no personal benefit to him.

Ms D M O'Toole is the Chief Financial Officer for Queensland Cotton and a Director of Raheny Consulting Pty Ltd. All contracts and transactions with these entities, if any, are based on normal commercial terms and conditions, and there is no personal benefit to her.

Ms L Paul is the Secretary of the Department of Education, Science and Training. All contracts and transactions with the Department are based on normal commercial terms and conditions, and there is no personal benefit to her.

Professor A D Robson is Vice Chancellor of The University of Western Australia, member of the Council of the National Library of Australia, member of the Premier's Science Council (Western Australia), and Chair of the Pastoral Lands Board of Western Australia. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions, and there is no personal benefit to him.

The Late Dr E D Tweddell was Chairman of Ansell Ltd and Nepenthe Group Pty Ltd and was a Director of Australia Post. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions, and there was no personal benefit to him.

The following Board Member had no involvement in related entities:

– Dr G G Garrett

Note 35 Average Staff Levels

	2005 Number	2004 Number
The average staffing levels measured on a full-time equivalent basis for the Organisation during the year.	5 910	5 914

Note 36 Financial Instruments

(a) Terms, conditions and accounting policies

Financial instrument	Notes	Accounting policies and methods	Nature of underlying instrument
Financial assets		Financial assets are recognised when control over future economic benefits is established and the amount of the benefit can be reliably measured.	
Cash at bank and term deposits	8	Cash at bank and deposits at call are recognised at their nominal amounts. Interest is credited to revenue as it accrues.	Balance of cash at bank is mainly from contract research monies received in advance and held in the Organisation's current bank account. Interest is earned on the daily balance at the prevailing daily 30-day bank bill rate less fees and is paid at month end. Deposits at call represent term Deposits which are monies invested for a minimum of 30 days and up to 90 days.
Receivables for goods and services and other receivables	9	These receivables are recognised at the nominal amounts less provision for doubtful debts. Provisions are made when collection of the debt is judged to be less rather than more likely.	Credit terms are net 30 days.
Investments – eg Shares	10	These are carried at cost or recoverable amounts. No dividends have been declared or paid by the investee.	–

Note 36 Financial Instruments (cont)

(a) Terms, conditions and accounting policies

Financial instrument	Notes	Accounting policies and methods	Nature of underlying instrument
Financial liabilities		Financial liabilities are recognised when a present obligation to another party is entered into and the amount of the liability can be reliably measured.	
Finance lease liabilities	16	Liabilities are recognised at the present value of the minimum lease payments at the beginning of the lease. The discount rates used are estimates of the interest rates implicit in the leases.	At reporting date, the Organisation had finance leases with terms averaging 15 years and a maximum term of 25 years. The interest rate implicit in the leases averaged 4.4% pa. (2004 4.4%). The lease liabilities are secured by the lease assets and disclosed in Notes 11 and 12.
Trade creditors and other creditors	20 & 21	Creditors and accruals are recognised at their nominal amounts, being the amounts at which the liabilities will be settled. Liabilities are recognised to the extent that the goods or services have been received (irrespective of having been invoiced).	Settlement is usually made net 30 days.
Research revenue received in advance	21	Revenue from contract research activities is recognised when work is performed. Revenue is deferred to the extent that CSIRO has not performed its contractual obligations as at 30 June 2005.	Research revenue received in advance is not recognised as revenue until work is performed.
Deposits	17	Deposits are recognised at their nominal amounts	Being monies held on behalf of third parties. They are payable on demand.
Guarantee	23	Bank guarantee with Westpac is not recognised in the Statement of Financial Position as at 30 June 2005. It is disclosed in the Schedule of Contingencies.	Bank guarantee with Westpac for USD 32 000 is supported by an irrevocable standby letter of credit. The terms and conditions are negotiable.

Note 36 Financial Instruments (cont) (b) Interest rate risk

Financial Instrument	Notes	Floating Interest Rate		Fixed Interest Rate								Non Interest Bearing		Total		Weighted Average Effective Interest Rate	
				1 year or less		1 to 2 years		2 to 5 years		> 5 years							
		2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 %	2004 %
Financial assets (recognised)																	
Cash at bank and cash on hand	8	23 675	28 998	–	–	–	–	–	–	–	–	–	–	23 675	28 998	5.5	5.0
Deposits – at call	8	–	–	135 000	150 000	–	–	–	–	–	–	–	–	135 000	150 000	5.8	5.3
Receivables for goods and services	9	–	–	–	–	–	–	–	–	–	–	47 194	40 960	47 194	40 960	n/a	n/a
Receivables for property sales	9	–	–	–	–	–	–	–	–	–	–	28 436	–	28 436	–	n/a	n/a
Loans receivable	9	–	1 436	–	–	–	–	–	–	–	–	1 425	1 000	1 425	2 436	n/a	8.8
Net GST receivable	9	–	–	–	–	–	–	–	–	–	–	1 014	899	1 014	899	n/a	n/a
Other receivables	9	–	–	–	–	–	–	–	–	–	–	6 471	5 768	6 471	5 768	n/a	n/a
Investments	10	–	–	–	–	–	–	–	–	–	–	15 333	13 087	15 333	13 087	n/a	n/a
Total financial assets (recognised)		**23 675**	**30 434**	**135 000**	**150 000**	–	–	–	–	–	–	**99 873**	**61 714**	**258 548**	**242 148**		
Total assets														**1 550 434**	**1 344 893**		
Receivable from AMC including royalties	23	–	70 000	–	–	–	–	–	–	–	–	–	16 855	–	86 855	n/a	n/a
Total financial assets (unrecognised)		–	**70 000**	–	–	–	–	–	–	–	–	–	**16 855**	–	**86 855**		
Financial liabilities (recognised)																	
Finance lease liabilities	16	–	–	18 297	19 492	–	–	6 715	7 154	54 805	58 386	–	–	79 817	85 032	4.4	4.4
Trade creditors	20	–	–	–	–	–	–	–	–	–	–	38 743	40 659	38 743	40 659	n/a	n/a
Research revenue received in advance	21	–	–	–	–	–	–	–	–	–	–	45 772	45 627	45 772	45 627	n/a	n/a
Deposits	17	15 118	18 428	–	–	–	–	–	–	–	–	–	–	15 118	18 428	5.5	5.0
Other creditors	21	–	–	–	–	–	–	–	–	–	–	25 232	27 833	25 232	27 833	n/a	n/a
Total financial liabilities (recognised)		**15 118**	**18 428**	**18 297**	**19 492**	–	–	**6 715**	**7 154**	**54 805**	**58 386**	**109 747**	**114 119**	**204 682**	**217 579**		
Total liabilities														**385 361**	**399 960**		
Legal claims	23	–	70 000	–	–	–	–	–	–	–	–	525	17 955	525	87 955	n/a	n/a
Bank guarantee	23	–	–									42	–	42	–		
Total financial liabilities (unrecognised)		–	**70 000**	–	–	–	–	–	–	–	–	**567**	**17 955**	**567**	**87 955**		

*Contingent asset and liability for Australian Magnesium Corporation Ltd (AMC) which was previously reported in 2003–04 is now classified as less than remote.

Note 36 Financial Instruments (cont)

(c) Net fair values of financial assets and liabilities

	Notes	2005 Total carrying amount $'000	2005 Aggregate net fair value $'000	2004 Total carrying amount $'000	2004 Aggregate net fair value $'000
Financial assets (recognised)					
Cash at bank and on hand	8	23 675	23 675	28 998	28 998
Deposits at call	8	135 000	135 000	150 000	150 000
Receivables for goods and services	9	47 194	47 194	40 960	40 960
Receivables for property sales	9	28 436	28 436	–	–
Loans receivable	9	1 425	1 425	2 436	2 436
GST receivable	9	1 014	1 014	899	899
Other receivables	9	6 471	6 471	5 768	5 768
Investments	10	15 333	15 333	13 087	13 087
		258 548	**258 548**	**242 148**	**242 148**
Financial assets (unrecognised)					
Receivable from AMC, including royalties	23	–	–	**86 855**	**86 855**
Financial liabilities (recognised)					
Finance lease liabilities	16	79 817	79 817	85 032	85 032
Trade creditors	20	38 743	38 743	40 659	40 659
Research revenue received in advance	21	45 772	45 772	45 627	45 627
Deposits	17	15 118	15 118	18 428	18 428
Other creditors	21	25 232	25 232	27 833	27 833
		204 682	**204 682**	**217 579**	**217 579**
Financial liabilities (unrecognised)					
Legal claims and bank guarantee	23	**567**	**567**	**87 955**	**87 955**

Financial assets

The net fair values of cash, deposits at call, receivables for goods and services, receivables for property sales, loans receivable, GST receivable, and other receivables approximate their carrying amounts.

The net fair values for listed equity investments is the quoted market price at reporting date, adjusted for the transaction costs necessary for realisation.

The net fair values for equity investments in unlisted companies have been reviewed and appropriate provision for diminution in value made based on the underlying business and expected future economic benefits from the investees in R&D and high technology industries.

Other than for listed financial assets, none of the classes of financial assets are readily

traded on organised markets in standardised form.

Note 36 Financial Instruments (cont)

Financial liabilities

The net fair values of finance leases are based on discounted cash flows using current interest rates for liabilities with similar risk profiles.

The net fair values for trade creditors, contract monies received in advance, other creditors and deposits are approximated by their carrying amounts.

Hedges

The Organisation has no specific forward exchange contracts.

(d) Credit risk exposures

The Organisation's maximum exposures to credit risk at reporting date in relation to each class of recognised financial assets is the carrying amount of those assets as indicated in the Statement of Financial Position.

The economic entity has no significant exposures to any concentrations of credit risk.

Note 37 Reporting of Outcome and Outputs

(a) Reporting of outcome

The Organisation's outputs contribute to a single outcome:
'The application or utilisation of the results of scientific research delivers:

- innovative and competitive industries
- healthy environment and lifestyles
- a technologically advanced society.'

(b) Net cost of outcome delivery

	2005 $'000	2004 $'000
Total expenses	**934 595**	**909 759**
Total costs recovered from provision of goods and services to the non-government sector	**–**	**1 359**
Other external revenues:		
Sale of goods and services – to related entities	86 267	47 876
Sale of goods and services – to external entities	194 626	246 916
Interest	7 884	7 498
Revenue from sale of assets	30 590	15 281
Reversals of previous asset write-downs	3 046	–
Contributions	160	273
Rental income	5 497	3 394
Sale of primary produce	1 364	1 376
Other	18 792	11 814
Total other external revenues	**348 226**	**334 428**
Net cost of outcome	**586 369**	**573 972**

Note to accompany the following table:

During the 2004–05 financial year, the Organisation applied the same methodology as 2003–04 for the allocation of corporate costs to enable a more accurate pricing of outputs. This methodology involves management estimation and decision as to the most appropriate choice of cost drivers such as staff numbers, floor space and divisional function per output.

In addition, the Organisation allocates direct costs and revenues to outputs derived from the use of project codes within the Organisation's project based accounting system and Divisional support costs are allocated to projects using appropriate cost drivers such as floor space and direct labour hours.

Note 37 Reporting of Outcome and Outputs (cont)

(c) Major Organisational Revenues and Expenses by Output Groups

	Output 1		Output 2		Output 3		Output 4		Total	
	Research products and services for Information Technology and Manufacturing Services		Research products and services for Sustainable Minerals and Energy		Research products and services for Environment and Natural Resources		Research products and services for Agribusiness and Health			
	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000
Operating Expenses										
Employees	164 554	168 575	82 025	80 360	153 122	135 999	135 467	136 805	535 168	521 739
Suppliers	83 369	86 664	44 215	43 988	71 999	70 112	99 714	88 171	299 297	288 935
Depreciation and amortisation	24 079	26 393	9 946	11 148	15 971	14 732	28 075	27 213	78 071	79 486
Value of assets sold	12 164	3 844	2 369	2 008	4 357	2 196	(2 520)	2 284	16 370	10 332
Write-down of assets	392	38	409	2 700	210	1 398	1 034	1 710	2 045	5 846
Other	1 186	1 277	506	591	837	615	1 115	938	3 644	3 421
Total operating expenses	**285 744**	**286 791**	**139 470**	**140 795**	**246 496**	**225 052**	**262 885**	**257 121**	**934 595**	**909 759**
Funded by:										
Revenues from Government	119 380	196 300	132 420	78 148	160 837	136 749	164 501	157 449	577 138	568 646
Sale of goods and services	75 073	85 573	42 953	50 858	83 462	76 069	79 405	83 651	280 893	296 151
Revenue from sale of assets	8 729	4 401	4 414	2 247	7 814	4 117	9 633	4 516	30 590	15 281
Reversals of previous asset write-downs	104	–	203	–	775	–	1 964	–	3 046	–
Contributions	46	53	–	25	106	60	8	135	160	273
Other	8 046	6 209	3 519	2 429	7 499	7 536	14 487	7 908	33 551	24 082
Total operating revenues	**211 378**	**292 536**	**183 509**	**133 707**	**260 493**	**224 531**	**269 998**	**253 659**	**925 378**	**904 433**

The Organisation's outputs are described in Note 37 (a).

Note 38 Appropriations

Acquittal of Organisation to draw cash from the Consolidated Revenue Fund (Appropriation) from Acts 1 and 3

	Departmental Outputs		Loans		Equity		Total	
	2005	2004	2005	2004	2005	2004	2005	2004
Particulars	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
2004–05 (current year)								
Balance carried forward from previous year	–	–	–	–	–	–	–	–
Reductions of appropriations (prior years)	–	–	–	–	–	–	–	–
Adjusted balance carried from previous period	–	–	–	–	–	–	–	–
Appropriation (Act No.1)	576 528	568 107	–	–	–	–	576 528	568 107
Appropriation (Act No.3)	610	539	–	–	–	–	610	539
Departmental adjustments by the Finance Minister (Appropriation Acts)	–	–	–	–	–	–	–	–
Comcover receipts (Appropriation Acts 13)	–	–	–	–	–	–	–	–
Advance to the Finance Minister	–	–	–	–	–	–	–	–
Appropriations reduced by section 9 determination (current year)	–	–	–	–	–	–	–	–
Subtotal 2004–05 Annual Appropriations	577 138	568 646	–	–	–	–	577 138	568 646
Total appropriation available for payment	577 138	568 646	–	–	–	–	577 138	568 646
Cash payments made during the year (GST inclusive)	(577 138)	(568 646)	–	–	–	–	(577 138)	(568 646)
Appropriations credited to Special Accounts	–	–	–	–	–	–	–	–
Balance of authority to draw cash from Consolidated Revenue Fund for Ordinary Annual Service Appropriation	–	–	–	–	–	–	–	–
Represented by:								
Cash at bank and on hand	–	–	–	–	–	–	–	–
Departmental appropriation receivable	–	–	–	–	–	–	–	–
GST receivable from the ATO	–	–	–	–	–	–	–	–
Formal reduction or appropriation	–	–	–	–	–	–	–	–
Departmental appropriation receivable (appropriation for additional output)	–	–	–	–	–	–	–	–
Total	–	–	–	–	–	–	–	–

Appendixes

Appendix 1

Staff demographics

CSIRO staff are employed under section 32 of the *Science and Industry Research Act 1949*.

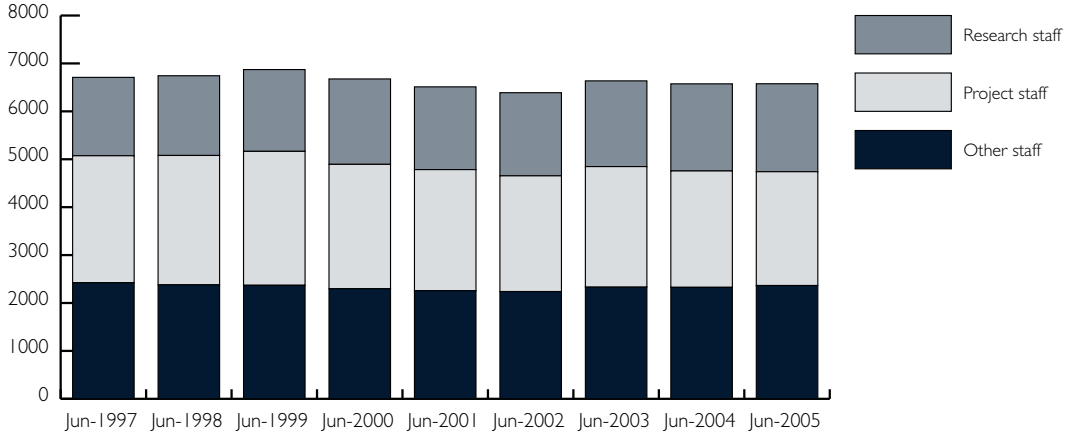
At 30 June 2005 CSIRO had a total staff of 6 576, which has an equivalent full-time (EFT) value of 5 946.

The numbers of staff employed in different job categories as at 30 June 2005 are shown below.

Staff by gender and principal functional area (comparisons with 2003–04)

	Female		Male		Total	
	2004–05	2003–04	**2004–05**	2003–04	**2004–05**	2003–04
Research Scientists	**318**	296	**1 305**	1 329	**1 623**	1 625
Research Project staff	**975**	1 000	**1 400**	1 429	**2 375**	2 429
Senior Specialists	**7**	9	**34**	35	**41**	44
Research Management	**19**	16	**194**	177	**213**	193
Technical Services	**80**	92	**560**	566	**640**	658
Communication and Information	**272**	267	**166**	142	**438**	409
General Services	**42**	50	**39**	48	**81**	98
Administrative Support	**766**	730	**281**	257	**1 047**	987
General Management	**30**	28	**88**	103	**118**	131
TOTAL	**2 509**	2 488	**4 067**	4 086	**6 576**	6 574

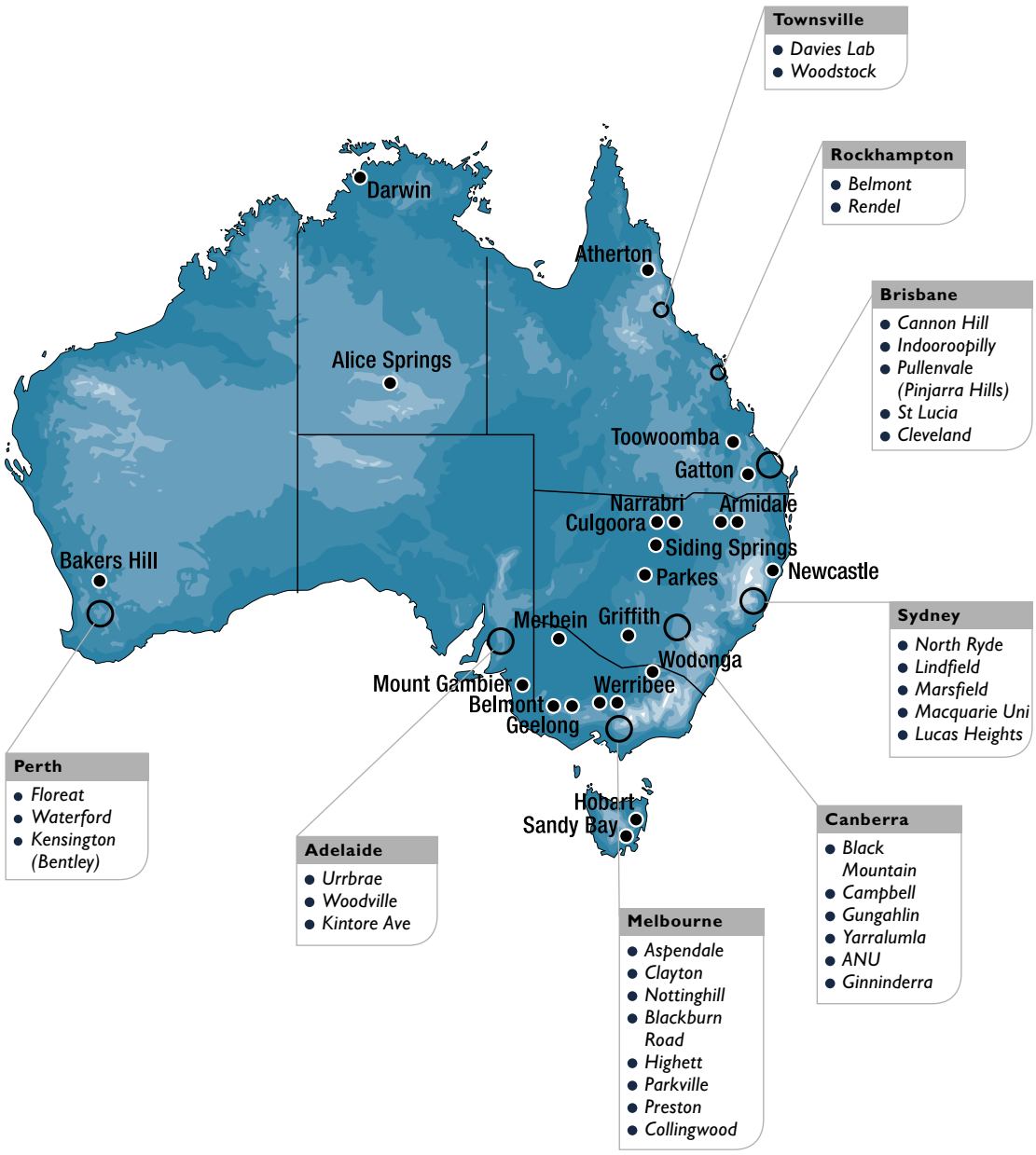
CSIRO Headcount[1]



[1] CSIRO Officers only. 1997–2005 figures at 30 June. Note that while CSIRO staff numbers have decreased from 6 709 in 1997 to 6 576 in 2005, the number of research staff (Research Scientists and Research Managers) has increased from 1 636 in 1997 to 1 836 in 2005.

Appendix 2

CSIRO locations



Internationally, CSIRO has staff located at the following locations: France; Ireland; The Netherlands; and the USA.

Appendix 3

CSIRO Alumni

Established in December 2003, the CSIRO Alumni membership has grown to 1 825, comprising former CSIRO staff, Board members, Honorary Fellows and eligible students. The overarching purpose of the Alumni is to establish networks to help former CSIRO staff make or retain contact with one another and with CSIRO's activities, and thereby draw on their skills and contacts to assist CSIRO in achieving its goals.

Communication with members is through a monthly e-newsletter and quarterly newsletter, a dedicated website, organised Alumni events and activities and member benefits. Since November 2004, eight editions of *Siroscope*, an e-newsletter designed to keep members informed of current CSIRO activities and achievements, have been produced. Our first Alumni quarterly newsletter was produced in July 2005.

Alumni activities and achievements in 2004–05 include:

- Alumni launch events were held in Hobart, Perth and Canberra in 2004 and in Sydney and Melbourne in 2005. Launch events are being planned in each State and Territory.
- Regional Alumni events were held at the Newcastle Energy Centre, Armidale, Narrabri and Parkes sites in NSW.
- The *Seminar Series* for Alumni members has been established, inviting them to CSIRO Divisional seminars and events which are registered on the Alumni home page. As at 30 June, sixty-one seminars had been registered.
- A volunteer register to match Alumni volunteers to CSIRO external activities, such as National Science Week has been established.
- Photography exhibition of prominent CSIRO scientists (current and former staff) featuring their contributions to science was developed. The exhibition has been displayed at all Alumni launch events and was also displayed to the general public at the CSIRO Discovery centre, Canberra in December 2004 and January and February 2005. The exhibition was also displayed in the Alice Springs Library as part of National Science Week. This touring exhibition will continue to be developed.
- The groundwork for Regional Alumni Chapters has been completed. The Chapters will soon be established to accommodate local members' interests and activities, with follow-up events to launches currently being initiated.
- An on-line community database is currently being developed to enable members to communicate directly with each other and CSIRO.

Appendix 4

National Research Priority Areas and Priority Goals

A. An environmentally sustainable Australia

Transforming the way we utilise our land, water, mineral and energy resources through a better understanding of human and environmental systems and the use of new technologies.

A1. ***Water – a critical resource***

Sustainable ways of improving water productivity, using less water in agriculture and other industries, providing increased protection of rivers and groundwater and the reuse of urban and industrial waste waters.

A2. ***Transforming existing industries***

New technologies for resource-based industries to deliver substantial increases in national wealth while minimising environmental impacts on land and sea.

A3. ***Overcoming soil loss, salinity and acidity***

Identifying causes and solutions to land degradation using a multidisciplinary approach to restore land surfaces.

A4. ***Reducing and capturing emissions in transport and energy generation***

Alternative transport technologies and clean combustion and efficient new power generation systems and capture and sequestration of carbon dioxide.

A5. ***Sustainable use of Australia's biodiversity***

Managing and protecting Australia's terrestrial and marine biodiversity both for its own value and to develop long term use of ecosystem goods and services ranging from fisheries to ecotourism.

A6. ***Developing deep earth resources***

Smart high-technology exploration methodologies, including imaging and mapping the deep earth and ocean floors, and novel efficient ways of commodity extraction and processing (examples include minerals, oil and gas) while minimising negative ecological and social impacts.

A7. ***Responding to climate change and variability***

Increasing our understanding of the impact of climate change and variability at the regional level across Australia and addressing the consequences of these factors on the environment and on communities.

B. Promoting and maintaining good health

Promoting good health and wellbeing for all Australians.

B1. ***A healthy start to life***

Counteracting the impact of genetic, social and environmental factors which predispose infants and children to ill health and reduce their wellbeing and life potential.

B2. ***Ageing well, ageing productively***

Developing better social, medical and population health strategies to improve the mental and physical capacities of ageing people.

B3. ***Preventive healthcare***

New ethical, evidence-based strategies to promote health and prevent disease through the adoption of healthier lifestyles and diet, and the development of health-promoting products.

B4. ***Strengthening Australia's social and economic fabric***

Understanding and strengthening key elements of Australia's social and economic fabric to help families and individuals live healthy, productive, and fulfilling lives.

C. Frontier technologies for building and transforming Australian industries

Stimulating the growth of world-class Australian industries using innovative technologies developed from cutting-edge research.

C1. *Breakthrough science*

Better understanding of the fundamental processes that will advance knowledge and facilitate the development of technological innovations.

C2. *Frontier technologies*

Enhanced capacity in frontier technologies to power world-class industries of the future and build on Australia's strengths in research and innovation (examples include nanotechnology, biotechnology, ICT, photonics, genomics/phenomics, and complex systems).

C3. *Advanced materials*

Advanced materials for applications in construction, communications, transport, agriculture and medicine (examples include ceramics, organics, biomaterials, smart material and fabrics, composites, polymers and light metals).

C4. *Smart information use*

Improved data management for existing and new business applications and creative applications for digital technologies (examples include e-finance, interactive systems, multi-platform media, creative industries, digital media creative design, content generation and imaging).

C5. *Promoting an innovation culture and economy*

Maximising Australia's creative and technological capability by understanding the factors conducive to innovation and its acceptance.

D. Safeguarding Australia

Safeguarding Australia from terrorism, crime, invasive diseases and pests, strengthening our understanding of Australia's place in the region and the world, and securing our infrastructure, particularly with respect to our digital systems.

D1. *Critical infrastructure*

Protecting Australia's critical infrastructure including our financial, energy, communications, and transport systems.

D2. *Understanding our region and the world*

Enhancing Australia's capacity to interpret and engage with its regional and global environment through a greater understanding of languages, societies, politics and cultures.

D3. *Protecting Australia from invasive diseases and pests*

Counteract the impact of invasive species through the application of new technologies and by integrating approaches across agencies and jurisdictions.

D4. *Protecting Australia from terrorism and crime*

By promoting a healthy and diverse research and development system that anticipates threats and supports core competencies in modern and rapid identification techniques.

D5. *Transformational defence technologies*

Transform military operations for the defence of Australia by providing superior technologies, better information and improved ways of operation.

For more information on the National Research Priorities see: http://www.dest.gov.au/sectors/research_sector/policies_issues_reviews/key_issues/national_research_priorities

Appendix 5

Sector Advisory Councils and Flagship Advisory Committees

The Sector Advisory Councils (SACs), with members representing CSIRO's stakeholders and customers in seven Sectors, ensure CSIRO's planned program of research and development for each Sector is responsive to the strategic research needs of industry and society.

The following SACs are those at 30 June 2005:

Energy and Transport Sector

Chair
Mr Brad Page
Chief Executive Officer
Energy Supply Association of Australia

Members
Mr Colin Beckett
General Manager, Venture Gas
Chevron Texaco Australia Pty Ltd

Ms Tricia Caswell
Chief Executive
Victorian Association of Forest Industries

Mr Drew Clarke
Head, Energy and Environment Division
Department of Industry, Tourism and Resources

Mr Roman Domanski
Executive Officer
Energy Users Association of Australia

Mr Barry Jones
Executive Director
Australian Petroleum Production and Exploration Association

Mr Ron Knapp
Executive Director
Australian Aluminium Council

Mr Lachlan McIntosh
Executive Director
Australian Automobile Association

Mr Gerry Morvell
Branch Head, Energy Futures
Australian Greenhouse Office

Mr Ian Nethercote
Chief Executive
Loy Yang Power Management Pty Ltd

Mr Dennis O'Neill
Chief Executive Officer
Australian Council for Infrastructure Development

Mr Mark O'Neill
Executive Director
Australian Coal Association

Mr Ross Rolfe
Chief Executive Officer
Stanwell Corporation

Mr Andrew Stock
Executive General Manager, Generation
Origin Energy

Dr John Tilley
Executive Director
Australian Institute of Petroleum

Sector Coordinator
Dr Rod Hill
CSIRO Sustainable Minerals and Energy Group

Environment and Natural Resource Management Sector

Chair
Mr Greg Bourne (until 7/10/04)

Mr Oleg Morozow (Acting from 8/10/04–present)
Manager SA and Principal External Affairs Advisor
ECOS Consulting Australia Pty Ltd

Members
Mr Howard Bamsey
Chief Executive Officer
Australian Greenhouse Office

Ms Leith Boully
Farmer and community engagement expert

Mr Richard Dinham
Chairman
DesignInc Sydney Pty Ltd

Mr Don Henry
Executive Director
Australian Conservation Foundation

Dr Peter Scaife
Director, Centre of Sustainable Technology
University of Newcastle

Mr Tony Slatyer
Department of Environment and Heritage

Mr Robert Stribling
Chief Risk Officer
National Australia Bank

Mr Ian Thompson
Executive Manager
Rural Policy and Innovation
Department of Agriculture, Fisheries and Forestry

Professor Beth Woods
School of Natural and Rural Systems Management
University of Queensland

Sector Coordinator
Dr Steve Morton
CSIRO Environment and Natural Resources Group

Health Sector

Chair
Dr Alison Coutts
Director, Head of Research
Emerging Growth Capital Pty Ltd

Members
Professor Warwick Anderson
Head, School of Biomedical Sciences
Monash University

Professor Bruce Armstrong
Head, School of Public Health
University of Sydney

Professor Felix Bochner
Head, Department of Clinical and Experimental
University of Adelaide

Professor Tony Burgess
Director
Ludwig Institute for Cancer Research

Professor Don Chalmers
Head Faculty of Law
University of Tasmania

Dr Murray Esler
Associate Director
Baker Heart Research Institute

Professor Kerin O'Dea
Director
Menzies School of Health Research

Ms Helen Owens
Commissioner
Productivity Commission

Professor Alan Pettigrew
Chief Executive Officer
National Health and Medical Research Council

Professor Dave Roberts
Director
Australian Food and Grocery Council

Sector Coordinator
Dr Richard Head
CSIRO Preventative Health Flagship

Information, Communication and Services Sector

Chair
Dr Chris Beare
Independent Director

Members
Dr Rod Badger
Deputy Chief Executive Officer
National Office for the Information Economy

Mr Rob Durie
Executive Director
Australian Information Industry Association

Dr Pradeep Khosla
Electrical and Computer Engineering
Carnegie Mellon University

Dr Phil Robertson
General Manager, Solutions Division
Canon Information Systems Research Australia

Mr Silvio Salom
Managing Director
Adacel

Mr Robert Sale
Chief Executive Officer
Abacus Data Systems

Professor Arun Sharma
Deputy Vice Chancellor
Queensland University of Technology

Mr Stuart Simson
Executive Chairman
Emitch Ltd

Sector Coordinator
Mr Alex Zelinsky
Director of ICT Centre
CSIRO Information, Communication and Services

Manufacturing

Chair
Mr Bob Herbert
Consultant

Members
Mr Ron Adams
Managing Director
Wespine Industries

Mr Peter Burn
Associate Director, Public Policy
Australian Industry Group

Mr Phillip Butler
Managing Director
Textor Pty Ltd

Mr Russell Cooper
Managing Director
Sita Australia Pty Ltd

Dr Paul Gee
Scientific Affairs Manager
Tasmanian Alkaloids

Mr Leo Hyde
R&D Director
DuPont Australia

Mr Ken Pettifer
Head, Manufacturing, Engineering
and Construction Division
Department of Industry, Tourism and Resources

Mr Ken Porter
Chief Executive Officer
QMI Solutions Ltd

Mr Peter Rea
Manager for Clusters
Department of State and Regional Development

Professor Alan Seale
Department of Chemical Engineering
Monash University

Dr Mark Smith
Chief Executive Officer, FibreGen
Carter Holt Harvey Ltd

Mr Alan Stevens
Vice President
Pacifica Group Technologies

Mr Robert Trenberth
Principal
Ernst and Young

Mr Ian Vaughan
Retired

Dr Barry Westlake
Chief Executive Officer and Managing Director
Geophysical Technology Ltd

Sector Coordinator
Mr Larry Little
CSIRO Manufacturing and
Infrastructure Technology

Mineral Resources Sector

Chair
Dr Ian Gould
Consultant

Members
Mr Alan Broome
Chairman
Austmine

Dr Megan Clark
VP Technology
BHP Billiton

Dr Bobby Danchin
Consultant
Anglo American Plc

Mr Eduard Eshuys
Consultant
Sons of Gwalia

Mr Brian Fisher
Executive Director
Australian Bureau of Agriculture and
Resource Economics (ABARE)

Mr John Hartwell
Head, Resources Division
Department of Industry, Tourism and Resources

Dr Joe Herbertson
Adjunct Professor of Chemical Engineering
University of Newcastle

Mr Mitch Hooke
Chief Executive
Minerals Council of Australia

Mr Ron Knapp
Executive Director
Australian Aluminium Council

Mr Don Larkin
Chief Executive Officer
AusIMM

Ms Elisabeth Lewis-Gray
Executive Director
Gekko Systems Pty Ltd

Mr Ian Nethercote
Chief Executive
Loy Yang Power Management Pty Ltd

Mr George Savell
Chairman
CRC for Landscape Evolution
and Mineral Exploration

Mr Deming Whitman
Chief Executive Officer
AMIRA International

Sector Coordinator
Dr Bart Follink
CSIRO Minerals

Flagship Advisory Committees

This list represents all members of Flagship Advisory Committees during 2004–05.

Energy Transformed

Chair
Mr Russell Higgins
Director, Australian Pipeline Trust
Chairman, CRC for Coal in
Sustainable Development

Members
Mr Mark O'Neil
Executive Director
Australian Coal Association

Mr Greg Bourne
Chairman
World Wildlife Fund Australia

Mr Drew Clarke
Head of Energy and Environment Division
Department of Industry, Tourism and Resources

Associate Professor Hugh Outhred
School of Electrical Engineering
and Telecommunications
University of New South Wales

Ms Margaret Beardow
Principal
Benchmark Economics

Mr Lauchlan McIntosh
Executive Officer
Australian Automobile Association

Internal member
Dr John Wright
Director
Energy Transformed Flagship

Food Futures

Chair
Mr Trevor Flugge
Chairman
Australian Wool Services Ltd

Members
Dr Geoffrey Annison
Head of Grain Technology and Quality Assurance
AWB Ltd

Ms Jo Davey
Manager Ingredients Business Development
Dairy Farmers

Dr Wayne Gerlach
Executive Director
Johnson and Johnson Research Pty Ltd

Dr Rod Kater
Past Chairman Stanbroke Pastoral
Company/Beef Industry Advisor

Mr Philip Laffer
Chief Winemaker/Director of Winemaking
Orlando Wyndham Group

Mr David Roberts
Scientific and Technical Director
Australian Food and Grocery Council

Mr Rob Robson
Chief Executive Officer
One Harvest

Dr Reuben Rose
General Manager
Livestock Production and Innovation
Meat and Livestock Australia

Mr Peter Schutz
Chief Executive
George Weston Technologies
(A Division of George Weston Foods Ltd)

Professor Beth Woods
Executive Director – R&D Strategy
Qld Department of Primary
Industry and Fisheries

Internal member
Dr Bruce Lee
Director
Food Futures Flagship

Light Metals

Chair
Mr Ron Knapp
Executive Director
Australian Aluminium Council

External members
Dr Ray Shaw
General Manager Technology Support
Rio Tinto Technical Services

Dr Ian Gould
Chairman
AJ Parker CRC

Mr Ian Vaughan
Industry Consultant

Dr Mark Taylor
Director – Light Metals Research Centre
University of Auckland
New Zealand

Internal members
Dr Rod Hill
Group Executive
Information, Manufacturing and Minerals

Dr Bart Follink
Chief
CSIRO Minerals

Mr Larry Little*
Chief
CSIRO Manufacturing and
Infrastructure Technology

Dr Raj Rajakumar
Director
Light Metals Flagship

Preventative Health

Chair
Professor Tony Burgess
Director
Ludwig Institute for Cancer Research

External members
Professor Bruce Armstrong
Head, School of Public Health
University of Sydney

Dr Alison Coutts
Director
Emerging Growth Capital Pty Ltd

Dr David Roberts
Scientific and Technical Director
Australian Food and Grocery Council

Professor Kerin O'Dea
Director
Menzies School of Health Research

Professor Felix Bochner
Department of Clinical and
Experimental Pharmacology
University of Adelaide

Internal members
Dr Michael Eyles
Group Executive
Agribusiness

Dr Alastair Robertson
Chief Executive Officer
Food Science Australia

Dr Graeme Woodrow
Chief
CSIRO Health Sciences and Nutrition

Dr Richard Head
Director
Preventative Health Flagship

Water for a Healthy Country

Chair
Mr Don Blackmore AO
Consultant

External members
Ms Leith Boully
Farmer and community engagement expert

Mr Ian Thompson
Executive Manager
Rural Policy and Innovation
Department of Agriculture, Fisheries and Forestry

Mr Jos Mensink
Director
State Water Strategy
WA Department of the Premier and Cabinet

Mr Roger Wickes
Executive Director
NRM Services Directorate
SA Department Water
Land and Biodiversity Conservation

Mr Greg Wilson
Deputy Secretary
Water Sector Group
Vic Dept of Primary Industries

Mr Peter Cosier
Deputy Director General
NSW Department of Infrastructure,
Planning and Natural Resources

Mr Adrian Jeffreys
Acting Executive Director
Environment and Resources Policy
Qld Department of Premier and Cabinet

Mr Warwick Watkins
Director General
Surveyor General
Registrar General
NSW Department of Lands

Professor Gary Jones
Chief Executive
CRC for Freshwater Ecology

Dr Chris Pigram
Deputy Chief Executive Officer
Geoscience Australia

Mr Ross Young
Executive Director
Water Services Association of Australia

Dr Trevor Powell*
Deputy Chief Executive Officer
Geoscience Australia

Internal members
Dr Steve Morton
Group Executive
Environment and Natural Resources

Mr Colin Creighton
Director
Water for a Healthy Country Flagship

Wealth from Oceans

Chair
Professor Russell Reichelt
Chief Executive Officer
CRC Reef Research Centre

Members
Dr Wendy Craik
Chief Executive Officer
Murray-Darling Basin Commission

Dr Katherine Woodthorpe
Executive Director, People and Innovation
Corporate Advisers Pty Ltd
Chair, CRC Antarctic Climate
and Ecosystems (ACE)

Dr Geoff Love
Chief Executive Officer
Bureau of Meteorology

Dr Conall O'Connell
Deputy Secretary
Department of Environment and Heritage

Mr Bob Stribling
Chief Risk Officer – Australia
National Australia Bank

Commodore Geoff Geraghty
Systems Commander
Royal Australian Navy

Internal members
Dr Steve Morton
Group Executive
Environment and Natural Resources

Mr Craig Roy
Director
Wealth from Oceans Flagship

* denotes member who stepped down during 2004–05

Appendix 6

Our research through Cooperative Research Centres (CRCs)

The Australian Government sponsored Cooperative Research Centres (CRCs) Program supports collaborative research between industry, Commonwealth and State Government agencies, universities and other research providers including CSIRO.

The Organisation makes a major contribution to the Program through its experience in collaborating with industry and in applying its research management skills. At 30 June 2005, CSIRO was a participant in 49 of the 69 active CRCs, and will be a participant in ten CRCs that commence operations on 1 July 2005.

During 2004–05, CSIRO's total in-kind and cash contribution to CRCs from its own resources was $64.1 million. When combined with funding from the Australian Government and external sources provided specifically for CRCs, the total expended during the financial year was $102.3 million.

Working in CRCs has enabled CSIRO to contribute to a range of exciting advances in research and development. Among those announced during 2004–05 were:

- The creation of a rice plant that expresses a toxin which only kills bloodworm, the only significant insect pest in the Australian rice industry, and completely protects rice plants from bloodworm attack.
- The development of an accurate and cost-effective 'visual guide' for the operational assessment of the amount of foliage in eucalypt plantations for two of Australia's key plantation species. The guide is now used routinely by the majority of Australia's hardwood plantation companies to predict plantation productivity and guide management.
- The development of new guidelines for integrated pest management in cotton farming. These guidelines have delivered benefits in the range of $300 million through reduced pesticide use, and associated reductions in pesticide levels in river systems.
- The discovery of widespread and rapid changes in the deep waters of the Southern Ocean. Water sinking near Antarctica is part of a global pattern of ocean currents known as the 'ocean conveyor belt'. The new measurements demonstrate that the Antarctic part of the conveyor belt is able to change significantly over a period as short as 10 years. Analyses are underway to determine whether similar changes are observed in other areas around Antarctica and whether the changes are more likely to be due to climate change or a long-term natural climate cycle.
- Modelling the hydrodynamics, nutrient flows and phytoplankton ecology of the Huon and D'Entrecasteaux Channel in Southern Tasmania. The models can be used to determine the contribution of fish farming and other sources to the nutrient and phytoplankton dynamics, and thus help managers to ensure an environmentally sustainable industry.
- Australian hardwood timbers are difficult to bond by commodity adhesives. This has led to the development of new processes that demonstrate improved bond strength of surface-engineered Spotted Gum in comparison to untreated wood. Further research is focusing on the most difficult species to bond, for example Sugar Gum and Blackbutt.

Full details of CRC activities are available through their annual reports and publications and from the Internet on https://www.crc.gov.au/

Cooperative Research Centres in which CSIRO was a participant, as at 30 June 2005:

Manufacturing Technology

CRC for Advanced Composite Structures II*	http://www.crc-acs.com.au/
CRC for Bioproducts	http://www.bioproducts.org.au/
CRC for Cast Metals Manufacturing[1]	http://www.cast.crc.org.au/
CRC for Construction Innovation	http://www.construction-innovation.info/
CRC for Functional Communication Surfaces	http://www.crc-fcs.com/
CRC for Intelligent Manufacturing Systems and Technologies II*	http://www.crcimst.com.au/
CRC for Polymers II[1]	http://www.crcp.com.au/
CRC for Welded Structures*	http://www.crcws.com.au/
CRC for Wood Innovations	http://www.crcwood.unimelb.edu.au/

Information and Communication Technology

Australian Telecommunications CRC	http://www.telecommunications.crc.org.au/
CRC for Enterprise Distributed Systems Technology*	http://www.dstc.edu.au/
CRC for Satellite Systems	http://www.crcss.csiro.au/

Mining and Energy

AJ Parker CRC for Hydrometallurgy II[1]	http://www.parkercentre.crc.org.au/
CRC for Clean Power from Lignite	http://www.cleanpower.com.au/
CRC for Coal in Sustainable Development	http://www.ccsd.biz/
CRC for Greenhouse Gas Technologies	http://www.co2crc.com.au/
CRC for Landscape Environments and Mineral Exploration	http://crcleme.org.au/
CRC for Predictive Mineral Discovery	http://www.pmdcrc.com.au/
CRC for Sustainable Resource Processing	http://www.csrp.com.au/

Agriculture and Rural Based Manufacturing

Australian Biosecurity CRC: Emerging Infectious Disease	http://www1.abcrc.org.au/
Australian Cotton CRC[1]	http://www.cotton.crc.org.au
Australian Sheep Industry CRC	http://www.sheepcrc.org.au/
CRC for Cattle and Beef Quality[2]	http://www.beef.crc.org.au/
CRC for Innovative Dairy Products	http://www.dairycrc.com/
CRC for Sugar Industry Innovation through Biotechnology	http://www.crcsugar.com/
CRC for Sustainable Aquaculture of Finfish	http://www.aquafincrc.com.au/
CRC for Sustainable Production Forestry[1]	http://www.forestry.crc.org.au/
CRC for Sustainable Rice Production[3]	http://www.ricecrc.org/
CRC for the Australian Poultry Industries[4]	http://www1.poultrycrc.com.au/
CRC for Tropical Plant Protection	http://www.tpp.uq.edu.au/
CRC for Viticulture II	http://www.crcv.com.au/

Environment

Bushfire CRC*	http://www.bushfirecrc.com/
CRC for Antarctic Climate and Ecosystems	http://www.acecrc.org.au/
CRC for Australian Weed Management	http://www.weeds.crc.org.au/
CRC for Biological Control of Pest Animals[1]	http://www.pestanimal.crc.org.au/
CRC for Catchment Hydrology II[1]	http://www.catchment.crc.org.au/
CRC for Coastal Zone, Estuary and Waterway Management	http://www.coastal.crc.org.au/
CRC for Freshwater Ecology II[1]	http://enterprise.canberra.edu.au/
CRC for Greenhouse Accounting	http://www.greenhouse.crc.org.au/
CRC for Irrigation Futures	http://www.crcirrigation.nisn.com.au/
CRC for Plant-based Management of Dryland Salinity	http://www1.crcsalinity.com/
CRC for the Great Barrier Reef World Heritage Area*	http://www.reef.crc.org.au/
CRC for Tropical Rainforest Ecology and Management II	http://www.rainforest-crc.jcu.edu.au/
CRC for Tropical Savannas Management	http://savanna.ntu.edu.au/
CRC for Water Quality and Treatment II	http://www.waterquality.crc.org.au/
Desert Knowledge CRC	http://www.desertknowledge.com.au/crc_main.html

Medical Science and Technology

CRC for Diagnostics	http://diagnosticscrc.org/
CRC for Vaccine Technology II	http://www.crc-vt.qimr.edu.au/
The Vision CRC[4]*	http://www.visioncrc.org/

[1] Following successful Round 9 renewal bid, current CRC ceases operations on 30 June 2005. New CRC will begin operations 1 July 2005. CSIRO will be a core participant in the new CRC.

[2] Following successful Round 9 renewal bid, current CRC ceases operations on 30 June 2005. New CRC will begin operations 1 July 2005. CSIRO will be a supporting participant in the new CRC.

[3] CRC ceases operations on 30 June 2005.

[4] CSIRO is a supporting participant only in this CRC.

* CRC is an Incorporated Joint Venture

Appendix 7

Consultancy services

CSIRO's policy on selection and engagement of consultants is based on the principles of:

- value for money
- open and effective competition
- ethics and fair dealing
- accountability and reporting
- national competitiveness and industry development
- support for other Australian Government policies.

These principles are included in CSIRO's consultancy procedures that are included in the CSIRO Procurement Policy.

CSIRO engages individuals and companies to provide professional services, taking account of the skills and resources required for the task, the skills available internally and the cost-effectiveness of these options.

CSIRO spent $2 018 040 (including GST) on consultancies during 2004–05. There were 60 new consultancies let during the year with the total whole of life value of $2 605 265 (including GST). The following table provides details of consultancy services let by CSIRO during 2004–05 with a contract value, GST inclusive, of $10 000 or more.

Registration number	Consultant	Nature and pur
2004/08/02	Marsh Consulting	Develop a Busir
2004/08/03	Linda Butler	Undertake an a Policy Project (I
2004/09/01	Dr Charles Ian Chessell	Provide independent a opportunities for Secur
2004/09/02	Four Scenes Pty Ltd	Provide a full plan and i natural resource manag
2004/10/01	SoftBiotech Consulting	Conduct independent c
2004/10/02	Dr Vic Knauf	Conduct independent c
2004/10/03	Jan Pen Consultancy in Biotechnology	Deliver reports on the potential scientific or in
2004/11/01	Altis Consulting Pty Ltd	Provide consultancy se
2004/11/02	Knowledge Teams International Pty Ltd	Facilitate sessions at the
2004/11/03	Convergence Design	Develop a detailed con exhibits and interpretiv
2004/12/01	Secura Monde International Ltd	Update the valuation a Devices Technology.
2004/12/02	Asquith, Trotman and Spence	Review three of the Inf (ICT) Centre's Themes the outcomes and cont recommendations resu
Registration number	**Consultant**	**Nature and purpose o**
2004/12/03	Runge Ltd	Undertake economic a software.
2004/12/05	Brondum	Review three of the Inf (ICT) Centre's Themes the outcomes.
2004/12/07	LEK Consulting Pty Ltd	Conduct a Post Implem Framework.
2004/12/09	ACIL Tasman Ltd	Provide independent a Kilometre Array (SKA)
2004/12/10	Hassall and Associates	Develop an evaluation (CSE) that meshes with for CSE staff to undert
2004/12/11	PriceWaterhouseCoopers	Identify and report risk

2004/12/12	Storey Marketing Services	Provide a business case on research and development opportunities to overcome strategic challenges in the grains industry.	$82 022	SS	OT
2005/01/01	Amgun Holdings Pty Ltd	Provide professional and expert advice to CSIRO Commercial Executive Committee.	$48 000	SS	EX
2005/01/02	SAP Australia	Conduct a proof-of-concept of the applicability of the SAP Enterprise Platform within CSIRO.	$492 916	PA	OT
2005/01/03	Colmar Brunton Social Research	Assisting in conducting a national brand positioning and performance study.	$118 455	SS	OT
2005/02/01	Frost and Sullivan	Provide a global market overview of the image guided and robot assisted surgery market.	$27 716	IS	PM

Registration number	Consultant	Nature and purpose of consultancy	Estimated total life cost of consultancy (GST inclusive)	Reason for consultancy	Procurement method
2005/03/01	Centre for International Economics	Provide an independent cost-benefit analysis of Mapping and Monitoring (Mathematical and Information Sciences) technologies.	$22 000	IS	EX
2005/03/02	A R Liiband and Associates Pty Ltd	Develop an understanding of Organisational Development (OD), and present the OD plan to management.	$13 445	PA, SS	PM
2005/03/05	Minter Ellison	Provide legal advice on proformas on the terms and conditions of request for tender (RFT) documentation and IT contracts.	$14 000	SS	PM
2005/03/06	OTBC Pty Ltd	Develop a comprehensive business plan for the Flagship Oversight Committee.	$131 000	SS	EX
2005/03/08	National ICT Australia (NICTA)	Provide expert advice in science/project assessment and strategic direction for the ICT centre.	$12 469	IS	EX
2005/03/10	KPMG	Review CSIRO's existing risk management and recommend an enterprise based approach.	$48 950	IS	PM
2005/03/11	Integrity Management Consultants Pty Ltd	Conduct a Post Implementation Review of the One IT pilot and report results.	$15 969	IS	EX

2005/04/01	Fountain Close Pty Ltd	Provide technology roadmaps for the CeNTIE project, and evaluate progress against the Comex commercialisation plan.	$48 000	SS	EX
2005/04/02	CyberTrust Pty Ltd	Provide CSIRO access to an industry standard IT Security Architecture reference model.	$52 495	SS	OT
2005/04/04	Centuris Consulting	Contribute to the development of documentation to support a capital raising program for a life science start-up company and assist in the presentation of those materials to potential investors.	$15 465	SS	EX
2005/04/05	Galexia	Provide a market analysis into privacy preserving analytics and an IT based approach in preserving privacy and security.	$133 690	IS	OT

Registration number	Consultant	Nature and purpose of consultancy	Estimated total life cost of consultancy (GST inclusive)	Reason for consultancy	Procurement method
2005/04/07	GHD Pty Ltd	Conduct a physical review of security across CSIRO.	$58 300	IS	OT
2005/05/11	Niche Consulting Services Pty Ltd	Contribute to the Expert Review Committee assessing CSIRO Minerals Divisional research outputs.	$11 550	SS	EX
2005/05/12	Dr Julie Anne White	Provide advice on a proposed investment in a new technology company to develop and commercialise gene delivery technology.	$33 000	IS	EX
2005/05/13	Dr Chris Beare	Provide independent advice to the CSIRO Commercial Executive Committee as part of CSIRO's governance process.	$80 000	SS	EX
2005/06/01	Argyle Corporate Advisers	Prepare a status review highlighting achievements of the Queensland Centre for Advanced Technologies (QCAT), and its benefits to Queensland and Australia.	$32 963	IS, SS	EX
2005/06/02	STEM Partnership (Strategic Technology Evaluation and Management)	Conduct an impact analysis of proposed research for the Predictive Mineral Discovery Cooperative Research Centre (PMDCRC) in the years 2005–08.	$18 700	IS, SS	EX

2005/06/03	LEK Consulting Pty Ltd	Provide expert guidance and advice in relation to the preparation of the Agribusiness Strategic Plan.	$15 000	PA	PM
2005/06/04	PriceWaterhouseCoopers	Develop a strategic plan for Risk Assessment and Audit for the next two years and beyond.	$20 262	IS	ST
2005/06/05	Environmetrics Pty Ltd	Review and recommend ways to improve upon any underutilised areas within the CSIRO Discovery public complex.	$17 595	IS	OT
Registration number	**Consultant**	**Nature and purpose of consultancy**	**Estimated total life cost of consultancy (GST inclusive)**	**Reason for consultancy**	**Procurement method**
2005/06/06	Protiviti Pty Ltd	Provide a Business Plan for the ongoing development of the CSIRO Procurement Unit.	$49 500	PA	RQ
2005/06/07	Belinda Everingham, Peter Everingham and Angus Taylor	Provide an analysis of the flagship themes contributing to the $A3 billion contribution target of Food Futures by 2013.	$49 500	IS	OT
Total value of consultancies below $10 000					$59 343
Total value of consultancies let during 2004–05					$2 605 265

Notes to Table

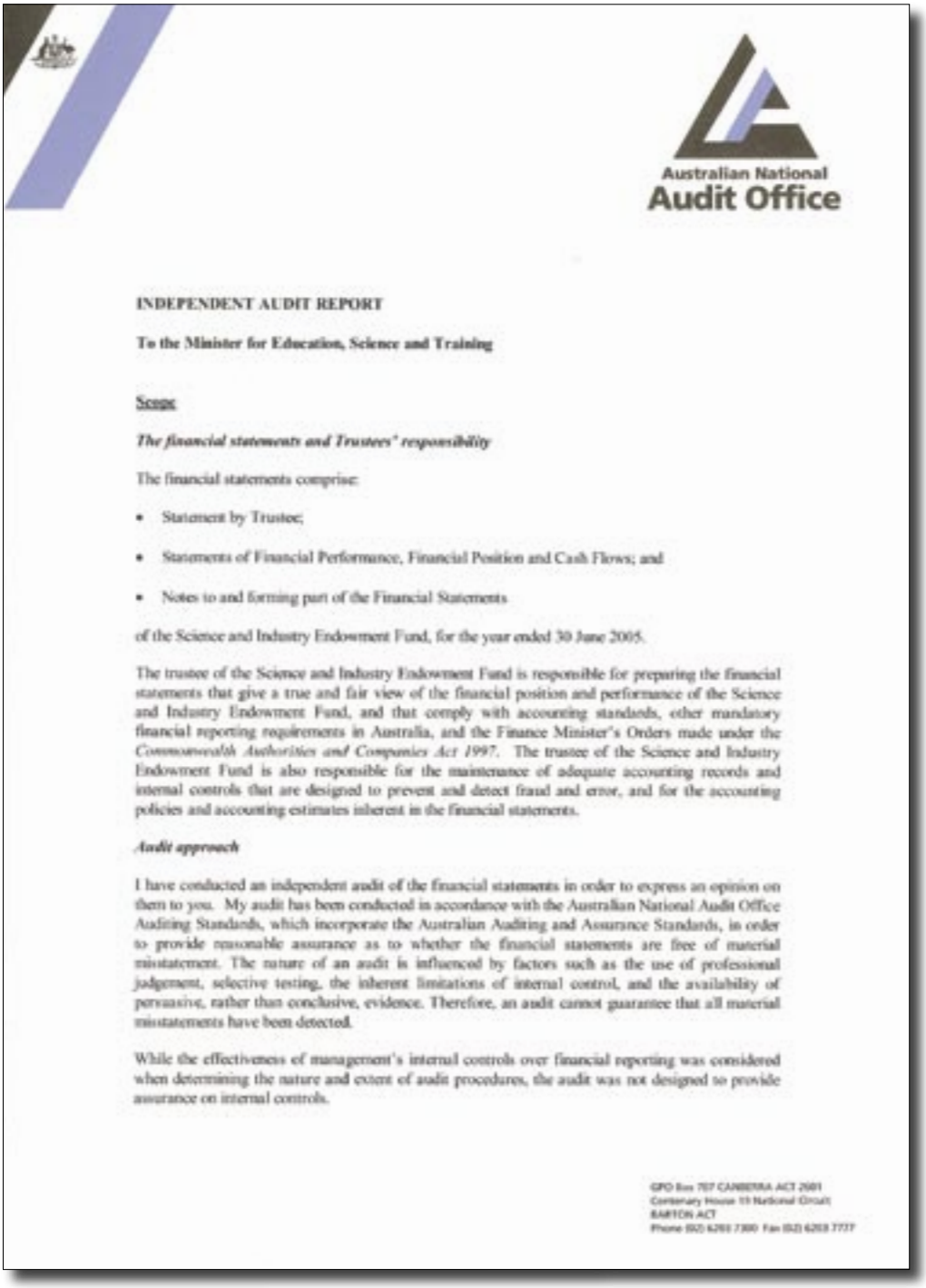
Reason Code	Reason for Consultancy
IS	Need for independent study/evaluation
PA	Need for professional assistance to manage and facilitate change and its consequence
SS	Specialist skills were not otherwise available

Procurement Code	Procurement Method
PM	An existing panel member – this category includes standing offers, common use arrangements and approved supplier panels.

OT	Tenders sought from the market place (Request for Proposal, Request for Tender, Expressions of Interest)
ST	Tenders being sought from suppliers who have prequalified through some form of previous competitive process.
RQ	Purchasing thresholds consistent with CSIRO's minimal standards.
EX	Exemption arrangement such as sole supplier, pre-eminent expertise or urgency and/or practicality

Appendix 8

Science and Industry Endowment Fund Report



Australian National
Audit Office

INDEPENDENT AUDIT REPORT

To the Minister for Education, Science and Training

Scope

The financial statements and Trustees' responsibility

The financial statements comprise:

- Statement by Trustee;
- Statements of Financial Performance, Financial Position and Cash Flows; and
- Notes to and forming part of the Financial Statements

of the Science and Industry Endowment Fund, for the year ended 30 June 2005.

The trustee of the Science and Industry Endowment Fund is responsible for preparing the financial statements that give a true and fair view of the financial position and performance of the Science and Industry Endowment Fund, and that comply with accounting standards, other mandatory financial reporting requirements in Australia, and the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*. The trustee of the Science and Industry Endowment Fund is also responsible for the maintenance of adequate accounting records and internal controls that are designed to prevent and detect fraud and error, and for the accounting policies and accounting estimates inherent in the financial statements.

Audit approach

I have conducted an independent audit of the financial statements in order to express an opinion on them to you. My audit has been conducted in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing and Assurance Standards, in order to provide reasonable assurance as to whether the financial statements are free of material misstatement. The nature of an audit is influenced by factors such as the use of professional judgement, selective testing, the inherent limitations of internal control, and the availability of persuasive, rather than conclusive, evidence. Therefore, an audit cannot guarantee that all material misstatements have been detected.

While the effectiveness of management's internal controls over financial reporting was considered when determining the nature and extent of audit procedures, the audit was not designed to provide assurance on internal controls.

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BARTON ACT
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I have performed procedures to assess whether, in all material respects, the financial statements present fairly, in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*, including accounting standards and other mandatory financial reporting requirements in Australia, a view which is consistent with my understanding of the Science and Industry Endowment Fund's financial position, and of its performance as represented by the statements of financial performance and cash flows.

The audit opinion is formed on the basis of these procedures, which included:

- examining, on a test basis, information to provide evidence supporting the amounts and disclosures in the financial statements; and
- assessing the appropriateness of the accounting policies and disclosures used, and the reasonableness of significant accounting estimates made by the trustee of the Science and Industry Endowment Fund.

Independence

In conducting the audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate the ethical requirements of the Australian accounting profession.

Audit Opinion

In my opinion, the financial statements of the Science and Industry Endowment Fund:

(a) have been prepared in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*; and
(b) give a true and fair view of the Science and Industry Endowment Fund's financial position as at 30 June 2005 and of its performance and cash flows for the year then ended, in accordance with:
  (i) the matters required by the Finance Minister's Orders; and
  (ii) applicable accounting standards and other mandatory financial reporting requirements in Australia.

Australian National Audit Office

Rebecca Reilly
Executive Director

Delegate of the Auditor-General

Canberra
22 August 2005

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT BY TRUSTEE

In our opinion, the attached financial statements for the year ended 30 June 2005 have been prepared based on properly maintained financial records and give a true and fair view of the matters required by the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the fund will be able to pay its debts as and when they become due and payable.

This statement is made in accordance with the resolution of the Board Members.

Dr Geoff G Garrett
Chief Executive
19 August 2005

Mr Mike Whelan
Chief Finance Officer and Executive Director
Corporate Operations
19 August 2005

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF FINANCIAL PERFORMANCE
For the period ended 30 June 2005

	Notes	2005 $	2004 $
Revenues from ordinary activities			
Interest		28 009	26 693
In-kind contribution – CSIRO	4	3 322	4 220
Total revenues from ordinary activities		**31 331**	**30 913**
Expenses from ordinary activities			
Scientific research grants		16 822	24 655
Bank fees		32	25
Advertising		–	1 231
Accounting, secretarial and audit	4	3 322	4 220
Total expenses from ordinary activities		**20 176**	**30 131**
Net operating surplus from ordinary activities	7	**11 155**	**782**
Net surplus		**11 155**	**782**
Total changes in equity other than those resulting from transactions with owners as owners		**11 155**	**782**

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF FINANCIAL POSITION
As at 30 June 2005

	Notes	2005 $	2004 $
ASSETS			
Financial assets			
Cash	5	469 238	482 759
Receivables	6	26 718	2 042
Total assets		**495 956**	**484 801**
LIABILITIES			
Payables			
Awards		–	–
Total liabilities		–	–
NET ASSETS		**495 956**	**484 801**
EQUITY			
Contributed equity	7	200 000	200 000
Accumulated surpluses	7	295 956	284 801
Total equity		**495 956**	**484 801**
Current assets		**495 956**	**484 801**
Non-current assets		–	–
Current liabilities		–	–
Non-current liabilities		–	–

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF CASH FLOWS
For the period ended 30 June 2005

	Notes	2005 $	2004 $
OPERATING ACTIVITIES			
Cash received			
Interest		3 334	26 295
Total cash received		**3 334**	**26 295**
Cash used			
Grants		16 822	24 655
Advertising		–	1 231
Other		32	25
Total cash used		**16 854**	**25 911**
Net cash from/(used by) operating activities	8	**(13 520)**	**384**
Net increase/(decrease) in cash held		**(13 520)**	384
Cash at the beginning of the reporting period		482 759	482 375
Cash at the end of the reporting period		**469 239**	**482 759**

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
Notes to and forming part of the financial statements for the period ended 30th June 2005

Note 1 Summary of Significant Accounting Policies

1.1 Basis of accounting

The financial statements are required by section 10 of the *Science and Industry Endowment Act 1926* and are a general purpose financial report.

The statements are prepared in accordance with:

- Finance Minister's Orders (being the Commonwealth Authorities and Companies (Financial Statements for the periods ending on or after 30 June 2005) Orders)
- Australian Accounting Standards and Accounting Interpretations issued by Australian Accounting Standards Board
- Urgent Issues Group Abstracts.

The financial statements have been prepared on an accrual basis and are in accordance with the historical cost convention. No allowance is made for the effect of changing prices on the results or the financial position.

Assets and liabilities are recognised in the Statement of Financial Position when, and only when, it is probable that future economic benefits will flow and the amounts of the assets or liabilities can be reliably measured.

Revenues and expenses are recognised in the Statement of Financial Performance when, and only when, the flow or consumption or loss of economic benefits has occurred and can be reliably measured.

1.2 Adoption of Australian Equivalents to International Financial Reporting Standards from 2005–06

The Australian Accounting Standards Board has issued replacement Australian Accounting Standards to apply from 2005–06. The new standards are the Australian Equivalents to International Financial Reporting Standards (AEIFRS) which are issued by the International Accounting Standards Board. The new standards cannot be adopted early. The standards being replaced are to be withdrawn with effect from 2005–06, but continue to apply in the meantime, including reporting periods on 30 June 2005.

AEIFRS contains certain additional provisions which will apply to not-for-profit entities, including SIEF. Some of these provisions are in conflict with the International Financial Reporting Standards (IFRS) and therefore SIEF will only be able to assert that the financial report has been prepared in accordance with Australian Accounting Standards.

Accounting Standard AASB 1047 Disclosing the Impact of Adopting Australian Equivalents to International Financial Reporting Standards requires that the financial report for 2004–05 disclose:

- an explanation of how the transition to AEIFRS is being managed
- narrative explanations of the key policy differences arising from the adoption of AEIFRS

- any known or reliably estimable information about the impacts on the financial report had it been prepared using AEIFRS
- if the impacts referred to above are not known or reliably estimable, a statement to that effect.

The purpose of this Note is to make these disclosures.

The Trustee believes that the first financial report prepared under AEIFRS ie 30 June 2006, will be prepared on the basis that SIEF will be a first-time adopter under AASB *1 First-time Adoption of Australian Equivalents to International Financial Reporting Standards.* Changes in accounting policies under AEIFRS are applied respectively, ie as if the new policy had always applied except in relation to exemptions available and prohibitions under AASB 1. This means that an AEIFRS compliant balance sheet has been prepared as at 1 July 2004. This will enable the 2005–06 financial statements to report comparatives under AEIFRS.

A first-time adopter of AEIFRS may elect to use exemptions under paragraphs 13 to 25E. When developing the accounting policies applicable to the preparation of the 1 July opening balance sheet, no exemptions were applied by this Fund.

Management's review of the quantitative impacts of AEIFRS represents the best estimates of the impacts of the changes as at the reporting date. The actual effects of the impacts of AEIFRS may differ from these estimates due to:

- continuing review of the impacts of AEIFRS on the Organisation's operations
- potential amendments to AEIFRS and AEIFRS Interpretations
- emerging interpretations as to accepted practice in the application of AEIFRS and AEIFRS Interpretations.

The Trustee is tasked with the oversight of the transition to and implementation of the Australian Equivalents to IFRS. A project team has been established to review and identify IAS standards which are applicable to SIEF and contain differences from the current AASB and may impact on SIEF's financial statements.

An analysis of the differences between the current Australian Standards and the new international standards was conducted and of the current Australian Equivalents of IFRS which are applicable to SIEF, all are already substantially similar due to previous harmonisation work of the AASB. Therefore, the introduction of AEIFRS standards on 1 July 2005 will not have any material impact on the accounting policies or financial statements of SIEF. Since there has been no impact identified and no movement in equity, the statement of reconciliation of equity is not necessary.

1.3 Cash

For the purpose of the Statement of Cash Flows, cash includes cash at bank and deposits at call. They are readily convertible to cash.

1.4 Revenue

Interest revenue is recognised on a proportional basis taking into account the interest rates applicable to the financial assets.

1.5 Resources received free of charge

Services received free of charge are recognised as revenue when and only when a fair value can be reliably determined and the services would have been purchased if they had not been donated. Use of those resources is recognised as an expense.

1.6 Financial instruments

Accounting policies for financial instruments are stated in Note 9.

Note 2 Contingencies

No contingent liabilities and commitments exist as at 30 June 2005.

Note 3 Principal Activity

The Fund was established under the *Science and Industry Endowment Act 1926* with the Trustee of the Fund being the CSIRO Chief Executive. An appropriation of 100 000 pounds was received at the time the fund was established. The funds were invested and have subsequently earned interest over time.

The principal activity of the Science and Industry Endowment Fund is to provide assistance to persons engaged in scientific research and in the training of students in scientific research.

	2005 $	2004 $
Note 4 Resources Received Free of Charge		
Estimated value of resources provided free of charge by CSIRO are as follows:		
– accounting and secretarial services	2 122	3 020
– auditors remuneration paid and payable to the Auditor-General for auditing the financial statements of SIEF	1 200	1 200
	3 322	**4 220**
Note 5 Cash (current)		
Cash at bank	2 723	(10 620)
Deposits – at call	466 515	493 379
	469 238	**482 759**
Note 6 Receivables (current)		
Interest receivable	**26 718**	**2 042**
Gross receivables are aged as follows:		
Not overdue	**26 718**	**2 042**

Note 7 Equity – Movement Summary

Description	Contributed Equity		Accumulated Results		Total Equity	
	2005 $	2004 $	2005 $	2004 $	2005 $	2004 $
Balance as at 1 July	200 000	200 000	284 801	284 019	484 801	484 019
Net surplus	–	–	11 155	782	11 155	782
Balance as at 30 June	**200 000**	**200 000**	**295 956**	**284 801**	**495 956**	**484 801**

Note 8 Cash Flow Reconciliation

	2005 $	2004 $
Reconciliation of operating surplus to net cash from/(used by) operating activities:		
Operating surplus/(deficit)	11 155	782
Changes in assets and liabilities		
(Increase)/decrease in receivables	(24 675)	(398)
Increase/(decrease) in payables	-	-
Net cash from/(used by) operating activities	**(13 520)**	**384**

Note 9 Financial Instruments

Financial Assets		
Cash at bank and deposits at call.	Cash at bank and deposits at call are recognised at their nominal amounts. Interest is credited to revenue as it accrues.	Cash at bank and deposits at call represent surplus cash available for awards.

The net fair value of cash and deposits at call approximate their carrying amounts. Interest Rate Risk – Average rate of return on cash and short term deposits was 5.88% (2004 5.41%).

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Acronyms

AAHL	Australian Animal Health Laboratory
ABARE	Australian Bureau of Agriculture and Resource Economics
ACARP	Australian Coal Association Research Program
ACIAR	Australian Centre for International Agricultural Research
ADF	Australian Defence Force
ADJR Act	*Administrative Decisions (Judicial Review) Act 1977*
AGO	Australian Greenhouse Office
AIMS	Australian Institute of Marine Science
AMSA	Australian Maritime Safety Authority
ANAO	Australian National Audit Office
ANSTO	Australian Nuclear Science and Technology Organisation
APGs	Annual Performance Goals
ARPANSA	Australian Radiation and Nuclear Safety Agency
ASEAN	Association of South East Asian Nations
ATLR	Average Time Lost Rate
ATNF	Australia Telescope National Facility
AWI	Australian Wool Innovation
BCC	Board Commercial Committee
BHPBIO	BHP Billiton Iron Ore
BPPS	Brand Positioning and Performance Study
CAC Act	*Commonwealth Authorities and Companies Act 1997*
CDS	Commonwealth Disability Strategy
CenDEP	Centre for Distributed Energy and Power
CRC	Cooperative Research Centre
CREST	CREativity in Science and Technology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSIROSEC	CSIRO Science Education Centre
CVS	Customer Value Survey
DAF&F	Department of Agriculture, Fisheries and Forestry
DCC	Drained Cathode Cells
DCITA	Department of Communications, Information Technology and the Arts
DDA Act	*Disability Discrimination Act 1992*
DEST	Department of Education, Science and Training
DSTO	Defence Science and Technology Organisation
EEO	Equal Employment Opportunities
EMC	Executive Management Council
EMS	Environmental Management System
EPA	Environment Protection Authority
ERI	Environmental Resource Indicator
ESA	European Space Agency
ESD	Ecologically Sustainable Development
ESI	Emerging Science Initiative
ESOC	Emerging Science Oversight Committee
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
EU	European Union
FASTS	Federation of Australian Scientific and Technological Societies
FOI Act	*Freedom of Information Act 1982*
FWPRDC	Forest and Wood Products R&D Corporation
GBRMPA	Great Barrier Reef Marine Park Authority
GEF	Global Environment Facility
GMOs	Genetically Modified Organisms

GRA	Global Research Alliance
GRDC	Grains Research and Development Corporation
GPS	Global Positioning System
HSEACW	Health, Safety and Environment Assessment and Control of Work
ICT	Information and Communication Technologies
IEA	International Energy Agency
IPHE	International Partnership for the Hydrogen Economy
ISI	Institute for Scientific Information
ISO	International Standards Organisation
LTIFR	Lost Time Incident Frequency Rate
MAUS	Mobile Automated Scanner
mecu	Members and Education Credit Union
MLA	Meat and Livestock Australia
MOU	Memorandum of Understanding
MTFR	Medical Treatment Frequency Rate
MVS	Murata Vortex Spinning
MXDPs	Major Cross-Divisional Programs
NASA	National Aeronautic Space Administration
NCRIS	National Collaborative Research Infrastructure Strategy
NEPM	National Environmental Protection Measures
NIRS	Near Infrared Reflectance Spectroscopy
NIS	National Innovation System
NOAA	National Oceanic and Atmospheric Administration
NPI	National Pollutants Inventory
NPV	Net Present Value
NRM	Natural Resource Management
NRP	National Research Priorities
NSW	New South Wales
NTDIPE	Northern Territory Department of Infrastructure Planning and Environment
OH&S	Occupational Health and Safety
OHS&E	Occupational Health Safety and Environment
PIN	Provisional Improvement Notice
PIRI	Pesticide Impact Rating Index
PMF	Performance Management Framework
PPF	Program Performance Framework
PPI	Positive Performance Indicator
PMI	Program Management Improvement
PW	Project Workflow
QDPIF	Queensland Department of Primary Industries and Fisheries
RA&A	Risk Assessment and Audit
RAN	Royal Australian Navy
RDC	Research and Development Corporation
REPP	Research Evaluation and Policy Project
RTA	Roads and Traffic Authority
RQF	Research Quality Framework
SAC	Sector Advisory Council
SBT	Southern Bluefin Tuna
SIEF	Science and Industry Endowment Fund
SIP	Science Investment Process
SIR Act	*Science and Industry Research Act 1949*
SKA	Square Kilometre Array
SME	Small and Medium sized Enterprise
SQUIDS	Superconducting Quantum Interference Devices
UST	Underground Storage Tank
WAERA	Western Australian Energy Research Alliance

Glossary

Capabilities

- Skills, relationships and assets are the three components of capabilities. A capability is an integration of these components that results in some particularly useful functionality – a capability is more than the simple sum of the underpinning scientific/technical and other skills.

Customer value survey

- An average of approximately 150 customers are surveyed quarterly. CSIRO's Score is given on a ten point scale. [1 = very poor; 10 = excellent]. The comparative score is calculated as CSIRO's score divided by the score our customer gives to an alternative provider, multiplied by 100. For example, 7.81 / 7.65 * 100 = 102. Thus a comparative score greater than 100 indicates that the customer rates CSIRO more highly than their main alternative R&D provider on the attribute in question.

Intellectual Property

- **Current Impact Index (CII):** This is the number of times a company's previous five years of patents are cited in the current year, relative to all patents in the US patent system. Indicates patent portfolio quality. A value of 1.0 represents average citation frequency; a value of 2.0 represents twice average citation frequency; and 0.25 represents 25 per cent of average citation frequency. (CII's vary by technology. For example, they are high in biotechnology and pharmaceuticals, and low in textiles).
- **Granted Patents**: Once a patent application has been examined and satisfies various patentability criteria it becomes a granted patent. It remains a granted patent until the end of the patent period (normally 20 years) provided renewal fees are paid.
- **Inventions**: This is the number of inventions where one or more patent/applications are current. Accordingly an invention might include a granted patent that is near the end of its life (eg 20 years), or it might include a provisional patent application that has only recently been filed. Further, one invention might relate to a patent application in one country only, or it might relate to over 20 patents/applications in different countries covering the one invention.
- **Live Patent Cases**: A live patent case is where either a patent application or a granted patent exists. It does not include cases that have lapsed, expired or been withdrawn. Applications may include provisional applications, PCT applications, and applications pending in Australia or foreign jurisdictions.
- **New inventions**: This is the number of new inventions where an application (normally an Australian provisional application) is filed for the first time to protect that invention. A major implication of filing that provisional application is that it provides the applicant with an internationally recognised priority date. It should be noted that a small percentage of CSIRO's new inventions are filed as US provisional applications.
- **PCT Applications**: International PCT (Patent Cooperation Treaty) applications are a 'temporary' phase in any international patenting process and these have a life span of 18 months. This type of application is very common in major international corporations and is used by CSIRO when it considers its invention may have wide commercial application. In view of the 18-month time span, it is reasonable to approximate that 2/3 of the reported number were filed in the previous 12 month period.

Outputs and Outcomes

- Outputs are products or services provided to individuals or organisations external to CSIRO. Outcomes are the impacts that outputs have on individuals or organisations external to CSIRO. Outcomes encompass economic, social and environmental benefits and may include evidence of changes in awareness, adoption and behaviour that have led (or clearly will lead) to such benefits.

Program Performance Framework (PPF)

- The PPF incorporates a set of tools developed to promote robust business planning, good target setting and strong accountability in the implementation and performance of major programs of work. CSIRO's research programs are organised into **Themes, Streams and Projects**. This classification method has been adopted across the Organisation to enable a greater ability to ensure the alignment of individual projects with high-level strategic goals and to monitor progress toward these goals.
- **Program:** A Program focuses significant CSIRO effort and resources on a clearly defined mission (eg The Preventative Health Flagship Program's mission is *to improve the health and well-being of Australians and save $2 billion in annual direct health costs by 2020 through the prevention and early detection of chronic diseases*).
- **Theme / Theme Goal**: A Theme refers to a major area of research that is directed towards a clear and measurable strategic goal which is a key part of the Program's mission (eg the Goal for the Colorectal Cancer Theme in Preventative Health is to reduce colorectal cancer incidence by 10 per cent and increase 5-year survival from around 63 per cent to 70 per cent by 2020 through prevention and early diagnosis).
- **Stream**: A Stream represents a collection of related projects that address a particular aspect of the Theme Goal. (eg The Colorectal Cancer Theme Goal is pursued through three streams of activity: Developing protective foods; Developing novel diagnostics; and Developing policies and guidelines). Each Stream has an explicit medium-term Stream Objective supported by specific annual performance goals.
- **Project:** A project is the core unit of research activity and budgetary control.

Publications

- **Books or Chapters**: Monograph, complete or a chapter, usually published by a commercial publisher.
- **Client Reports**: Report produced under collaborative or contractual arrangements. Includes individually authored chapters as well as whole reports. Often not publicly released.
- **Conference Papers**: Published conference paper, abstract or edited proceedings.
- **Journal Articles**: Journal article or other item published as part of a journal eg editorial, book review.
- **Technical Reports**: Includes individually authored chapters as well as whole reports. Usually publicly released.

Students Supervised and Sponsored

- Students are deemed to be **sponsored** if they receive a full or partial scholarship paid from CSIRO funds to pursue a research project leading to a PhD or Honours/Masters degree. This excludes CSIRO employees, whose study expenses are considered to be 'training and development'.
- Students are deemed to be **supervised** if they have a CSIRO staff member appointed officially by the University as the supervisor for their research project. Normally, CSIRO staff are joint supervisors in conjunction with a university academic.
- Sponsorship and supervision are separate issues. A student may be both sponsored and supervised; or just sponsored; or just supervised. A supervised student can be a CSIRO (or CRC) employee and supervised.

ROES™

A new mining system incorporating remote ore extraction.

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CSIRO – the Commonwealth Scientific and Industrial Research Organisation – is one of the largest and most diverse scientific organisations in the world. It has 6 576 staff located across 57 sites throughout Australia and overseas.

CSIRO is an independent statutory authority constituted and operating under the provisions of the *Science and Industry Research Act 1949* and the *Commonwealth Authorities and Companies Act 1997.*

Our purpose states:

By igniting the creative spirit of our people, we deliver great science and innovative solutions for industry, society and the environment.

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