CSIRO

Annual Report 2003-04

www.csiro.au

Letter of transmittal

The Hon Peter McGauran MP
Minister for Science
Parliament House
CANBERRA ACT 2600

We have pleasure in submitting to you, for presentation to Parliament, the fifty-sixth 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 2002.*

The report has been approved for presentation to you, signed this 17th day of August 2004 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 2004

Contents

	Page
Letter of transmittal	i
Contents	ii
Our purpose	1
Who we are	1
What we do	1
Our customers	1
Foreword by the Chairman and Chief Executive	2

Section 1: Performance

The year in summary – and looking ahead	6
Some scientific achievements	10
The year in review: Performance against strategic objectives	18
Focusing our science investment	18
Delivering world-class science	21
Partnering for community impact	25
Serving as a catalyst for industry innovation	28
Building One-CSIRO capability and commitment	32
Securing a financial foundation for growth	35
Delivering impact from our science	38
CSIRO's output and outcomes framework	38
■ Information technology, manufacturing and services	45
■ Sustainable minerals and energy	53
■ Environment and natural resources	60
■ Agribusiness and health	71
Education and outreach	79
Awards and honours	81

Contents

Section 2: Governance

Enabling legislation, functions and powers	92
Responsible Minister	92
Governance	93
Service charter	99
CSIRO policies	101
Administrative law	102
Occupational health and safety	103
Commonwealth disability strategy reporting	108
Environmental management, energy and heritage reporting	109

Section 3: People

CSIRO Board	116
Organisational chart	117
Staff demographics	118
CSIRO locations	119

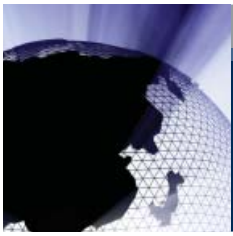
Section 4: Financial Statements 121

Section 5: Appendixes

Sector Advisory Councils	182
Cooperative Research Centres	187
Science and Industry Endowment Fund Report	190

Indexes

■ Acronyms	200
■ Glossary	202
■ Index	205
■ Compliance index	215



Our purpose

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

People are at the centre of everything we do. We work to create the right environment to amplify our talent. We take a 'Team Australia' approach.

It is not enough just to have a great idea; we must have impact, solve problems and make a difference.

We take a triple-bottom-line focus in our activities, balancing between commerce and the public good.

Great science is our foundation. Getting it out there is our aim.

Who we are

CSIRO is an independent statutory authority constituted by the *Science and Industry Research Act 1949*. It is a unique research organisation which because of its breadth, diversity and global credibility is able to deliver focused and strategic research. It addresses significant national and global issues and priorities.

What we do

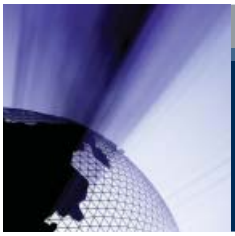
CSIRO carries out scientific research for the purpose of assisting Australian industry, furthering the interests of the Australian community, and contributing to the achievement of national objectives.

CSIRO also actively encourages the application or utilisation of the results of its research in industry and communities, both nationally and globally.

Our customers

Our customers are essential to our success. They include:

- Australian business and industry
- Commonwealth and State governments and their agencies
- the Australian community
- the International community including developing nations.



Foreword by the Chairman and Chief Executive

Catherine Livingstone, Chairman

Geoff Garrett, Chief Executive

This year's Annual Report reflects an organisation firmly positioned to continue its central role in further improving the nation's technological, environmental, economic and social well-being, with the strong support of the Government and the community.

A strong financial foundation for growth

Two related announcements in May 2004 signalled a watershed in CSIRO's history. The Prime Minister's announcement extending the Government's 2001 research and innovation program, *Backing Australia's Ability – Building Our Future Through Science and Innovation,* included additional funding of $305 million over the next seven years to enable CSIRO to accelerate the National Research Flagships Program and ensure that the Flagships deliver substantial impact as soon as possible. This was closely followed by the 2004 Federal Budget where CSIRO's three-year base funding arrangement was confirmed, with a record $1.7 billion appropriation being provided for the 2004–07 triennium.

These funding announcements, together with the provision of $20 million in the 2003 Federal Budget to stimulate CSIRO's Flagship Initiative, reflect the Government's strong support for CSIRO and its strategic direction. The Organisation's solid financial performance over this past year – total external revenue growth of 7.6 per cent to $320 million, very close to budget, a 60 per cent increase in intellectual property revenues, and a $25 million 'bottom line' improvement over that budgetted – augurs well for the future.

The confirmation of three-year funding provides the essential certainty and continuity of funding to enable CSIRO to plan and maintain its platform of world-class, core scientific capabilities which are fundamental to being able to develop and deliver the Flagships. Moreover, it will enable CSIRO to deliver many other large-scale, multidisciplinary research contributions aligned with the Government's National Research Priorities. It will provide the flexibility to underpin Australia's capacity to respond to changing research agendas, ensure quality support for those National Research Facilities and Reference Collections for which CSIRO is responsible, and provide a base for stable, strategic and effective partnering and co-investment.

CSIRO's differentiated role and contribution

This support for CSIRO follows considerable work over several years to develop a clear strategy to demonstrate what CSIRO was doing and what it is capable of achieving for the country. We needed to demonstrate that CSIRO was an 'investable' proposition. This led us to think hard about the need for a more clearly defined role for CSIRO in the National Innovation

System (NIS) and the need for a more focused organisational strategy.

The development of CSIRO's overall strategy, documented comprehensively in the 2003–07 Strategic Plan and released in August 2003, was the culmination of a vigorous consultative process with a number of key stakeholders and was a joint effort of management, staff and the Board. Central to the strategy was our thinking around CSIRO's essential and differentiated role in the NIS. This role centres on carrying out focused and relevant scientific research and facilitating the application of research results at a scale which maximises the opportunities to deliver genuine benefits and real impact for our clients and the nation. This role is possible because of the Organisation's excellent science, national reach, breadth of skills, and capacity and commitment to collaborate.

In fact this same central role for CSIRO in the NIS emerged in parallel in several Reviews undertaken by the Government during 2003–04. The Board reviewed and confirmed the direction of the Strategic Plan in April 2004 and noted that considerable progress has already been achieved.

Major challenges, ambitious goals

The thinking that followed the review of our strategy led to the concept of the Flagships as an effective and visible way of leveraging CSIRO's and Australia's excellent science into a number of large-scale, multidisciplinary programs. These Flagships would attract and involve many partners in a true 'Team Australia' approach to address specific challenges and opportunities facing Australia. In this important context of partnering, the new funding will provide CSIRO with the financial capacity to assist our partners in other institutions and universities to join with us in contributing to the Flagships through joint programs, studentships and postdoctoral and visiting fellowships.

The National Research Flagships Program, begun in 2002 and formally launched by the Prime Minister in April 2003, comprises six tightly focused, multidisciplinary research programs closely aligned with the Government's National Research Priorities. The Flagships were identified and developed to explore solutions to economic, environmental and social pressures facing Australia – now and well into the future. The additional funding received for 2005–12 signals the endorsement of the Flagship model and will build investor confidence and encourage further collaboration. It is important to emphasise here that the whole Organisation will benefit from the increased funding – while the additional funds are directed towards the Flagships, these all leverage the core science capabilities of CSIRO whose vitality is fundamental to being able to deliver the big Flagship outcomes.

With the assistance of the additional $20 million provided by the Government 12 months ago, the Flagships are already delivering real outcomes and benefits. For example, we have already demonstrated that a revolutionary new titanium powder manufacturing process has the capacity to cut production costs of this valuable light metal by up to 50 per cent. We have identified unique plant genes which control the synthesis of healthy dietary oils which could lead to novel health foods that can protect consumers against heart disease and cancer.

Delivering on expectations

Having promulgated our Strategic Plan and received the necessary financial support, CSIRO must now deliver on the commitment and the expectations that we have created. Our focus is on the implementation of the Strategic Plan through a series of annual Operational Plans and our commitment to its key elements.

The Flagships and the Emerging Science Initiative (the latter designed and funded to ensure CSIRO's science capabilities are constantly refreshed by supporting an early in-house capacity in relevant frontier and emerging new areas of science) are both well on track as we move into the second half of 2004. We are committed to continuing to grow in delivering value and impact and introducing efficiencies

across our overall operations to release more funds for growth in science.

Whilst the Government's increased support is an enormous boost, we must live within our means. We have, during 2003–04, begun a broad range of activities aimed at strengthening our corporate governance framework, focusing our overall research effort, growing our external earnings and intellectual property income. We are strengthening existing partnerships and developing new ones (including active and focused participation in the Cooperative Research Centre [CRC] Program), and introducing more streamlined business development and commercialisation processes. We are improving our people development and leadership and training programs and introducing a structured performance management framework coupled with simpler, integrated One-CSIRO research support functions (for example, in areas such as procurement, information technology and libraries).

Throughout all of this, it is critical that CSIRO continues to deliver excellent science. Excellent science, focused on delivering to identified needs, is our core business. We are committed to doing this in collaboration with others to achieve the return on investment that is so clearly expected of us.

The last two years have not been easy for CSIRO and its staff as we have sought to focus and reprioritise our research and implement our Strategic Plan. We have had some tough challenges which have led to considerable external and internal scrutiny. However, this is now yielding results and we would like to take this opportunity to thank everyone in CSIRO for their ongoing support, commitment and sacrifice through this challenging period. Their achievements and accompanying recognition by the Government would simply not have been possible without the dedicated efforts of all our people.

We now look forward to one of the most exciting periods in CSIRO's history as the Organisation works to play its part in building Australia's prosperity, sustainability and future opportunities.

Catherine B Livingstone
Chairman of the Board

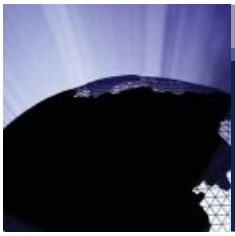
Geoff G Garrett
Chief Executive

Performance

The year in summary – and looking ahead 6
Some scientific achievements 10
The year in review: Performance against strategic objectives 18
- Focusing our science investment 18
- Delivering world-class science 21
- Partnering for community impact 25
- Serving as a catalyst for industry innovation 28
- Building One-CSIRO capability and commitment 32
- Securing a financial foundation for growth 35

Delivering impact from our science 38
- CSIRO's output and outcomes framework 38
- ■ Information technology, manufacturing and services 45
- ■ Sustainable minerals and energy 53
- ■ Environment and natural resources 60
- ■ Agribusiness and health 71

Education and outreach 79
Awards and honours 81



Performance

The year in summary – and looking ahead

CSIRO's 2003–07 Strategic Plan was finalised in August 2003 and is centred on six strategic goals, building on the six key messages we identified in 2001. This past year focused on **delivery** and **execution** against these six strategic goals. We continued to **focus** on the major scientific challenges and opportunities for Australia, both through the Flagships Initiative and our core research program, with a strong **outward-looking** emphasis. We further strengthened our **partnerships** with universities, other science agencies and industry and continued to build a **'service from science'** culture. Considerable gains were made in making full use of our collective strengths through a unified **'One-CSIRO'** approach, and above all we continued to **grow** our impact and relevance to the nation.

Focus, and building critical mass

In developing our future strategy, we recognised that we had been spreading our science investment too thinly and needed to better focus our efforts. Further implementation of the National Research Flagships has been our primary activity in re-prioritising our investment over the last 12 months. Flagships are closely aligned with the Government's National Research Priorities and build on CSIRO's core science capability and, in partnership, concentrate on major challenges and opportunities in the areas of energy, water, health, growing new industries based on our rich mineral and agricultural resources, and developing sustainable wealth from our oceans. Although the Flagships are relatively new, they are already delivering real outcomes eg, the discovery of unique plant genes which control the synthesis of protective oils for use in health foods, the development of a novel super-capacitor with a significant increase in power delivery and energy storage, and a revolutionary new titanium powder manufacturing process that significantly cuts the production costs of this valuable light metal.

We have also developed critical mass in a number of other areas. One of these has been in Information and Communication Technology (ICT). In September 2003, we established our ICT Centre with over 180 staff and an annual budget of approximately $40 million and we expect to continue to produce exciting innovations such as our recently awarded Virtual Critical Care Unit. Another focus has been in energy with the opening, in October 2003, of the CSIRO Energy Centre in Newcastle, New South Wales (NSW). This $36 million investment represents the largest consolidated base of energy R&D in the southern hemisphere.

Growing our financial foundation

A stable, and growing, financial platform is key to ensuring CSIRO's ongoing capacity and impact. The 2004 Federal Budget confirmed CSIRO's three-year base funding with a record $1.7 billion appropriation for 2004–07. Moreover, CSIRO's progress with the Flagships Initiative under *Backing Australia's Ability* (BAA) attracted $305 million of new money provided over the next seven years to enable us to accelerate this Initiative. This investment confirmed the

appropriateness of CSIRO's decision to refocus its own scientific investments and, over time, to devote up to 40 per cent of total resources to the Flagships.

Our overall financial performance during 2003–04 was very gratifying with total external revenue growth of 7.6 per cent to $320 million (very close to our budget of $322 million), a 60 per cent increase in intellectual property revenue (reaching our target of $22 million) and a $25 million 'bottom line' improvement over a budgeted $30 million deficit. During 2003–04, we also reviewed procurement, asset management and associated business processes aiming to reduce overall costs and release funds for additional investment in science. Highlights included realisation of significant savings gained across a number of 'One-CSIRO' initiatives, including the successful pilot of an e-procurement project and the revision of procurement policies and practices for the engagement of consultants.

Looking out for our science, and our people

CSIRO's core business is the delivery of impact from our world-class science. This requires us to attract and retain world-class people. Over the past year there has been a particular emphasis on talent management, enhancing performance and strengthening support arrangements for our staff (eg we have continued to make very good progress in Occupational Health and Safety, with improved performance figures and a positive change in our safety culture; there has also been strong take-up of our enhanced recognition and rewards processes). The quality and relevance of the science base in CSIRO and its scientific outputs is critical. Based on the Institute for Scientific Information's (ISI) *Essential Science Indicators* for 2003–04 (monitored across over 3 400 institutions) CSIRO continued to be ranked in the top one per cent of institutions world-wide in 12 of ISI's 22 research fields. During 2003–04, CSIRO scientists received a range of international awards with the highlight being Dr Keith Sainsbury (Marine Research) receiving the prestigious 2004 Japan Prize for his work on sustainable marine ecosystems.

Partnerships

Our rejuvenated collaboration initiatives allow CSIRO to have impact where our own efforts alone are insufficient. We are committed to a 'Team Australia' approach. For example, CSIRO remains the largest single participant in the Cooperative Research Centre (CRC) Program with involvement in 50 of the current 71 CRCs. In addition, within the Flagship Program, we developed collaborations with partners from industry, CRCs and academia, with some 34 collaborative partnerships currently in place. CSIRO is committed to further strengthening ties with universities and we see co-location as a strong facilitator of collaboration. At present over 2 600 of our 6 500 staff are on or adjacent to university campuses and this is set to increase significantly under our property consolidation plans.

'One-CSIRO'

CSIRO's scope and scale mean that when we act as a single unified organisation the possibilities are limitless. Progress has been achieved on migrating the culture of the Organisation to one more epitomised by the statement 'One-CSIRO' – one in which cooperation between different parts of CSIRO is actively sought out in order to bring to bear the full breadth of available skills and experience, to help identify exciting new 'cross-boundary' science and innovation possibilities, and to maximise the effectiveness of assessment, reporting and administrative systems.

This requires both a cultural change and the introduction of standard processes and Information Technology (IT) systems across CSIRO to enhance efficiency. During 2003–04, the CSIRO IT Services strategy was developed and Phase I of its implementation has begun through restructuring of IT delivery in the Sydney basin. This will provide both improved IT security and significant cost savings and represents the

first of a series of similar changes to ensure an enterprise approach to the support services.

Service delivery from our science

We have established a number of dedicated cross-Divisional Client Service Teams to provide a single window into all of CSIRO to enable customers to draw on the full breadth of our available skills. This has facilitated the development of some significant ventures with major corporations. In one notable example of larger coinvestment, CSIRO Petroleum Resources , Curtin University of Technology and the University of Western Australia, have established a strategic research partnership with Woodside Energy Ltd, with Woodside committing $30 million to fund oil, gas and other energy R&D projects. Another exciting venture is with Australian Customs. This crystallised in March 2004 following the commitment of $8.4 million by the Federal Government, with the signing of the contract for construction of a commercial-scale version of CSIRO's Air Cargo Scanner, which has the ability to detect materials such as drugs and other prohibited imports.

We recognise that Small and Medium Enterprises (SMEs) play a major part in jobs growth in Australia and we are currently involved in around 2 000 contracts with SMEs each year. We have developed a new approach to support the growth of existing SMEs and have also developed and implemented a new system for the execution of contracts across CSIRO *(FastTrack)* which is of particular benefit to SMEs. *FastTrack* simplifies CSIRO contracts from up to 20 pages to 1–1½ pages of plain English and reduces the time involved in negotiations from up to 70 days to as little as 24 hours.

In 2001, we commenced a systematic assessment of our customers' views using an internationally-benchmarked Customer Value Survey. Quarterly returns from an average of 150 of our customers (large and small, public and private) allow us to continually track our progress and identify ways to improve our customer relationships. For the year ending June 2004, CSIRO was ranked above average on overall value and achieved world-class ratings on customers' willingness to recommend and reuse and on our brand name.

Looking ahead

The year ahead will again be strongly 'delivery and execution' oriented. We have created expectations and we are delivering well against these but we must continue to do so. We must respond to the challenges provided by our local, regional and global environment and this requires us to embed the changes upon which we have embarked to ensure our future, ten to fifteen years out. The metaphor of 'changing the tyres while our car is travelling at 100kph' comes to mind! Being able to do this effectively is a hallmark of successful organisations in both the private and public sectors, world-wide. Our 2003–07 Strategic Plan, its six goals and corresponding 24 objectives, together with our six key messages, will continue to provide our framework for action.

Thus, we must prevail with our passion for **focus**. Delivering on our Flagships Program is critical and this will require, *inter alia*, streamlining the associated business processes and nurturing and enhancing our various partnerships and collaborations.

Looking out, into the future – the very nature of the science business – demands from us science leadership and the maintenance of CSIRO's strong tradition of science excellence. The science we choose to do, and how well we do at it (with our benchmark being global best practices) remain top priorities for our science leaders, our management, and our Board. Falling short of the standards we set ourselves will bring us into 'look out!' (ie, watch out/danger) territory. For this reason we will be focusing strongly on our objective (2.1) to *'concentrate people processes on developing, attracting, exciting and retaining talent'*, at all levels in the Organisation and in our collaborative arrangements. At the same time, understanding and migrating our organisational culture to

ensure we are positioned to respond to the pace and scale of change required of us all as a nation to compete in the world, remains a key priority.

'Partner or Perish' is not an overstatement. CSIRO, as a publicly-funded research organisation, is relatively big in world terms, and as such provides competitive advantage for Australia. However, the magnitude and complexity of the challenges ahead require us to interact closely and continuously both with our co-researchers (to ensure the best possible science and technology outcomes) as well as with our industrial and community partners (who carry the main responsibility for the effective take-up and diffusion of the technologies we develop).

CSIRO is in the service business: **service from science**. We exist only because of our stakeholders, our customers, and the community at large and our job is to meet and anticipate their needs. Australia's future well-being will continue to require strong economic growth and we in CSIRO must continually improve our effectiveness in serving as a catalyst for industrial innovation – whether through providing the scientific underpinning for growing regional agribusiness, establishing more comprehensive and strategic relationships with larger corporations, or stimulating the development of technology-oriented SMEs (a recognised engine of growth and job creation into the future).

Harnessing the power of **'One-CSIRO'** is our key differentiating advantage. We must work as one for the benefit of the nation. We have the 'muscle' of our 6 500 staff, including close to 2 000 PhDs across almost 60 sites in Australia, and a wide diversity of expertise, and we must all pull together. This is no easy task. It requires us to make it much easier for clients to access and work with us; to continually seek those new breakthroughs which will emerge from cross-disciplinary cooperation and mutual understanding; and to harmonise and unify the processes and systems that support our great science. Of our six 'key messages' this is the one that has most resonated with CSIRO staff, and we will continue to push very hard to make our aspirations a reality.

A stable financial foundation provides a springboard for **growth** and for unleashing creative thought. We have received strong financial support from the Federal Government for the next three years and we are on track in our plans to increase revenues from our vast intellectual property assets for reinvestment into our research activities. We also have real opportunities for improving efficiencies, around the way we work with our clients, but also in savings possibilities in the way we do our business. We will continue to vigilantly seek and meet targeted gains in these areas.

Finally, while our Strategic Plan has provided strong guidance into our future, it is just that – a guide, not a road map. We are already analysing CSIRO's possible future roles and responsibilities in order to define, more specifically, what exactly it is to be a 'research enterprise with global reach'. Moreover, as stewards for the wise investment of close to $600 million of taxpayers' money each year, we are reviewing our strategic investment portfolio – both the process and the content.

CSIRO has a proud tradition of close to 80 years of distinguished achievement. It is often accorded 'icon' status. Rightly so. We are in transition, in complex and ambiguous times, but our core purpose remains robust ***– 'by igniting the creative spirit of our people, we deliver great science and innovative solutions for industry, society and the environment'.***

Some scientific achievements

Injectable polymer gel being cured with a blue light. Photo: Mark Fergus

Breakthrough polymer for bone repair

A CSIRO breakthrough in polymer development could lead to a radical new treatment for people with broken bones.

The new material can 'glue' broken bone back together and support it while it heals, before breaking down to leave only natural tissue.

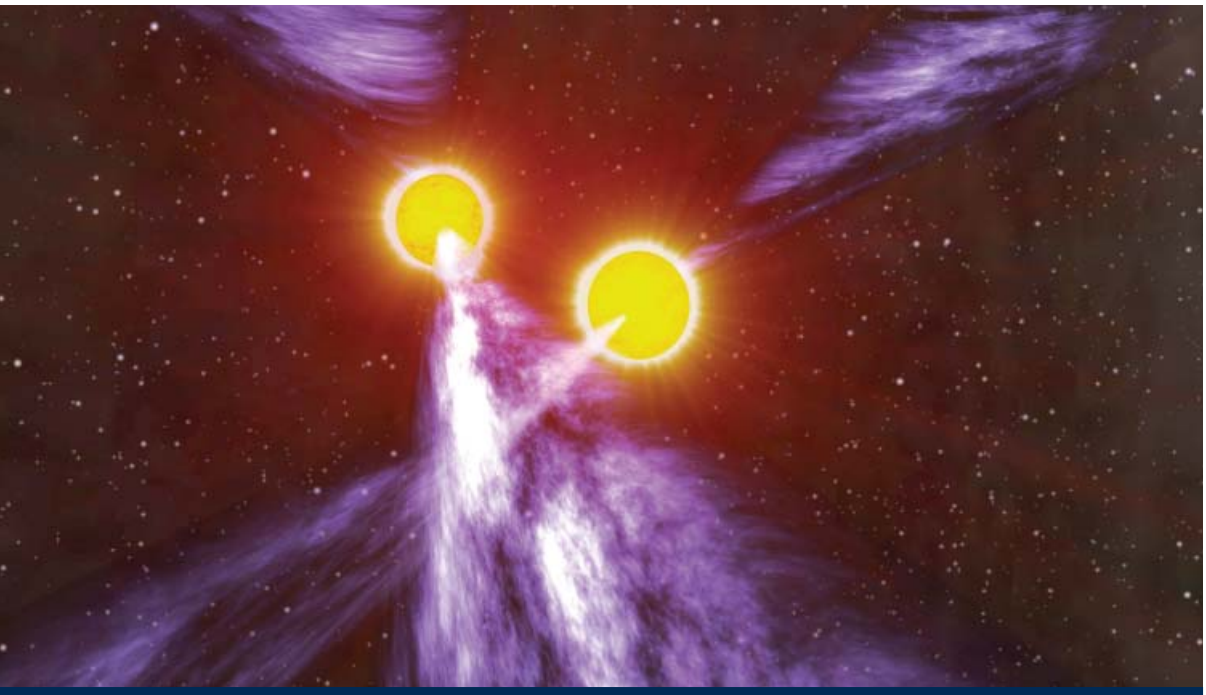
Developed by scientists at CSIRO Molecular Science, the new biodegradable and biocompatible polymer can be formulated as an injectable gel which cures in-situ or on-demand by promoting tissue growth. The polymer's rate of degradation can also be controlled.

Synthetic polymers offer a number of advantages over ceramic and natural polymer-based materials and it is envisaged that the technology could be tailored for applications in orthopaedics, orthodontics, drug delivery, wound care, tissue engineering and cartilage repair.

Plans are underway to apply it initially in the form of a bone glue for fracture repair – an area in which it has a distinct advantage due to its combination of injectability, adhesiveness and excellent mechanical strength.

Further research is planned to demonstrate the polymer's ability to deliver cells or biological agents to accelerate tissue regrowth.

In line with CSIRO's commercialisation strategy, a spin-off company, PolyNovo Biomaterials Pty Ltd (formerly PolymerCo Pty Ltd), has been established – in a partnership with Xceed Biotechnology Ltd – to develop this revolutionary new technology for medical device applications.



An artist's impression of the new-found double pulsar system. Photo: John Rowe Animations

Discovery of the first known double pulsar

Using CSIRO's Parkes Radio Telescope in New South Wales, scientists from the UK, Australia, Italy and the USA have found the first system of two pulsars orbiting each other. This is the only such system known among the 1 400-plus pulsars found in the last 35 years. The two pulsars lie almost 2 000 light-years away in our Galaxy and are separated by 800 000 km, about twice the distance between the Earth and Moon. They orbit each other every 2.4 hours, which makes them some of the fastest-moving stars known.

A pulsar is the collapsed core of a massive star that has ended its life in a supernova explosion. Weighing more than our Sun, yet only 20 kilometres across, these incredibly dense objects produce beams of radio waves which sweep round the sky like lighthouse beams, often at hundreds of times a second. Radio telescopes receive a regular train of pulses as the beam repeatedly sweeps across the Earth.

The scientists have been surveying our Galaxy, the Milky Way, for new radio pulsars, using the powerful new 'multibeam' receiver at Parkes, which was built as a joint venture between engineers at the Australia Telescope National Facility and the University of Manchester's Jodrell Bank Observatory, funded by the Particle Physics and Astronomy Research Council. The receiver gives the telescope 13 beams capable of scanning the sky simultaneously. The surveys designed by the team to discover new pulsars at the Parkes Telescope have been extraordinarily successful, finding more than 700 pulsars in the last five years – nearly as many as were discovered in the preceding 30 years. The discovery of this double pulsar system is the jewel in the crown.

Dr Brian Sowerby standing beside CSIRO's laboratory prototype Air Cargo Scanner.
Photo: CSIRO Minerals

CSIRO's Air Cargo Scanner – A world first

The world is set to be a safer place due to another outstanding piece of CSIRO technology and innovation. Called an 'Air Cargo Scanner', the device can accurately and rapidly detect illicit drugs and explosives concealed inside air freight containers.

The Australian Customs Service and CSIRO have already successfully prototyped and tested the unique Scanner which uses world-first neutron technology developed by CSIRO's On-Line Analysis and Control (OLAC) team at Lucas Heights. The team has an international reputation for developing novel instrumentation for the minerals and energy industries – the Scanner is one of their many successes.

The neutron technology is non-intrusive to minimise the impact of security measures on rapid freight movement, and it is estimated that scanning an air freight container will take less than two minutes.

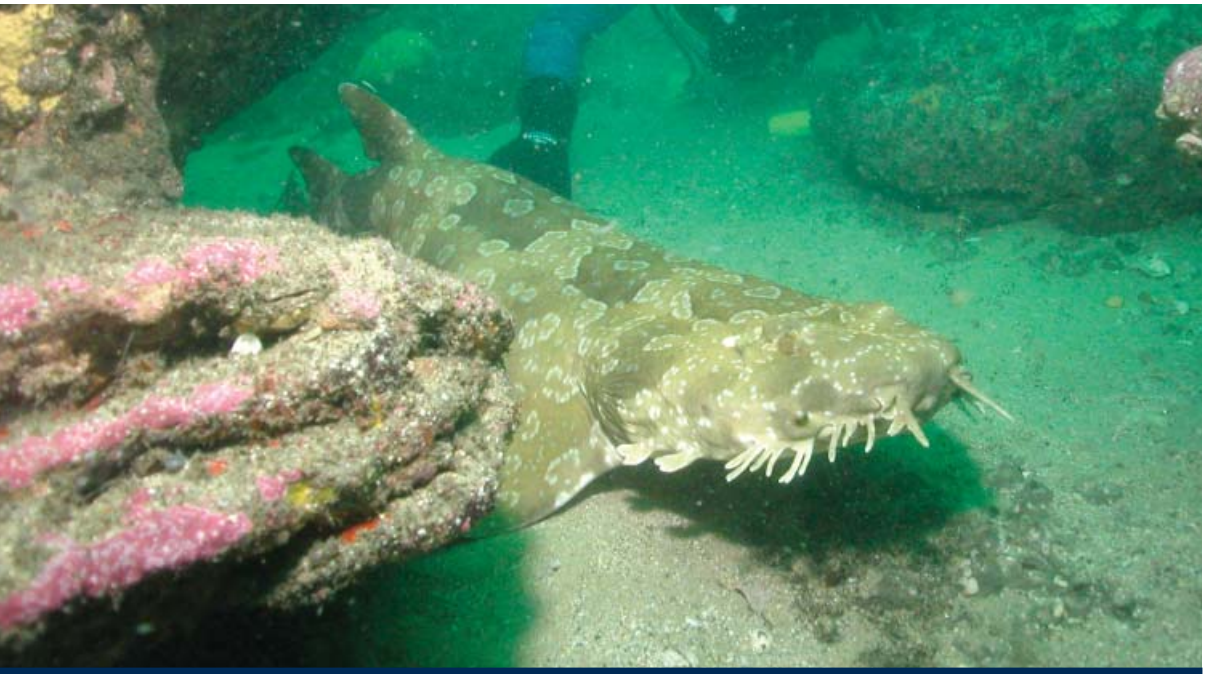
The main advantage of the Scanner over current and potential new scanners is its ability to accurately and rapidly analyse the composition, shape and density of an object – in real-time without unpacking the container.

Conventional X-ray scanners are good at detecting objects based on their density and shape – but not their composition.

The Scanner is unique in the way it employs gamma rays and neutron analysis to build an image and help identify the composition of the object being scanned.

CSIRO has now patented this truly world-first technology. When fully commercialised, the technology has the potential to earn millions of export dollars for Australia.

In the meantime, the Federal Government has allocated $8.4 million dollars to the Australian Customs Service to construct a commercial-scale facility at Brisbane Airport to trial the first commercial prototype Air Cargo Scanner being developed by CSIRO. The Scanner is expected to be operational in mid-2005.



Shark antibodies, now produced via recombinant gene technology, were originally sourced from the spotted wobbegong shark (Orectolobus maculatus). Photo: Dr Rob Harcourt, Macquarie University

Shark antibodies point the way to new diagnostics

Scientists at CSIRO's Health Sciences and Nutrition, and the Cooperative Research Centre (CRC) for Diagnostics, were the first to solve and publish the three-dimensional molecular structure of a new class of antibodies from sharks.

Antibodies are the immune molecules responsible for binding and neutralising the wide range of pathogens, toxins, and foreign molecules we encounter. Antibodies are high-value reagents, being the main products in over 20 per cent of both clinical diagnostic and biopharmaceutical industries.

The genes encoding these proteins were originally obtained from spotted wobbegong sharks (*Orectolobus maculatus*), a species found in the Western Pacific ocean including Australian waters.

The researchers showed that these shark antibodies have a unique evolutionary history, and are completely unlike those seen in humans. Thus, these findings should prove to be an important milestone in increasing our understanding of the evolution of the immune system.

The next step is to use this antibody structure to design a library of similar proteins for selection against a wide range of human diseases and other targets. Because these antibodies have evolved to a small size they are extremely robust, and ideally suited to diagnostic applications where harsh conditions are encountered. This includes diagnostic tools for the detection of bio-warfare agents and the rapid monitoring of environmental pollutants.

The dome above the Arecibo telescope in Puerto Rico, in which the ALFA instrument is installed.
Photo: NAIC - Arecibo Observatory, a facility of the National Science Foundation

CSIRO technology boosts world's largest telescope

The world's largest radio telescope can now scan the heavens seven times faster than previously, and gaze deeper into space, after being fitted with unique CSIRO-built equipment.

The $1.4 million instrument is essentially a camera that uses radio waves instead of light to make pictures of galaxies and gas clouds in space.

Called ALFA (Arecibo L-band Feed Array), it is about the size of two washing machines stacked on top of each other, and weighs more than 600 kilograms.

It was installed at the 305-metre diameter Arecibo radio telescope in Puerto Rico in April 2004.

Traditionally, radio telescopes have been able to see only one spot in the sky – only one pixel – at a time. To make a picture you have to image one spot after another. ALFA lets the telescope see seven times more sky – seven pixels – at once, slashing the time needed to survey the whole sky.

ALFA was commissioned following the success of a similar ground-breaking instrument CSIRO had designed and built for its own Parkes radio telescope.

That instrument, the Parkes multibeam receiver, increased the Parkes telescope's view 13-fold, making it practical for the first time to search the whole sky for faint and hidden galaxies.

CSIRO Plant Industry's Dr Ben Trevaskis discovered WAP1 – the major gene that triggers flowering in cereals – its discovery could help breed better crops in the future. Photo: CSIRO Plant Industry

Knowing when to flower

CSIRO Plant Industry scientists made a major breakthrough late in 2003 with its discovery of the gene that triggers flowering in cereal crops like wheat and barley.

Although much more work needs to be done before the secrets of flowering in plants are fully revealed, the discovery of the WAP1 gene provides researchers with the key to influence one of the major traits cereal crop breeders have sought to control for thousands of years.

It is now known that WAP1 turns 'on' to activate flowering when the cereal plant is at the right stage of development and when environmental conditions are suitable.

For example, in winter wheat, WAP1 (and hence flowering) is activated after a cold period, like winter. Spring wheat, however, flowers without exposure to cold because its version of WAP1 does not require a cold period to start it.

In the future, WAP1 could be used to help breed cereal plants that flower when needed and experiments are already underway to see if spring wheats can be made to flower even earlier using more active versions of WAP1.

WAP1 could also be used to block flowering in grasses that cause allergies and to prevent sugarcane flowering – thereby allowing sugarcane plants to allocate more resources to producing cane.

The discovery of WAP1 has been simultaneously confirmed in the USA and Canada where scientists have independently identified the same gene for cereal flowering.

CSIRO Land and Water scientist Dr Shahbaz Khan measuring salinity in a flooded rice bay near Griffith, New South Wales. Photo: Gregory Heath

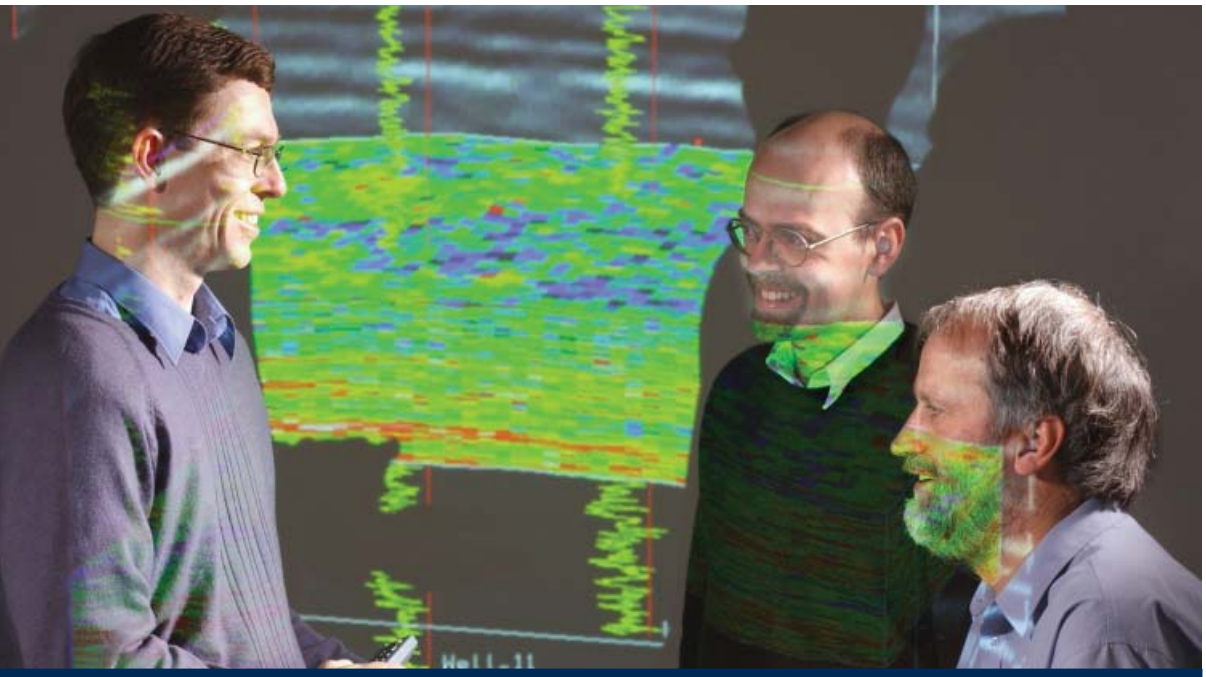
Forecasting more efficient irrigation

A climatic forecasting model which literally mimics the workings of the human brain is helping farmers improve irrigation efficiency. The Artificial Neural Network (ANN) model developed by CSIRO in conjunction with research partners is delivering better predictions of likely water flows, and hence water allocation, in the Murrumbidgee Valley.

Irrigators are using this information to make more informed cropping and water trading decisions. This improves irrigation efficiency and environmental management by optimising the spread of irrigation demand over summer and winter periods, leading to better use – and less waste – of available water. Using this model, it is anticipated that irrigators and water managers will be able to gain lead times of up to six months in predicting the next season's water allocation.

In the same way a human brain uses memory and experience to make deductions and evaluate likely outcomes, the ANN approach can 'learn' from historic model simulations and incorporates these in predicting water allocation trends over a given season. The ANN is an artificial intelligence technique to produce smarter data analysis, that is inspired by the way the brain processes information. ANN is composed of a large number of highly interconnected processing elements (neurons) working together to solve specific problems.

Users only need to input three pieces of information: start of the season water allocations, sea surface temperatures at a specific location affecting rainfall and flow in the catchment, and the acceptable farming risk the user is willing to take in making a planting decision. The software package then generates predicted water allocation for the next season. With potential to be adapted for other Australian and international irrigation regions, the work has local and international significance as greater pressure is placed on limited water resources.



James Gunning, Jonathan Ennis-King and Lincoln Paterson discuss the characterisation of a petroleum reservoir. Photo: Mark Fergus

Improving the performance of oil and gas reservoirs

The research undertaken by CSIRO's Petroleum Reservoir Characterisation team has had a major influence on industry practice in Australia and overseas. One company alone estimates savings in the range of $10 to $100 million.

The research has resulted in more efficient production performance from known oil and gas fields, as well as improved risk analysis in exploration and field development. The team has developed and applied new methods combining geophysics, geostatistics and reservoir engineering to assess oil and gas reservoirs in deep sedimentary formations. These deep formations are predominantly mixtures of sandstone and shale from which fluids are either withdrawn or injected. The challenge has been to predict fluid behaviour with limited data from surface-based seismic imaging and from drill intersections.

The research team has achieved outstanding success, and the new methods have had a major impact in petroleum production and on the reduction of greenhouse gases. One major international company described a component of the new method as a 'jewel' of quantitative interpretation technology.

This has been a building block in the development of significant new measures to assist decision-makers to drill a well or develop a field. The team has also applied its work to the evaluation of potential geological storage of greenhouse gases, conducting world-leading research on the movement of carbon dioxide injected into deep sedimentary formations.

The year in review: Performance against strategic objectives

This section provides a comprehensive report on CSIRO's performance against the Strategic Goals and Objectives articulated in CSIRO's Strategic Plan 2003–07, including reference to the *specific success measures and targets* identified in the Strategic Plan and in the CSIRO Operational Plan for 2003–04. This information incorporates the performance indicators included in the Triennium Funding Agreement (TFA) for 2000–01 to 2002–03 which, by mutual agreement between CSIRO and the Government, was extended to apply to the 2003–04 year.

The success measures selected as 'Headline Indicators' for each strategic goal are provided in bold throughout the text.

Goal 1 – Focusing our science investment

In developing our future strategy we recognised that we have been spreading our science investment too thinly and needed to better focus our efforts to maximise our impact. The further development and implementation of the National Research Flagships has been a prime focus in this area over the last 12 months. Flagships build on CSIRO's core science capability and, in partnership, concentrate on major challenges and opportunities in the areas of energy, water, health, growing new industries based on our rich mineral and agricultural resources, and developing sustainable wealth from our oceans.

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*

CSIRO reviewed and updated its implementation plan to reflect and deliver on the Government's National Research Priority (NRP) Framework – an environmentally sustainable Australia; promoting and maintaining good health; frontier technologies for Australian industries; and safeguarding Australia. Our plan was well received by the Government and this, in part, was reflected in significant additional funding for the Flagships initiative announced as part of the new *Backing Australia's Ability* program in the 2004 Federal Budget. In announcing the funding package, the Prime Minister stated the additional money for Flagships 'recognises the effort by CSIRO to align its large scale collaborative research programs with national research priorities'. Flagships are a key component of the CSIRO response to the NRPs – in 11 of the original 17 NRP priority areas at least one Flagship had a major objective closely aligned to an NRP goal.

There is also strong alignment between the NRPs and CSIRO's core research portfolio with each of our 21 research Divisions contributing to at least three of the original 17 NRP priority areas. In 2003–04, approximately 80 per cent of CSIRO's overall science investment was aligned with NRPs, and the forecast for 2004–05 is approximately 83 per cent, against a minimum target set by the Organisation of 66 per cent.

Evidence of the impact of CSIRO's research on NRPs is included in the 'Outputs and Outcomes' section on pages 38–78.

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*

CSIRO's Program Performance Framework (PPF) was initially developed and applied during 2002–03 to enhance the planning and monitoring of performance in Flagship Programs.

In 2003–04, application of the PPF was extended and all Divisional research programs are now identified in a common hierarchy of 'Themes-Streams-Projects' (see glossary), and Annual Performance Goals (APGs) identified at the stream level, are used as the basis for regular monitoring of performance by Divisional and Group Management, the Executive Team and the CSIRO Board.

During 2003–04, a number of Divisions restructured their research portfolios to build critical mass, capitalise on synergies and maximise impact. For example, CSIRO Livestock Industries moved from a science structure involving multiple small projects organised around seven site-based programs into four themes, each addressing a major issue for Australia's livestock industries.

CSIRO Petroleum Resources' activities were refocused from 14 research groups into two themes – Maximising Australia's Oil Self-sufficiency and Supporting Australia's Gas Future, both fully aligned with two priority goals of the NRPs. In response to a clear need to better focus our ICT research effort, CSIRO established the ICT Centre in September 2003 (see detail at Section 4.4). In early 2004, the CSIRO Board and our Minister approved the establishment of a Joint Venture between CSIRO Forestry and Forest Products and New Zealand Forest Research Pty Ltd. This 50:50 Joint Venture, known as **ensis,** came into effect on 1 July 2004 and aims to build focus, critical mass and world-class R&D capability for Australian, regional and global forestry industries. CSIRO's commitment to the Joint Venture involves approximately 90 staff and a revenue budget of $15 million. The major focus of the Joint Venture is on pulp, paper and packaging; wood and fibre quality; wood products and processing; and tree improvement and germplasm.

In October 2003, the CSIRO Energy Centre was opened in Newcastle. This $36 million investment (funded in part by the NSW Government) represents the largest consolidated base of energy R&D in the southern hemisphere. The Centre is the head office of both the Division of Energy Technology and the Energy Transformed Flagship. It provides an international focus for energy research in Australia, covering a number of areas including fossil fuels, renewables and hydrogen, distributed energy and energy storage and environmental aspects of energy utilisation. The Centre is a 5-star energy rated building showcasing new and renewable energy technologies with wind turbines, photovoltaic cells and gas microturbines providing most of the Centre's power.

As a response to the Government's request for enhanced accountability and transparency around science investment, CSIRO developed a new process (piloted in the Division of Petroleum Resources) to assess the quality of its research. The Science Assessment Reviews, endorsed by the CSIRO Board, will involve a rolling series of external reviews of each Division across the next triennium. These reviews will build on existing assessments of research and project performance currently undertaken by Divisions and will ensure that CSIRO's position as a pre-eminent research agency is not only maintained but enhanced.

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

Success measures:

- ***Proportion of Flagship Annual Performance Goals achieved***
- *Flagship programs operating successfully*
- *Share of CSIRO science budget (appropriation funding) in Flagships*
- *Total external revenue for Flagships*
- *Adoption and impact of Flagship program outputs*

As indicated above, CSIRO's progress with the National Research Flagships Initiative attracted a high-level of commitment from the Australian Government, as evidenced by its recent

decision to invest $305 million in new money in the Initiative over the next seven years. This investment has confirmed the appropriateness of CSIRO's decision to refocus its own scientific investments and, over time, to devote up to 40 per cent of its total resources to this initiative. In 2003–04, total expenditure across the Flagship Programs was $82.5 million, comprising $20 million specifically provided by the Federal Government in the 2003–04 Budget, $53.8 million of redirected CSIRO funding and $8.7 million of leveraged external funds.

In 2003–04, the Flagship programs accounted for expenditure of some 13.0 per cent of CSIRO's total appropriation funds. Our longer-term goal is to have 30 to 40 per cent of resources devoted to Flagship programs. Our target is 20 per cent for the 2004–05 financial year.

Five of the six Flagships were launched during the year, most recently Water for a Healthy Country, launched in Parliament House by the Deputy Prime Minister, The Hon John Anderson and the Minister for Science, The Hon Peter McGauran. Two new Directors were appointed over the period: Dr Bruce Lee, formerly with Syngenta in Europe, was appointed Director of Food Futures and Craig Roy, formerly a senior officer in the Royal Australian Navy, was appointed as Director of Wealth from Oceans. All six Flagships now have permanent Directors.

Although the Flagships are relatively new, significant progress has been made towards delivering on Flagship goals, eg, the discovery of unique plant genes which control the synthesis of protective oils for use in health foods; the identification of two new ways to make magnesium metal; the development of a novel super-capacitor with a significant increase in power delivery and energy storage; a revolutionary new titanium powder manufacturing process; the filing of four provisional patents for protective foods and novel diagnostics applicable to prevention and early detection of colorectal cancer; and the completion of an economic and commercial feasibility study for local desalination of groundwater for a town in the Western Australian wheatbelt. Some further examples are included in the 'Outputs and Outcomes' section on pages 38–78.

In 2003–04, 71 per cent of the annual performance goals set in the Flagships' performance plans were achieved. This is against a target of 70 per cent set in recognition of the inherent challenge and risk in these activities.

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*
- *Implement Program Performance Framework (PPF) for MXDPs*
- *Identify major cross-Divisional opportunities*
- *Adoption and impact of outputs from MXDPs*

CSIRO continued to foster major cross-Divisional projects with national impact. For example, in the NRP area of Safeguarding Australia, CSIRO identified three areas in which we have current capability to make significant impact – biosecurity, counter-fraud devices and detection technologies. In April 2004, Dr Greg Simpson (Deputy Chief, Molecular Science) was appointed as the Coordinator of the Secure Australia Program – involving 11 CSIRO Divisions.

Research over the past year has included the development of powerful diagnostic reagents against emerging biowarfare agents (including anthrax) by two La Trobe PhD students co-supervised by CSIRO and the Defence Science and Technology Organisation (DSTO). In March, CSIRO and Australian Customs began construction of a commercial-scale version of CSIRO's unique neutron scanner with the ability to detect explosives, drugs and other prohibited imports. CSIRO's Optical Variable Devices research program, which has led the world in

cutting-edge counter-fraud devices for more than a decade, has developed a new optical encryption technology for currency, which will be more difficult to counterfeit and has the potential to dramatically reduce production costs.

CSIRO's Climate Science Program involving 13 Divisions, more than 200 staff and a budget of around $22 million, is another area where some refocusing for maximising impact has occurred. CSIRO's Climate Program underwent a repositioning during 2003–04 to fully reflect science advances, changing policy demands and the impact of the Flagship Programs. This included the establishment and implementation of a major collaborative climate project with government agencies in the Murray-Darling Basin; negotiation of a new 2004–08 climate change science program with the Australian Greenhouse Office; continuing involvement in the Indian Ocean Climate Initiative; and submissions to Government on the Kyoto Protocol Ratification Bill and the Drought Review. In December 2003, Dr Bryson Bates from CSIRO Land and Water took over from Dr Graeme Pearman as Director of the Program.

Two other MXDPs identified in CSIRO's Operational Plan for 2003–04 were the ICT Centre, and SKA/LoFAR (development of a Square Kilometre Array/Low Frequency Array for Radioastronomy). Success in establishing the ICT Centre is reported under Objective 4.4, and progress in relation to SKA/LoFAR is reported under Objective 2.4.

With the exception of the ICT Centre, implementation of the Program Performance Framework's planning and reporting tools for MXDPs was only partially achieved in 2003–04, and this will be pursued further in 2004–05. A case for a new MXDP to focus CSIRO's involvement in the Australian Synchrotron Project will be developed (see detail at Section 2.4).

Evidence of adoption and impact associated with MXDPs is included in the 'Outputs and Outcomes' section on pages 38–78.

Goal 2 – Delivering world-class science

Delivering world-class science is the foundation of all that we do. However, we realise that it is not enough just to do great science. We are committed to delivering outputs and solutions that create value for Australia.

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*

To deliver on our strategic objectives, we must attract and retain world-class people and provide the environment that allows them to be the best they can be. Over the past year we developed a People Development strategy to support the CSIRO Strategy, concentrating on: change management; performance culture; talent management; Occupational Health Safety and Environment (OHS&E); learning and development; and operational performance of the People Development function across CSIRO. To further assist and provide leadership in the area we have recently appointed Mr Peter May as Executive Director, People and Culture. Over the past year there has been a particular emphasis on talent management and enhancing performance (see also Section 5.2). In addition, the revised *Leading the Research Enterprise* program, aimed at developing current and future leadership capability began in March 2004 with an intake of 17 staff.

In September 2003, we conducted our regular 'Insight' survey to solicit staff feedback on the Organisation. The results showed positive trends in a number of areas, particularly in satisfaction with remuneration, performance management and working environment and safety. The result

for the 'bottom line' question *'taking everything into account how satisfied are you with CSIRO as a place to work?'* remained unchanged from the previous year, at around 68 per cent, some three points above the norm for global R&D organisations. Similarly CSIRO's overall Staff Satisfaction Index is three points above the global benchmark (our target) despite a two-point decline from the previous year (Table 1).

Table 1: CSIRO Staff Satisfaction, Commitment and Engagement

Insight Survey	2002	2003
Staff Satisfaction Index (Target = global R&D norm)	68 (66)	66 (63)
Staff Commitment and Engagement: aggregate result (Target)	156	154 (156)

Although these overall results are pleasing, there are still some areas of staff concern that need to be addressed. We are continuing to work hard to communicate our strategic direction and performance to all staff, because quite a few people are still not sure as to where we are headed, and how we are performing. These uncertainties are reflected in survey results for 'staff commitment and engagement' which fell slightly, with a result of 154 compared to our target of 156. Processes are in place to follow-up on all issues identified in the survey.

The CSIRO Postgraduate Scholarship Program awarded 31 additional top-up scholarships to students to commence PhD studies in 2004 and 15 additional scholarships to students whose projects align with one of the Flagship Programs. The students are spread across 18 Divisions and all Flagships, with 18 universities involved in these collaborative research-training projects. This brings the total number of postgraduate students currently under supervision by CSIRO staff to more than 560 (Table 2). The number of students either fully or partially sponsored by CSIRO grew by more than 20 per cent on the previous year. CSIRO also appointed 22 new postdoctoral fellows across 16 Divisions under the CSIRO Postdoctoral Fellowship Program. CSIRO currently employs 259 postdoctoral fellows across the Organisation, an increase of 25 per cent over the previous year.

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

Supervision	1998–99	1999–00	2000–01	2001–02	2002–03	2003–04
PhD	579	379	475	433	425	464
Masters	176	143	57	53	48	46
Honours			77	71	62	56
Total	**755**	**522**	**609**	**557**	**535**	**566**
With CRC	30%	30%	23%	26%	21%	22%

Sponsorship	1998–99	1999–00	2000–01	2001–02	2002–03	2003–04
Full	30	32	42	49	52	70
Partial	97	69	86	112	143	165
PhD	103	91	110	144	179	219
Masters	24	10	8	9	4	3
Honours			10	8	11	13
Total	**127**	**101**	**128**	**161**	**194**	**235**

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

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'*

In 2002, the Australian National Audit Office (ANAO) confirmed the concern identified through an internal review, that project management was an area where we needed to adopt new and better practices. This has been a major focus of activity over the last year. Preliminary reports, following ANAO's most recent review, indicate that we have made considerable improvements, as assessed by actions taken to implement the recommendations of their 2002 Audit Report. However, the rate of improvement is variable across the Organisation and some issues such as project risk assessments and project selection criteria still require significant attention.

One of the specific initiatives piloted in 2003 was Project Workflow (PW) – an online tool that supports and enables CSIRO's project management policies and guidelines. It covers all aspects of managing a project, from initiation and planning through to delivery, review and closure. PW provides an element-by-element process guide for project leaders and has now been enhanced to include functionalities such as: electronic approvals for project decision points; reminders for upcoming milestones and events; reporting tools; and a capability to support effective commercial management processes.

The 'process and people' score from CSIRO's Customer Value Survey (CVS) provides an external assessment of attributes relevant to project management from the perspective of customers. Consistent with the audit findings, the most recent results (Table 3) show an improvement in CSIRO's 'process and people' score. The comparative score (greater than 100) indicates CSIRO's 'process and people' attributes are rated more highly than those of alternative providers to the surveyed customers.

Table 3: Customer Assessment of CSIRO's 'Process and People'

Customer Value Survey	Year to March 2003	Year to March 2004
CSIRO Score	7.1	7.5
Comparative Score	109	109

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

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

Success measures:

- ***Citations of publications***
- ***Citations of patents (current impact index)***
- *Number of publications by type*

CSIRO is a significant contributor to the international scientific literature. Trend data for CSIRO's publication and patenting activity are shown in Tables 4 and 5. During the year, CSIRO, continued to make significant scientific advances across our entire research portfolio – many of which are highlighted elsewhere in this Report. CSIRO scientists also received a range of international awards acknowledging outstanding effort. These are detailed in the 'Awards and Honours' section of this Report on pages 81–90. In addition, the Australian Animal Health Laboratory (CSIRO Livestock Industries) became the World Health Organisation's Reference Laboratory for Severe Acute Respiratory Syndrome (SARS) and the Office International des Epizooties (OIE) Reference Laboratory for Avian Influenza.

The quality and relevance of the science base in CSIRO and its scientific outputs is critical to the ongoing reputation and impact of the Organisation's work. Based on the Institute for Scientific Information's (ISI) *Essential Science Indicators* for 2003–04, (monitored across 3 400 institutions), CSIRO ranked in the top one per

cent of institutions world-wide in 12 of ISI's 22 research fields (based on the total number of citations over a rolling 10 year period). While the average citation rate for all CSIRO publications included in the ISI database fell marginally from 9.23 to 9.18, it remains well above the ISI average (7.94).

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

Type of Publication	1997	1998	1999	2000	2001	2002	2003
Journal Articles	**1 682**	**1 472**	**1 535**	**1 619**	**1 631**	**1 686**	**1 836**
Conference papers	1 278	1 183	1 280	1 035	1 096	1 142	1 428
Technical reports	318	194	229	175	153	240	442
Books and chapters	207	123	236	178	128	223	240
Total	**3 485**	**2 972**	**3 280**	**3 007**	**3 008**	**3 291**	**3 946**
Client reports	7 075	8 099	7 339	8 936	9 324	10 486	8 451

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

Patent Category	1998	1999	2000	2001	2002	2003	2004
Inventions (patent families)	723	735	705	751	733	779	754
New inventions	96	74	79	93	80	92	89
Current PCT[1] applications	83	84	63	82	104	90	92
Granted patents			1 749	1 774	1 801	2 002	2 079
Live patent cases	3 182	3 371	3 436	3 475	3 537	3 965	3 961
Australian trade marks					262	287	290
Foreign trade marks					84	93	92
Australian plant breeders					65	62	77
Foreign plant breeders rights					17	17	17
Australian registered designs					8	5	3
Foreign registered designs					9	12	12
Current Impact Index[2]	**0.48**	**0.48**	**0.49**	**0.60**	**0.53**	**0.56**	**0.59**

1. Patent Cooperation Treaty

2. The Current Impact Index (Source: CHI Research Inc). See glossary on page 202 for definition. Note that these data are for the calendar year indicated. The 2004 result shown here is for quarter one only.

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 Low Frequency Array for Radioastronomy (LoFAR)*
- *Australian engagement in the Square Kilometre Array (SKA)*
- *Initiatives to establish international science facilities*

In November 2003, ASTRON, the Dutch partner in the Low Frequency Array for Radiotelescope (LoFAR) consortium, accepted a Euro 52M Dutch Government grant to site the facility in the Netherlands, contrary to scientific advice that rated Western Australia as the best option. Consequently, the ATNF and the Massachusetts Institute of Technology (MIT) withdrew from the consortium. Subsequently, in March 2004, a science and technical meeting of international research partners previously engaged in the LoFAR project endorsed the importance of developing a low-frequency radio astronomy facility in Western Australia. The Australia Telescope National Facility (ATNF) is now developing a project plan for a lowfrequency demonstrator array in that State. The plan is being developed in collaboration with the MIT. In the meantime, Australia and the ATNF continue to play a leading role in the international Square Kilometre Array (SKA) consortium.

The Victorian Government has committed $157 million to the construction of a world-class synchrotron to be located adjacent to CSIRO's Clayton laboratories and Monash University. Because of the impact and importance of the facility on CSIRO's current and emerging science and technology, CSIRO has contributed $5 million for use in the design and construction of the core set of nine beamlines (and to ensure its priority access to research beam time). Other members of this 'Foundation Consortium of Research Organisations' are Monash University, Melbourne University and the Australian Nuclear Science and Technology Organisation. CSIRO has made known its intention to bid to become Operator/Manager of the Facility from its commissioning in April 2007. To underpin this involvement, CSIRO has initiated a Major Cross-Divisional Program in Synchrotron Science to coordinate the access and involvement of its scientists.

Goal 3 – Partnering for community impact

Partnerships allow us to have impact where our efforts alone are insufficient and they allow us to tailor research outcomes specifically to the broadest possible community needs and aspirations. We are committed to a 'Team Australia' approach to creating community impact.

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

Success measures:

- *Engagement with universities, CRCs and other agencies in responding to government reviews – and partnerships focused on clear strategic goals*
- *Partner feedback from collaboration with universities, CRCs and other agencies*
- *Co-location of new facilities*

Developing meaningful, long-term collaborative partnerships continues to remain a priority. CSIRO provided a detailed submission to the Federal Government's Issues Paper *Closer Collaboration between Universities and the Major Publicly Funded Research Agencies* where we reaffirmed our commitment to collaboration and offered a number of detailed recommendations as to how this might be improved.

CSIRO remains the largest single participant in the CRC Program; we are a participant in 50 of the 71 CRCs with a total expenditure (in 2003–04), including in-kind contribution, of approximately $73 million. We are currently involved in 15 bids for Round Nine of the Program. With university colleagues, CSIRO staff supervise or co-supervise more than

100 postgraduate research students annually through this Program. In 2003, we developed and implemented new criteria and processes to enhance the way CSIRO makes its investment decisions with respect to CRCs and to provide ongoing review of performance and governance of the CRCs with respect to CSIRO's contribution. This has significantly streamlined and provided greater consistency and efficiency in our dealings with CRCs.

In addition, within the Flagship Program, we are actively developing collaborations with partners from industry and academia. This trend is expected to increase. At the time of writing, some 34 collaborative partnerships are in place and spread over industry, government and semi-government agencies, as well as Australian and international universities.

CSIRO is committed to strengthening ties and increasing collaboration with universities. More than 2 600 of CSIRO's 6 500 staff are located on or adjacent to university campuses and this is set to increase as a result of our recently developed property consolidation plans for Sydney, Melbourne, Brisbane and Townsville. Over the last 12 months we entered into discussion with both Monash and James Cook universities on the potential for relocation of CSIRO laboratories to their campuses.

CSIRO, the University of Western Australia and the Curtin University of Technology formed the Western Australian Energy Research Alliance to attract and develop world-leading, industry-focused R&D for the oil and gas industry. CSIRO Marine Research has jointly sponsored a unique and very successful PhD program with the University of Tasmania, which involves CSIRO and UTas staff teaching and supervising students together.

In the course of the activities described above we have received helpful feedback to help us improve our collaborative practices. During 2004–05, we propose to establish a formal process to provide regular quantitative and qualitative feedback on our collaboration with our research partners. (In the light of other priorities this activity was not pursued in 2003–04 as originally intended).

3.2 Service the needs of government for informed policy setting

Success measures:

- *Engagement with the federal and state/territory governments*
- *Government satisfaction with CSIRO*

This past year CSIRO has worked hard to service the needs of governments for informed policy setting. This activity also enhances the capability of our scientists and management to contribute to broader issues and to strategically engage with, and influence, governments. CSIRO made more than 20 submissions to Commonwealth and State Government inquiries covering such areas as collaboration between universities and publicly funded research agencies; aviation safety; future energy supply; research infrastructure; impact of invasive species; salinity; the role of R&D in industry cluster development; and commercialisation of science. In addition, CSIRO staff provided parliamentary briefings on a number of topics such as the Flagships Program, Science for Global Development and Nanotechnology.

CSIRO provided comprehensive submissions, verbal reports, presentations and seconded several staff members to the 2003 Government research review process.

We also instituted a formal program to provide advice to the Federal Government involving regular meetings with Ministers, Departmental Secretaries, other Agency Heads, and Ministerial and Departmental staff. This included a regular series of officer-to-officer level meetings with our portfolio Department of Education, Science and Training (DEST), other agency liaison meetings and briefings and the Parliamentary briefing program, together with the provision of formal advice to the Parliament and Governments, both Federal and State.

CSIRO has contributed to State government policy setting over the past year by investing in relationship management at various levels. For example, our Victorian and Queensland State Relationship Managers are working closely with their respective Innovation Departments.

They provide continuous feedback in relation to emerging areas of scientific collaboration and discovery, links between public sector R&D and emerging industry clusters, and opportunities for increasing the scale and focus of strategic local coinvestments. As one result of this engagement, Queensland's Smart State innovation policy framework was underpinned by two new joint ventures (see Section 4.1). In Victoria we remain focused on the opportunities offered by the Science, Technology and Innovation grants as well as the Synchrotron project (see Section 2.4), and have contributed to the policy dialogue around emerging industries such as biotechnology and nanotechnology. Similar initiatives are developing in other States and Territories.

A measure of government satisfaction with CSIRO, based on a formal survey approach, has not been established as initially proposed and will now be pursued in 2004–05. However, the interactions and initiatives described above – combined with formal programs of meetings with Ministers and Departments, structured Triennium Funding briefings and negotiations, and informal meetings – have provided a sound foundation for assessing performance. Ultimately, Government satisfaction is evidenced by recent funding decisions, the significant degree to which advice sought from CSIRO has been reflected in policy development, and in CSIRO membership and invitations to high-level committees and briefings.

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 – surveys show increasing levels*

The Board endorsed CSIRO's Communication Strategy in August 2003. Key features include: the effective positioning of CSIRO's brand and reputation; raising the profile of science within the community; supporting the Flagships Initiative; enhancing interactions with government and industry; and improving communications with staff. To assist and provide leadership in the implementation of the strategy, Ms Donna Staunton was appointed as Executive Director, Communications in March 2004.

The Education and Outreach section on pages 79–80 indicates the success of CSIRO's education programs in reaching their target audiences, and also reports on the highly favourable media coverage achieved by CSIRO during 2003–04. These achievements suggest CSIRO is making a strong, positive contribution to raising 'trust and excitement in science'. (We did not conduct any targeted surveys of these attributes in 2003–04 but will do so in 2004–05.)

Development of our new unified web presence was also finalised during the year (see Section 5.4).

To help facilitate parliamentarians' understanding of science issues, CSIRO was a Gold Sponsor of the Federation of Australian Scientific and Technological Societies (FASTS) *Science Meets Parliament,* which also involved almost 40 CSIRO scientists, and was a silver sponsor of the inaugural *Humanities, Arts and Social Sciences on the Hill* event.

Respondents to our Customer Value Survey are asked how important the CSIRO brand name is to them when choosing an R&D provider. While we did not achieve the quantitative target set for this year (see Table 6), the comparative score, which is significantly greater than 100, indicates that CSIRO's brand name is rated very highly compared with those of alternative providers to the surveyed customers.

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

Customer Value Survey	Year to March 2003	Year to March 2004
CSIRO Score (target)	6.8	6.6 (6.7)
Comparative Score (target)	128	118 (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.*

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

Success measures:

- *Partnerships with other agencies to advance Australia's global development contributions – progress Global Research Alliance water project and obtain funding*
- *Level of global aid funding*
- *More focused and effective international effort*
- *Evidence of impacts on global development (triple-bottom-line)*

CSIRO brings multidisciplinary expertise to bear on problems of international humanitarian concern. Global development continues to be a focus for CSIRO. During 2003–04, CSIRO and AusAID signed a Memorandum of Understanding to cooperate on work in Vietnam in environmental remediation, integrated livestocking and coastal preservation. In addition, in partnership with AusAID, CSIRO leads the World Bank's Development Gateway website on Water Resources Management. The United Nations (UN) and other agencies use this site as the key website on development issues. In seeking to ensure that Australia secures more of the global funding available for humanitarian research, two full Gates Foundation Health Initiative proposals have been submitted ($US20 million and US$17 million respectively), together with seven Welcome Trust 'Animal Health in the Developing World' applications. Early stage AusAid funding ($50K) has been received.

Our work as a foundation member of the Global Research Alliance (GRA) – involving eight other CSIRO 'sister' organisations around the world – has involved collaborative workshops with international partners on themes driven by the UN Millennium Development Goals. One exemplary output to date has been our engagement on a project to develop a water strategy for the Association of South East Asian Nations (ASEAN). CSIRO was also successful in its bid to work on the remediation of the Iraqi agricultural system, in conjunction with SAGRIC of South Australia and Development Alternatives Inc (DAI) of the United States. In addition, in conjunction with DAI, CSIRO was retained to research the Southern Iraqi Marshlands, destroyed through draining and poisoning actions in the past. Economic and community education tools developed by CSIRO Land and Water working in the Murrumbidgee Basin are being used by the United Nations Educational Scientific and Cultural Organisation (UNESCO) as a model for more than 100 catchments worldwide and have recently been adopted in China and Pakistan.

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.

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

Success measures:

- ***Number of significant commercial relationships with rural research and development corporations (RDCs): $10 million threshold***
- ***Number of significant commercial relationships with States: $10 million threshold***
- *Revenue from RDCs*
- *Revenue from governments (non-appropriation revenue)*
- *Customer Value Survey results – RDCs*
- *Growth of targeted regional industries*

CSIRO's State and Regional Partnership team has forged closer ties to our key partners in the regional development area, including the Rural R&D Corporations and State Governments.

Over the past year, for example, we have cemented our longstanding partnership with the Grains R&D Corporation (GRDC) through a strategic dialogue aimed at aligning our joint investment in enhancing the productivity and sustainability of Australia's globally competitive grains industry. Currently CSIRO is involved in more than 100 GRDC projects worth more than $14 million annually. Teams of scientists, together with commercialisation experts, have worked with the GRDC to identify and develop large research opportunities. We are advancing similar strategic partnerships with other Rural R&D Corporations.

A small improvement was evident in the overall Customer Value Score for the RDC customer segment (Table 7), and the number of significant commercial relationships with RDCs ($10 million threshold) has increased from a baseline of one in 2001–02 to three in 2003–04 (Fisheries, Cotton and Grains). The small decline in revenue received from RDCs in 2003–04 (Table 11), may be attributed to drought conditions reducing the revenue RDCs receive from growers in the form of levies available for expenditure on R&D.

The number of significant commercial relationships with State governments ($10 million threshold) has also increased from one in 2001–02 to four in 2003–04 (Queensland, NSW, Victoria, and WA). There was strong growth in 2003–04 in revenue received from Australian governments for contracted and collaborative research.

Table 7: Customer Value Survey Results for RDCs

Customer Value Survey	Year to March 2003	Year to March 2004
CSIRO Score	6.6	6.8
Comparative Score	103	103

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

We have also worked to build partnership clusters with Government agencies, local corporations, universities and other research centres. In Queensland, where we have taken this approach for the longest period of time, the year delivered two exciting new joint ventures:

e-Health Research Centre – This coinvestment between CSIRO (contributing $7.6 million) and the Queensland State Government (contributing $8.6 million) will develop world-class health information (with increased public access) on prevention, diagnosis, monitoring and treatment of medical conditions. The Centre will combine CSIRO's expertise in e-health (through the e-Health Research Centre, part of the new CSIRO ICT Centre – see Section 4.4) with Queensland's extensive tele-health network and e-health experience.

Centre for Low Emission Technology – Queensland's coal and power generation industries are major contributors to jobs, exports, and regional development, but need to improve their efficiency and environmental performance. This new Centre will develop technologies to address these needs. The Queensland Government and CSIRO have each committed $9 million towards the Centre. Tarong Energy, Stanwell Corporation, CS Energy, the Australian Coal Association Research Program (ACARP) and the University of Queensland have also indicated in-principle support to the Centre with possible contributions of $2 million each, bringing total funding to an expected $28 million.

In 2003–04, a detailed analysis was undertaken of the geographical distribution of CSIRO capabilities. This will help to identify appropriate clustering of capabilities that will in turn assist CSIRO to be even more effective in facilitating the growth of targeted regional industries in the future.

4.2 Structure deeper and more meaningful relationships with large corporations

Success measures:

- ***Number 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*

Over the last year, CSIRO has developed a more systematic approach for working with large corporations. We have established dedicated cross-Divisional Client Service Teams to provide a coordinated 'One-CSIRO' approach and worked closely with company executives to identify major 'challenges' corresponding to the key drivers of shareholder value for the particular corporation. In several cases (eg BOC, Coca-Cola Amatil, Orica, Procter & Gamble and 3M) this has led to the identification of a portfolio of exciting business opportunities. All the corporations have expressed satisfaction with this seamless account management process (which we have been using with Boeing for several years).

In one notable example of larger coinvestment, CSIRO Petroleum Resources, Curtin University of Technology and the University of Western Australia, operating as the Western Australian Energy Research Alliance (WAERA), have established a strategic research partnership with Woodside Energy Ltd known as R2D3 (Research to Discover Develop and Deploy). Through this unincorporated venture, Woodside Energy has committed $30 million to fund oil, gas and other energy R&D projects designed to deliver high-impact business driven technology solutions to meet Woodside's current and future needs. Strategic coinvestment and applied R&D programs being developed with Woodside across the full spectrum of its business interests are expected to involve six to eight CSIRO Divisions operating through WAERA. The initial R&D programs will focus on joint oceanography measurements, natural gas processing and oil/gas reservoir characterisation. CSIRO Petroleum manages both the WAERA and R2D3 ventures.

Our new approach to working with large corporations has provided a firm foundation for improved performance into the future, and is reflected in an improvement in Customer Value Survey results for this segment (Table 8). During the year, two deals with large corporations were signed with expected royalties greater than $2 million per annum. The revenue received by CSIRO from large corporations in 2003–04 was $49.5 million, up from $44.2 million in 2001–02. Evidence of impact associated with CSIRO research for large companies is included in the 'Outputs and Outcomes' section on pages 38–78.

Table 8: Customer Value Survey Results for Large Corporations

Customer Value Survey	Year to March 2003	Year to March 2004
CSIRO Score	7.1	7.3
Comparative Score	106	107

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

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

Success measures:

- ***Number of significant commercial relationships with SME growth stars: $0.1 million threshold***
- *Revenue from SMEs*
- *Customer Value Survey results – SMEs*
- *Impact of research for SMEs*

SMEs account for 70 per cent of jobs growth in Australia and nearly 50 per cent of total R&D performed by Australian companies. CSIRO is currently involved in approximately 2 000 contracts with SMEs per year. We have made

significant improvements in the way in which we engage with SMEs, in particular streamlining the contractual process through the implementation of *FastTrack* (see Section 5.4).

Over the past year we developed and promoted a program, *Australian Growth Partnerships* (AGP), to support the growth of existing 'star' SMEs having a strong technology foundation and export orientation. The concept behind the AGP proposal, which was promoted to Governments, is that large-scale collaborative R&D projects that link star SMEs with CSIRO and other research organisations will help Australia create the next generation of world-leading companies such as ResMed and Cochlear. Market driven collaborations with star SMEs will further stimulate the growth of the SME sector as well as provide a productive commercialisation vehicle for CSIRO and other research organisations. Such large-scale collaborative R&D projects with star SMEs require external funding to overcome the financial constraints of the SME. Although the AGP funding proposal failed to gain support in the 2004–05 Budget, we are continuing to actively explore the concept with the Federal and State governments.

Customer Value Survey scores for SMEs are shown in Table 9. Improved results for the small enterprise segment were offset by a decline in the medium enterprise segment. The revenue received by CSIRO from SMEs in 2003–04 was $30.1 million, up from $24.4 million in 2001–02. Evidence of the impact of CSIRO's research for SMEs is included in the 'Outputs and Outcomes' section on pages 38–78.

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

Customer Value Survey	Year to March 2003	Year to March 2004
Small Enterprises		
CSIRO Score	6.9	7.4
Comparative Score	106	111
Medium Enterprises		
CSIRO Score	7.8	7.3
Comparative Score	113	104

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

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

Success measures:

■ *Leadership in ICT Research*

Following an external review in 2002–03, the structural framework for the reinvention of CSIRO ICT research was put in place during 2003–04 with the launch of the ICT Centre in September 2003, consolidating staff from two Divisions (Telecommunications and Industrial Physics and Mathematical and Information Sciences). Additional staff from CSIRO Manufacturing and Infrastructure Technology joined the Centre early in 2004. It now has more than 180 staff working in both discipline-based and application-based research and a budget of approximately $40 million. The Centre has a four-pronged strategy for external engagement – collaboration with other Divisions in applied research; coinvestment with multinationals and governments; targeting 'star' SMEs that are likely to grow if injected with CSIRO Intellectual Property; and cooperation with the National ICT Australia (NICTA), DSTO and the ICT CRCs. In December 2003, Dr Alex Zelinsky was appointed as Director of the Centre.

In March 2004, CSIRO's revolutionary MultiBeam Antenna was awarded the 2004 Industry Innovators Award of the Society of Satellite Professionals International and, in May, CSIRO's Panoptic Enterprise Search Engine and its Virtual Critical Care Unit each won Australian Information Industry Association Awards. Other recent achievements include the development of a process for manufacturing spherical dielectric lenses used for radioastronomy and, in partnership with surgeons from the University of Melbourne, the development of a prototype training tool for bone surgery.

Goal 5 – Building One-CSIRO capability and commitment

CSIRO's scope and scale mean that when we act as a single, unified organisation, the possibilities are limitless. Progress has been achieved on migrating the culture of the Organisation to one more epitomised by the statement 'One-CSIRO' – one in which cooperation between disparate parts of CSIRO brings the full breadth of available skills and experience to help identify exciting new 'cross-boundary' science and innovation possibilities and to maximise the effectiveness of assessment, reporting and administrative systems.

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*
- *CSIRO status in targeted 'hot science' areas*

CSIRO's Emerging Science Initiative is one key to enhancing our reputation for scientific excellence and developing breakthrough science and frontier technologies. During 2003–04, the operating and governance arrangements for Emerging Science were significantly revised to provide greater focus and coordination. A key component was development of Divisional Emerging Science Plans which are linked to the PPF-based Divisional Plans. The Emerging Science Plans were assessed by the Emerging Science Oversight Committee (ESOC) for the purpose of monitoring Division-based activities and allocating additional funds (up to two per cent of a Division's base appropriation for 2004–05) to emerging science activities.

The CSIRO Centre for Complex Systems Science, a 'virtual' Centre, has become an extensive network with projects involving 15 Divisions, linkages with nine universities and interactions with at least ten other institutions, six of which are international. It has initiated leading-edge Complex System Science projects and has achieved an unprecedented degree of One-CSIRO cooperation and external partnering. Recent achievements include: in collaboration with the Energy Transformed Flagship, the development of the capacity to identify market bidding strategies of traders in the Australian electricity market; demonstration of the possibility of simulating insect tracking of pheromones; and the development of a theory for the allocation and decay of carbon in plants in ecosystems.

The Social and Economic Integration area catalysed and supported a range of innovative cross-Divisional projects. For example, the 'greener cities' project brings together remote sensing data and social and demographic information to provide new insights into the health impacts of urban design.

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

Success measures:

- *Improved OH&S injury indicators*
- *Improved OH&S positive performance indicators*
- *Improved safety culture*
- *Implement the Program Performance Framework across the board*
- *Management of performance (Insight Survey results)*
- *Complete development of governance framework*
- *External assessment/benchmarking of relevant governance, OHS&E and performance management processes: other agencies adopt relevant One-CSIRO practices*

We have continued to make very good progress in OH&S with improved performance and a

positive change in the safety culture across the Organisation. Results from the recent staff survey indicate that 87 per cent of staff believe CSIRO is doing a good job in managing safety. As at June 2004, the majority of CSIRO Divisions had achieved, or exceeded, performance targets set for the year and no Divisions were ranked unsatisfactory. The Average Lost Time (through injury) Rate has continued to decrease reflecting improved management of return to work programs. Further details on OH&S performance are provided on pages 103–107.

The new Program Performance Framework (PPF) that emphasises both science quality and path to market has been further developed and rolled out; it is now used routinely for reporting and has become the basis for framing all Divisional Plans. The PPF has been selected as an example for inclusion in the Department of Prime Minister and Cabinet's 'better practice' guide on performance reporting.

Our continued focus on our learning and development framework has emphasised the importance of enhancing the skills of our managers in conducting performance-related discussions with their staff. A performance coaching pilot has been conducted across four Divisions, designed to help managers to more effectively conduct performance-related discussions, including giving positive performance feedback and redirecting poor performance. We have continued to ensure that CSIRO's individual performance management and rewards and recognition systems actively support a strong performance culture and align with CSIRO's Strategic Plan. CSIRO staff responses in the Insight Poll indicate significant improvement over the past year in relation to performance management – up five percentage points.

Significant progress has been made in further developing CSIRO's governance framework. During 2003–04, the Board reviewed and agreed on the formal charters for the operations of the Board and its three sub-committees and reviewed and issued a new set of *Directions to the Chief Executive.* Management commenced a project to review all existing policy aimed at adoption of a standard format; a clear distinction between policy, procedures and guidelines; and easy accessibility to all policy in a single place on the CSIRO intranet. A major revision to the Organisation's enterprise risk management profile was undertaken as well as the development of a comprehensive fraud risk assessment. CSIRO retained a four-star ranking in Comcover's annual risk management (three-star rating is the average outcome for Comcover fund members).

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

Success measures:

- ***Customer Value Survey results – Overall Value***
- *Number of active customer service teams*
- *Increased amount and share of revenue from top accounts*

Through the use of cross-Divisional Client Service Teams (CSTs), CSIRO is enabling scientists from across the Organisation to work in a cohesive and One-CSIRO manner and grow CSIRO's business development activities with various customer segments. The CST structure provides a single window into all of CSIRO, enabling large corporations to draw on CSIRO's wide-ranging expertise to help them solve some of their biggest challenges. The CST approach is being used to establish deep interactions with companies. In 2003–04, CSTs had detailed engagement and ran workshops to identify research and partnering opportunities, with organisations such as Procter & Gamble; BOC; 3M; National Starch; Holden/General Motors; and the UCB Group. These new activities complement the existing CST-based relationships with Boeing, Orica and Woodside. CSTs were also formed for public sector partners like Victoria, Queensland, the GRDC (see Section 4.1), and the Gates Foundation.

In 2001, CSIRO commenced a systematic assessment of our customers' views using an internationally-benchmarked Customer Value Survey. Quarterly returns from an average of 150 of our customers (large and small, public and private) allow us to continually track our progress and identify ways to improve our customer relationships. For the year ending June 2004, CSIRO was ranked above average on the headline measure '*overall value*' (Table 10).

Table 10: Customer Value Survey Results: Overall Value

Customer Value Survey	Year to March 2003	Year to March 2004
CSIRO Score (target)*	7.0	7.0 (8.0)
Comparative Score (target)	108	109 (110)

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

We achieved world-class ratings on '*willingness to recommend CSIRO to others*', '*willingness to contract CSIRO for further work*' and '*the importance of the CSIRO brand name in choosing an R&D provider*'. Customers rated CSIRO above average on '*overall quality*', '*products and services*' and '*processes and people*'. The only area where alternative suppliers are rated better is on overall price. This may not be a major issue because our customers have rated us high on willingness to reuse even at the prices we charge, because of perceived value-for-money.

The revenue earned from our top five customers in 2003–04 was $41.5 million (14.0 per cent of total research and services revenue) compared with $40.4 million (14.7 per cent) in 2002–03.

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

Success measures:

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

CSIRO currently spends approximately $74 million annually in providing IT services across the Organisation, employing more than 300 staff, both corporately and in Divisions. Standardisation of IT systems throughout CSIRO is critical to the successful implementation of a number of CSIRO-wide initiatives such as improved project management. During 2003–04, the CSIRO IT strategy was developed and Phase I of its implementation has begun through restructuring of IT delivery in the Sydney basin. When fully implemented across all CSIRO sites, all non-research-based IT staff will be managed at the enterprise level for improved career development and better coordination of services, and there will be significant rationalisation of IT infrastructure purchases and operation (designed to improve security and save costs). Further progress was made during the year on rationalising our library services, including an increasing use of electronic journals and improved knowledge management. The first phase of the *CSIRO.au* web project, which included finalisation of the technology platform, information architecture and the 'look and feel' of the site, was completed in June 2004. This project will deliver a unified web presence for CSIRO with rollout during 2004–05 to provide easily accessible, current information to all interested stakeholders.

FastTrack, a new system for the execution of contracts across CSIRO was implemented during the year – simplifying CSIRO contracts from up to 20 pages to 1–1½ pages of plain English and reducing the time involved from up to 70 days to as little as 24 hours – resulting in very positive feedback from clients.

Other examples of building the One-CSIRO capability include the introduction of CSIRO-wide procurement for a number of products and services (see Section 6.4); centralisation of pay services; and improvements to the CSIRO On-Line recruitment system.

The overall assessment by staff of *working relationships* and of *work organisation and efficiency* in the September 2003 Insight Survey, returned a result of 129, a two point improvement on the previous year's result.

Goal 6 – Securing a financial foundation for growth

A stable and growing financial platform is the key to ensure CSIRO's ongoing capacity and impact. Confirmation of Triennium Funding for 2004–07 and the new funds for the Flagships Program have provided greatly enhanced certainty for CSIRO and its staff.

Our overall financial performance during 2003–04 was very gratifying (see Table 11). Total external revenue growth of 7.6 per cent to $320 million was very close to our budget of $322 million. A 60 per cent increase in intellectual property revenue met our target of $22 million, and there was a $25 million 'bottom line' improvement over the $30 million deficit budgeted.

Table 11: Financial Summary

	1999–00	2000–01	2001–02	2002–03	2003–04	2003–04 CSIRO Group[5]	CSIRO Strategic Plan (2003 to 2007) Budget for 2003–04
	$m	$m	$m	$m	$m	$m	$m
REVENUE BY SOURCE:							
Co-investment, Consulting and Services							
Australian Private Sector	67.9	68.6	68.6	77.8	79.6	83.1	
Australian Government	68.6	66.8	75.6	76.8	87.0	89.1	
Research and Development Corporations[1]	40.7	40.8	41.6	42.6	40.0	42.7	
Cooperative Research Centres	30.0	27.6	26.7	32.0	33.1	33.4	
Overseas entities[2]	20.5	31.0	35.3	34.3	33.0	33.0	
Not classified by source	4.9	5.2	0.2	0.0	0.0	0.0	
Work in Progress/Deferred Revenue adjustment	-0.1	-7.0	2.1	-1.9	1.4	1.4	
Co-investment, Consulting and Services	232.5	233.0	250.1	261.6	274.1	282.7	291.0
Intellectual Property, Royalties etc	8.3	9.3	16.9	13.8	22.0	22.1	22.0
Total Research and Services Revenue	**240.8**	**242.3**	**267.0**	**275.4**	**296.1**	**304.8**	**313.0**
Other External Revenue (including interest)[3]	27.5	21.7	58.5	37.0	23.8	24.4	9.0
Total External Revenue	**268.3**	**264.0**	**325.5**	**312.4**	**319.9**	**329.2**	**322.0**
Appropriation Revenue[4]	**500.3**	**497.0**	**509.5**	**532.3**	**568.6**	**568.6**	**568.0**
Total Revenue	**768.6**	**761.0**	**835.0**	**844.7**	**888.5**	**897.8**	**890.0**
Gain/(Loss) on sale of assets	9.4	10.2	21.6	-2.0	5.0	5.0	9.0
Less: Expenses	775.1	784.3	809.6	864.4	898.9	908.2	929.0[6]
Operating Result[4]	**2.9**	**-13.1**	**47.0**	**-21.7**	**-5.3**	**-5.3**	**-30.0**

Notes:

1. *RDC income has been impacted by drought, with some RDCs experiencing a reduced flow of levy income as a result of production declines in their industry. (This was particularly the case for rice and cotton industries). The drought related reduction in RDC income has a flow-on effect on the RDC research investment through CSIRO.*
2. *Revenues from overseas entities have been impacted by the significant increase in the value of the AUS$ against the US$ in 2003–04.*
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 1July 2003.*
5. *'CSIRO Group' includes CSIRO and its 50 per cent interest in the external revenue of the Food Science Australia joint venture ($9.3 million).*
6. *The Strategic Plan records total expenses of $933 million minus $4 million in overhead savings = $929 million.*

6.1 Secure greater Federally funded support for CSIRO science investment

Success measures:

- **Appropriation Revenue**

This year's Federal Budget included increased funding for CSIRO from a successful Triennium Funding Agreement bid as well as a significant increase in funds for Flagships ($305 million over seven years). The Budget provided funding for the next triennium totalling $1 665 million; including the additional funds for Flagships, this represents an effective 17.5 per cent increase in total appropriation for the next three years compared to corresponding 2000–01 to 2002–03 period.

CSIRO's appropriation for 2004–05 is $576.5 million. After adjusting for the $11.9 million (transferred to the Department of Industry, Tourism and Resources with the National Measurement Laboratory) this represents an increase of $27 million over the baseline forward estimates – just $3 million short of our target $30 million increase.

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)*

In 2003–04, CSIRO earned IP licence and equity revenues of $22 million and put in place a range of strategies to increase future revenues in line with the targets set in the Strategic Plan. In addition to many technology licences and assignments, we also formed and took up equity in the following spinout companies:

- ComEnergy Pty Ltd – dedicated to the commercialisation of technology which allows coal mines to utilise waste streams (methane, coal waste) to generate electricity
- Intellection Pty Ltd – provides mineralogical solutions, services and systems for the international minerals industry
- Carbon Management Group Pty Ltd – providing management services in the area of carbon accounting, trading and advice
- PolyNovo Biomaterials Pty Ltd (formerly known as PolymerCo Pty Ltd) – developing applications in the field of biomaterials which may be used for bone repair, drug delivery, stents and dental applications

- HRZ Wheats Pty Ltd – aiming to develop new varieties of wheat for high rainfall areas
- VacTX Pty Ltd – dedicated to commercialising a new vaccine.

During the year we also resolved a major dispute (and finalised a licensing collaboration) with ASX-listed Benitec Ltd in the area of gene silencing; reduced our equity stake in GroPep Ltd; and identified and prioritised our investment in several promising IP assets such as wireless local area networks and security devices.

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

Success measures:

- *Customer Value Survey results*
- *Subsidy in consulting services activity*

Our objective is to deliver value for money to our customers and to eliminate subsidisation in consulting services and hence free up resources for increased investment in science. We made excellent progress in reducing subsidisation with a 63 per cent reduction in 2003–04 from $24 million to $8.9 million (exceeding our target of 30 per cent) and achieved an above average result for providing value for customers in the Customer Value Survey (see Section 5.3).
A uniform costing and pricing framework is fundamental to the elimination of subsidies and increased customer satisfaction. Accordingly, we conducted a series of value-based pricing workshops during the year to support a wider understanding of costing and pricing principles.

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

Success measures:

- ***Overall financial result***
- ***Overhead and support costs***
- *Purchasing costs*
- *Research support processes*
- *Overhead ratio*
- *Investment capacity*

During 2003–04, we reviewed procurement, asset management and associated business processes to reduce overall costs. Highlights in 2003–04 include realisation of the targeted $4 million in procurement and asset management savings for re-investment in science. These savings were gained across a number of One-CSIRO initiatives, including:

- the successful pilot of an e-procurement solution with a potential organisation-wide rollout in the first half of the next financial year
- the revision of existing procurement policies aimed to increase transparency and accountability for all purchases
- the revision of procurement policies and practices for the engagement of consultants modelled more closely to those which apply in the Australian Public Service and providing greater attention to strong governance to ensure effective implementation
- the tendering for five national contracts for One-CSIRO products in the areas of chemicals, labware, electronic components, office machines, and stationery with formal contracts to be established late in 2004
- the pilot and implementation of an expense management system aimed to reduce the amount of manual effort associated with the clearance and reconciliation of credit card and associated expenses.

A favourable operating result compared to budget (see Table 11) provides an improved equity result which strengthens the Organisation's capacity for investment in future years.

Delivering impact from our science

CSIRO's output and outcomes framework

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

Figure 1: CSIRO's Outcome-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

** As amended November 2003*

These 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 Output-Outcome 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.

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.

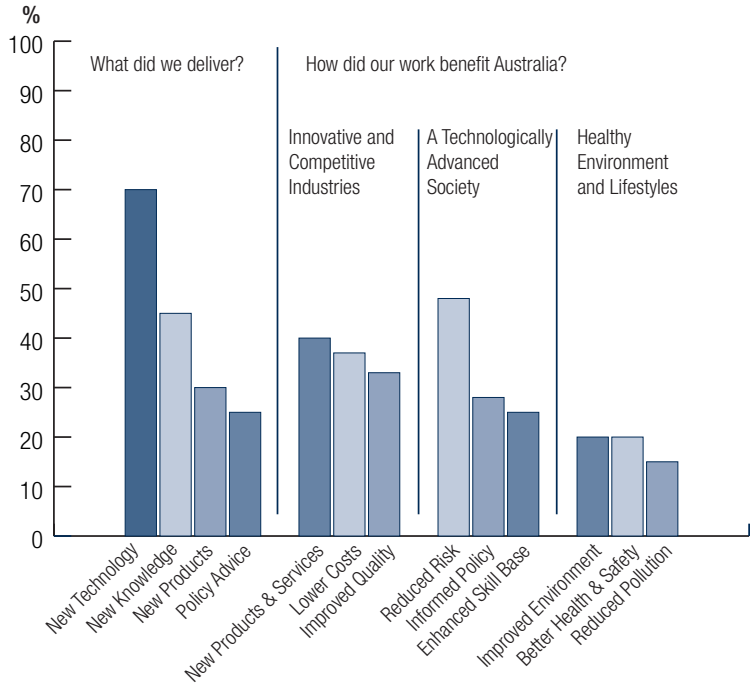
These four types of outputs contribute to economic, social and environmental benefits in a variety of different ways but, specifically by contributing to:

- lower/more competitive production costs
- improved quality of goods and services
- new products, services and businesses
- reduced risk (economic, environmental and/or social)
- development of skills (enhanced human capital)
- improved human health, safety and well-being

- informing policy (cost-effective public programs)
- reduced pollution
- improved environmental health.

Chart One illustrates how the achievements described in the following pages are distributed across these different types of outputs and outcomes. However, this CSIRO-wide view disguises the fact that the nature of outputs and outcomes varies across the four research groups. This variation can be seen by comparing Charts two to five. For example, the largest category of outcomes in the IT, Manufacturing and Services Group is *'new products, services and businesses'*, but in the Sustainable Minerals and Energy Group the largest category of outcomes is *'reduced risk (economic, environmental and/or social)'* followed closely by *'lower/more competitive production costs'*.

Chart 1: CSIRO - Overview of Selected Achievements, 2003–04*



* *This chart shows, for example, that ~70 per cent of the achievements described in the text involve delivery of 'new technology' and ~25 per cent involve the delivery of 'policy advice'. Each of the selected achievements has been allocated to a maximum of two of the four output categories and a maximum of three of the nine outcome categories. (Percentages therefore add to more than 100 per cent). Given the nature and breadth of some of the achievements, the allocation process necessarily involves an element of subjective judgement. The labels on the horizontal axis have been abbreviated.*

Chart 2: Information Technology, Manufacturing and Services

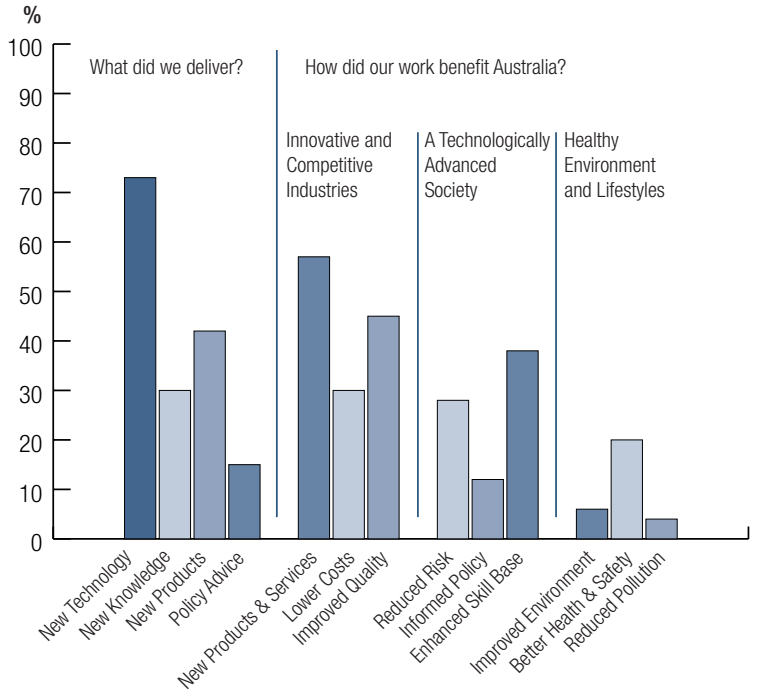


Chart 3: Sustainable Minerals and Energy

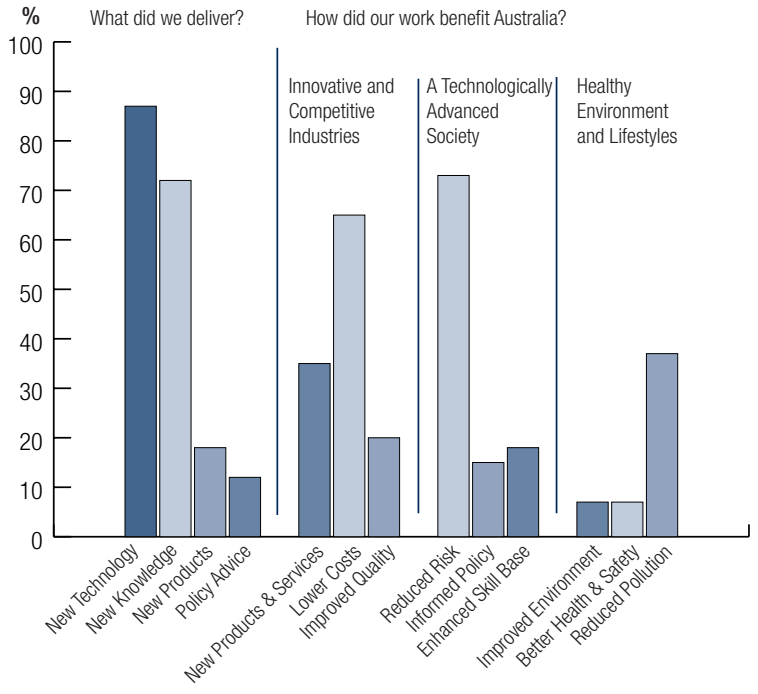


Chart 4: Environment and Natural Resources

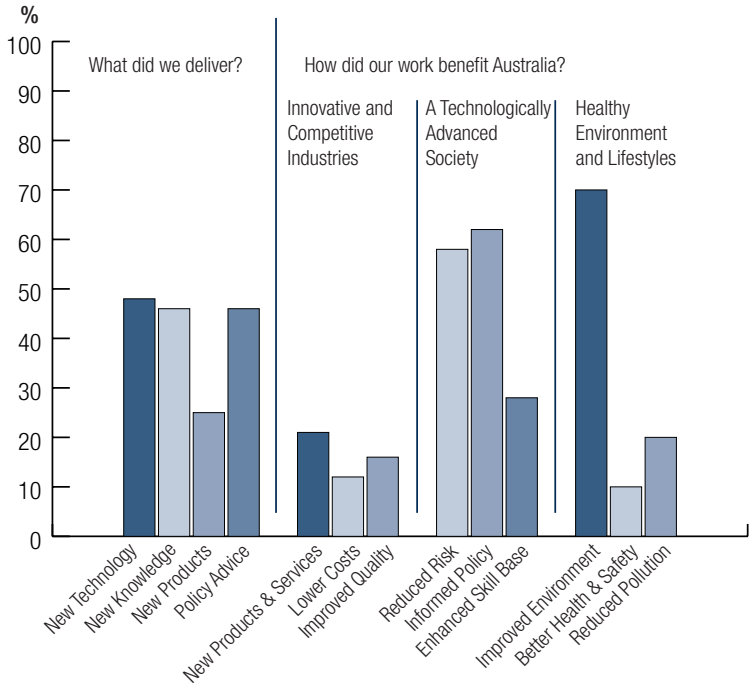
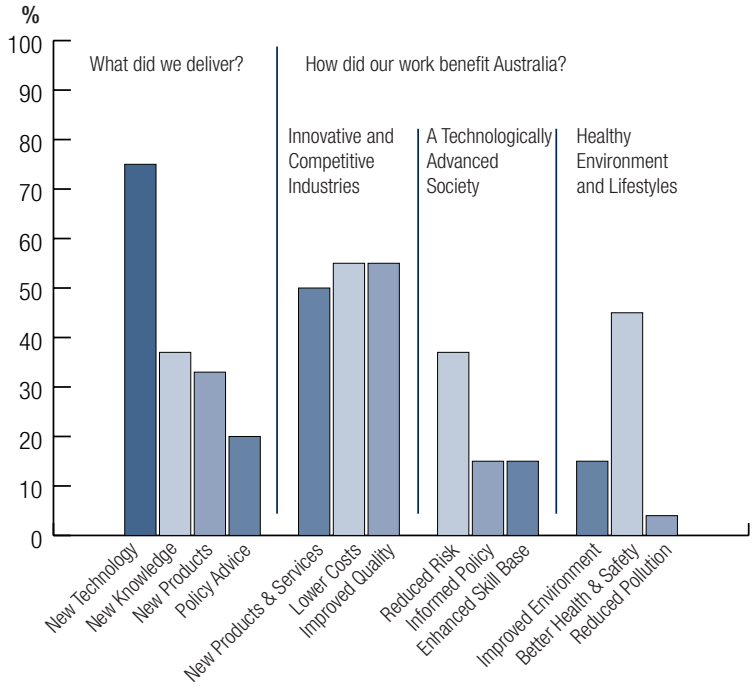


Chart 5: Agribusiness and Health



Contributing to National Research Priorities

As stated on page 18, in 2003–04 approximately 80 per cent of CSIRO's overall science investment was aligned with NRPs.

Under the description of each of the following achievements, we have inserted a small chart that graphically illustrates how the achievement aligns to the Government's National Research Priorities. In each case, where the achievement is aligned to a particular priority goal, its contribution has been classified as follows:

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).

Where the achievement is directly associated with one of the new Flagship Programs, this is indicated in parentheses after the title of the achievement.

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 well-being 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 well-being 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/priorities/default.htm.

Information Technology, Manufacturing and Services

High-Speed Automated Test for Dark Wool Fibres

Outputs:
CSIRO has developed a high-speed automated test for dark and medullated fibre contamination. The Australian merino wool clip has low dark fibre contamination, which has long been a competitive advantage for Australian wool, resulting in a high price premium. The importation of exotic sheep breeds into Australia has increased the risk of dark fibre contamination, resulting in a perception of lower quality and some discounting of Australian wool.

Outcomes:
Current tests for contamination used by the Australian Wool Testing Authority (AWTA) are manually based and costly. This new technology will significantly reduce testing costs and the turn-around time for pre-sale tests which are commissioned by woolgrowers from the AWTA. Confirmation of low contamination levels for Australian wool will help protect price premiums for Australian wool growers.

C2

Detection and removal of dark fibre contamination assists wool growers to achieve a premium. Photo: CSIRO Textile and Fibre Technology

New Scheduling System for the Royal Australian Navy

Outputs:
The Crew Boat Mission (CBM) scheduling system, developed with the Defence Science and Technology Organisation (DSTO) for the Royal Australian Navy, provides a schedule for all patrol boat missions over a year while simultaneously allocating crews and boats. The underlying mathematical problem of scheduling with multiple simultaneous assignments is extremely difficult. A new approach was developed, leveraging off existing background intellectual property.

Outcomes:
The system was used in the evaluation of tenders for the Navy's replacement patrol boat project to ensure that the maintenance regimes required by the boats could be scheduled around the required missions. Analysis of multi-crewing scenarios using CBM were also key inputs in determining how many crews to use. These decisions are critical to the ongoing performance of the patrol boat fleet, and hence to the security of Australia.

C4 D1 D4

Advanced Flight Software

Outputs:
Improved flight software for the F/A-18 Hornet aircraft has been developed by CSIRO and the Defence Materiel Organisation, drawing on a combination of 35 year's experience in aviation.

Outcomes:
The software has contributed to improvements in pilot steering guidance and control. The new technology has been incorporated into software in Australia's defence aircraft, keeping the pilots and planes safer and contributing to national security.

D5 C4

New Approach to Asset Management

Outputs:
Working with a large Australian company with significant infrastructure assets, CSIRO has developed innovative sample survey methodology and sophisticated models for estimating the life-span of assets. The approach differs from other approaches to infrastructure asset management, and has produced substantial intellectual property which is being leveraged in other infrastructure management areas.

Outcomes:
The new approach enabled the company to obtain good estimates of capital expenditure requirements and establish repair/replacement policies by sampling only a small number of sites (rather than an audit of all sites). The results provided an accurate measure of the risks and capital investment needs well into the future, saved considerable time, and improved accuracy/reliability. The saving to the company was quantified at several million dollars.

C4 C5

Analysing Landcover

Outputs:
In collaboration with the Australian Greenhouse Office (AGO) and the New South Wales (NSW) Department of Sustainability, Infrastructure and Resources, an operational perennial vegetation monitoring system has been developed which records changes in landcover in NSW from 1972 to the present.

Outcomes:
The system provides a comprehensive approach for reporting on vegetation change as part of the NSW Government's vegetation reforms. It is also consistent with a national program commissioned by the AGO which assesses, on a continental scale, the amount and rate of clearing and replanting. This information is used in the calculation of the nation's greenhouse performance for the National Carbon Accounting System.

A5 C4 A7

Boron Molecular Sold

Outputs:
Boron Molecular Ltd, a company spun-out of CSIRO in 2001, is a knowledge-base provider to the chemical and drug discovery industry in Australia. Its main outputs are novel chemical templates and leading chemical compounds for use by drug discovery companies in their development of new and replacement products.

Outcomes:
Over the past few years Boron Molecular has developed its production base and recently signed an agreement with Librarion Ltd in the United Kingdom (UK) to collaborate on the development and co-marketing of novel chemical compound libraries for drug discovery. The company was recently acquired by Xceed Biotechnology Ltd, which will help to secure a sustainable future for the company and for the specialised chemical industry in Australia.

New Biodegradable Polymer

Outputs:
There has been a rapid growth in the area of tissue engineering which has led to a requirement for new types of biodegradable polymers. CSIRO has developed a biodegradable polymer that can be formulated as an injectable gel which cures in-situ or on-demand, promotes tissue growth, and has a controllable degradation rate.

Outcomes:
A new spin-off company, PolyNovo Biomaterials Pty Ltd (formerly PolymerCo Pty Ltd), has been established by CSIRO and Xceed Biotechnology Ltd to develop the new platform technology. CSIRO and Xceed will each own 50 per cent of PolyNovo and Xceed Biotechnology will invest $5.1 million in the new company. The company's research will be directed towards tailoring the polymer for applications in orthopaedics, orthodontics, drug delivery, wound care, tissue engineering and cartilage repair (more information see page 10).

C3

Revolutionary New Process for Polymer Synthesis

Outputs:
CSIRO, in a strategic alliance with DuPont has developed a revolutionary new process, Reversible addition fragmentation chain transfer polymerisation (RAFT), for polymer synthesis. RAFT provides control over the formation of polymer structures and offers the ability to tailor these materials for different applications.

Outcomes:
The technology developed under this strategic alliance will lead to products as diverse as cleaner, greener car paints, improved textile ink jet printing, tyres with better rolling performance, and flocculants for water purification. Two CSIRO patents relating to RAFT have appeared as the first and tenth most cited patent families in a survey of papers published in the chemistry and related sciences field in 2002.

C1 C3

Luneburg Lens Development

Outputs:
CSIRO has developed an innovative process for manufacturing low-loss, low-density dielectrics that may scale to low-cost mass production. This material would be suitable for spherical Luneburg dielectric lenses for satellite communication or radioastronomy applications. The process has been used to construct a one-metre spherical dielectric lens that has been delivered to the Australia Telescope National Facility as a technology demonstrator for the Square Kilometre Array (SKA). The SKA is a global science project which aims to build an ICT-enabled radio telescope.

Outcomes:
The new one-metre lens demonstrates low dielectric loss and good performance as an antenna that validates the concept of low-cost manufacturing using moulded sections. Participating in the development of this technology forms part of Australia's commitment to the SKA project and has the potential to generate significant economic impact.

C2 C3 C1

Panoptic Search Engine

Outputs:
Panoptic is an advanced search engine for web sites, portals, e-commerce and customer services that delivers the most relevant results in an easy-to-digest form and does it almost instantly. Panoptic was developed by researchers at the Australian National University and CSIRO. CSIRO's Panoptic team also delivers high-quality advice on search strategies to its customers.

Outcomes:
Panoptic makes information, products and services highly accessible, which means increased profitability (eg from increased sales) and improved productivity (eg from streamlined web management processes) for businesses, and greater satisfaction for consumers and knowledge workers. Panoptic has been taken up by customers including the ABC, NineMSN and numerous Universities and government departments.

C4 C2

Precision Location Technology

Outputs:
CSIRO's Precision Location Technology (PLT) tracks the positions of multiple moving objects, in real time, to an accuracy of 20 centimetres within a defined tracking area. It provides superior accuracy and resistance to interference than can be achieved with the Global Positioning System (GPS). Data from small wireless transceivers attached to the objects being tracked can be displayed in real time or stored in a database and delivered to devices including television, the internet and mobile personal data assistants and phones.

Outcomes:
CSIRO is working on a commercial-in-confidence basis with a number of Australian and

international organisations on commercial trials of the technology. Potential areas of application include competitive sporting events (enhanced audience experience and more effective regulation); asset tracking (flexible, reliable management of the movement of valuable assets); farming (management of livestock and their impacts on pasture and environmental resources); and vehicle automation (monitoring of autonomous vehicles to improve safety and efficiency.

C2 | C1 | C4

Surgical Training Simulator

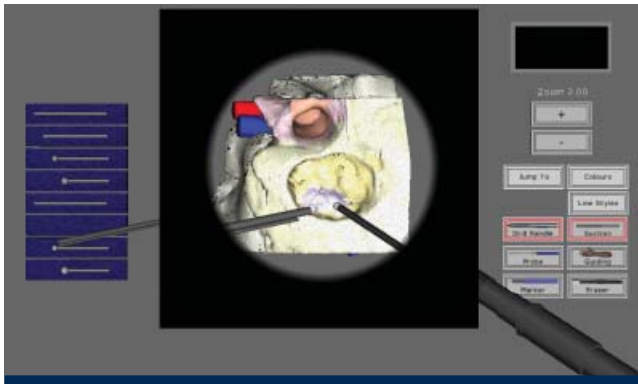
Outputs:

In a project funded by the Centre for Networking Technologies for the Information Economy (CeNTIE), and in partnership with surgeons from the University of Melbourne, CSIRO has developed a working prototype of a training tool for temporal bone surgery. By interacting with the virtual environment, and linked in real time, a trainee can be guided through a simulated operation by a surgeon thousands of kilometres away. The CeNTIE project is supported by the Australian Government through the Building on IT Strengths (BITS) Advanced Networks Program.

Outcomes:

Over 50 surgeons have provided detailed feedback which indicates a high degree of acceptance and strong engagement with the teaching scenarios. Trainee surgeons benefit by being able to develop skills before practicing on cadavers and long before they encounter real patients. Experienced surgeons benefit as they can use the system to practice rarely performed procedures or to learn new or modified techniques. Patients benefit by having more confident, experienced surgeons conducting their operations.

C2 | C1 | C4 | C5



An image from CSIRO's temporal bone drilling simulation. Photo: ICT Centre – Collaborative Surgical Training

Virtual Critical Care Unit Adopted

Outputs:

Critically ill patients in remote locations may require access to specialist medical services that are often only available at larger centres, or which may not be available locally at all hours. The Virtual Critical Care Unit (ViCCU™) system consists of a trolley placed by the patient's bed which communicates with a specialist's station at the main hospital. Using next generation broadband internet technology this provides an 'always on' teleprescence link so a specialist can remotely direct a medical team. This work was conducted with the Centre for Networking Technologies for Information Economy (CeNTIE) in collaboration with the Wentworth Area Health Service (NSW).

Outcomes:

The system has been delivered to the Blue Mountains and Nepean Hospitals with high-speed connectivity provided by the State Rail optical fibre network. Patients will be the main beneficiaries through improved access to specialist medical services, reduced delays in obtaining care and reduced risks associated with patient transport. Medical staff at remote locations benefit from improved access to specialist advice, resulting in speedier diagnosis and immediate commencement of appropriate treatment.

C2 | C4 | C1 | B4

Next Generation Space Instrumentation

Outputs:
State-of-the-art optical components have been supplied to the Jet Propulsion Laboratory in the USA for a space interferometer, part of the National Aeronautic Space Administration's (NASA's) New Millennium Program, 'Space Technology 7'. The components are made to exacting specifications requiring ultimate precision.

Outcomes:
These components will help NASA determine the suitability of different technology platforms for the next generation of space instrumentation. The project also builds on CSIRO's rapidly increasing international reputation for fabricating precision optical instruments. Improved skills have applications in new science fields such as in synchrotrons and national ignition facilities.

C2 C3

Towards Safer Aircraft Structures

Outputs:
There are many applications such as structural monitoring, traffic control and mobile phone networks where very large numbers of sensors or active elements are used. In collaboration with NASA and Boeing, CSIRO has developed a robust and scalable system for aerospace applications to demonstrate a new approach to solving problems. The system handles large amounts of data, avoiding network saturation and central controller failure.

Outcomes:
The demonstrator system built for NASA can detect and evaluate high-speed particle impacts, has no central controller, handles data from many sensors, and makes intelligent decisions based on damage evaluation, diagnosis and prognosis in a distributed system. CSIRO's growing expertise in understanding emergent behaviour in multi-agent systems may lead to major breakthroughs affecting many technologies in which large amounts of data are handled.

C1 C2 C3 C4

Detecting Hidden Targets

Outputs:
In its present form, the successful SiroPulse II high resolution security radar system requires an operator experienced in radar technology to interpret the received data stream. An interactive 3D-display software module has recently been developed that enables multiple data sets to be combined in a manner that significantly improves the visualisation and identification of hidden target objects.

Outcomes:
The new diagnostic module significantly improves the detection of hidden targets, enhancing national security and the associated social benefits. Increased world-wide sales for the SiroPulse II system have already been generated as a result of the new 3D module, and more are anticipated.

D4 D5 C4 B4

New Monitoring System for Offset Printing

Outputs:
Offset printing relies on the selective coating of printing plates with a layer that accepts ink and a thin layer of dampening solution applied to non-image areas, to repel ink. Until now the application of dampening solution has been a subjective judgement by printers based on experience. CSIRO has developed Optiba, the world's first press-wide dampening measurement system. Laser sensing bars are installed inside the press, allowing printers to rapidly assess and adjust the delivery of dampening solution.

Outcomes:
Applying dampening solution subjectively can waste paper and reduce print quality. Optiba enables more economical offset printing, reduced paper wastage, and reduced environmental damage. MAN Roland, the leader in large offset press sales, has evaluated Optiba, exhibited it at the world's premier printing trade show in May 2004, and now offers it as an optional extra to their Lithoman IV commercial press range.

C2 C1

Revolutionary Instruments for Solar Astronomy

Outputs:
CSIRO has provided compact, lightweight, robust, narrowband, tunable spectrometers to IMaX (Instituto De Astrofisica De Canarias), the Solar Magnetometer for the Sunrise Imaging Magnetometer Experiment and other institutions. The product, unique in its field, is a fully characterised tunable spectrometer capable of integration into observatory control systems. It provides the sensitivity of a large telescope in a package that is compact enough to fly from a balloon.

Outcomes:
Significant world-wide sales have been achieved as high resolution spectrometers are increasingly important in solar astronomy. A better understanding of the processes involved in dynamic events such as magnetic fields and matter velocities has been achieved. Further applications outside astronomy include remote sensing from ground, air or space, as well as telecommunications and possible medical applications. The development supports the emerging Australian astronomical instruments sector.

C2 C3

Better Fuel Efficiency [Energy Transformed]

Outputs:
A new generation of vehicles is being developed world-wide using a combination of electric and conventional petrol engines. Working with automobile manufacturers, CSIRO has developed computer models that describe the energy consumption of vehicles with various combinations of multiple power sources.

Outcomes:
Application of the models is providing Australia's automobile manufacturers with improved accuracy in estimates of the fuel efficiency gains possible for hybrid vehicles of varying configurations, aiding progress towards the development of more fuel efficient vehicles.

C2 C4 A4

Energy Efficient Architectural Designs

Outputs:
Architects interested in energy efficiency must select building features that respond to the threats and opportunities that the local climate presents. CSIRO's computer program, Energy Express for Architects (EEA) enables non-residential building designers to estimate energy consumption and cost at the design stage, and facilitates comparison of competing design options to maximise energy efficiency while meeting other design constraints.

Outcomes:
EEA has been licensed to Hearne Scientific Software and was launched in May 2004. It allows architects to evaluate their designs in a fraction of the time compared with current tools which require engineering expertise and are time consuming to operate. As it becomes widely adopted, new and refurbished buildings will consume less energy with lower greenhouse gas emissions and building owners and/or tenants may enjoy reduced operating costs, 'green building' status and improved profits.

A2 C4

Revolutionary Die-Casting Technology

Outputs:
Traditional high-pressure die-casting involves molten metal being injected into a die cavity through tunnels called runners which have overflow zones to reduce/improve internal porosity. CSIRO's new system reduces the overflow and can be applied to most existing machines. In the last twelve months, the key achievements have been to package the technology and make it more robust.

Outcomes:
The new runner systems for aluminium and magnesium die-castings have been licensed to users in Australia, North America and Europe. Manufacturers using die-casting for a wide range of product applications will benefit from reduced process scrap, lower reject rates, reduced cycle time, and lower labour and machine costs. The

technology could conceivably generate savings to the global die-casting industry of up to $100 million per annum.

A2 C1 C2 C4

Tensile testing of ATM castings has revealed improvements in both ultimate tensile strength and elongation. Photo: Mark Fergus

Oxygen/air Mixer for Treating Premature Babies

Outputs:

The Oxymix medical device, developed by CSIRO and NASCOR Pty Ltd, is an inexpensive device conceived for use in developing countries where hospitals have access to medical-grade compressed oxygen, but not to medical-grade compressed air. In such hospitals, when babies are treated for respiratory difficulties or lung disease, the correct level of oxygen is difficult to maintain, possibly resulting in blindness or brain damage. Oxymix provides a reliable way of providing the correct flow rate.

Outcomes:

Oxymix also has a place in the developed world and was launched into the market place in December 2003. It is available to hospitals for a significant discount to conventional blenders, which cost upwards of $2 000, and can provide hospitals with further cost savings as it does not need expensive compressed air supplies and uses relatively low flows of oxygen.

B1

Benefits to the Australian Furniture Industry

Outputs:

The Furnishing Industry Association of Australia (FIAA), with funding from the Innovation Access Program, commissioned CSIRO to deliver a comprehensive industry report entitled *Analysis of Current Production Practices*. Sixty-eight member companies received reports detailing production weaknesses and opportunities for improvement. A suite of analysis software tools has also been developed and a CD made to disseminate the knowledge from three 'showcase' projects established to demonstrate the latest manufacturing technologies.

Outcomes:

The Australian furniture industry needs to improve efficiency to compete internationally. FIAA has now established an ongoing industry technology support service team to help apply the knowledge to individual factories using the CSIRO tools. Zuster furniture manufacturers have achieved a 59 per cent increase in revenue, a 45 per cent increase in the number of units and a 27 per cent increase in return on cost of sales. Other results include a 42 per cent production lead time in one showcase company and a 6.5 per cent overall profit gain in another.

C5 C2 C4

New Receiver for the Parkes Telescope

Outputs:

A new dual band radio receiver for the Parkes radio telescope has been designed, constructed and installed on the telescope as part of the National Facility.

Outcomes:

The new receiver is available for the entire radioastronomy community. It provides the ability to simultaneously observe pulsar emissions at 50cm and 10cm wavelength. This allows improved pulse timing performance, pulsar emission mechanism studies and analysis of the interstellar medium through analysis of scintillation in the two wave bands.

C2

New Receiver System for the Australia Telescope Compact Array

Outputs:
A new 12 millimetre receiver system at the Australia Telescope Compact Array (ATCA), coupled with the existing spectrometer, has opened the possibility of extragalactic studies and discoveries.

Outcomes:
Radioastronomers now have the ability to measure parameters of high density gas in external galaxies. Using the new receiver system the first extragalactic detection of ammonia at the ATCA has been obtained, and the first interferometrically derived temperature map for any extragalactic object using the ammonia transition has been derived.

C1

Multibeam Radio Receiver for the Arecibo Radio Telescope

Outputs:
CSIRO's new 7-beam, dual-polarisation radio receiver was constructed and shipped to the Arecibo radio telescope in Puerto Rica.

Outcomes:
The new receiver will greatly enhance the efficiency of the Arecibo telescope which is commonly used to study the structure of the universe. The delivery and scientific impact of this instrument will enhance Australia's reputation for producing high-quality astronomical instrumentation (more information see page 14).

Discovery of First Double Pulsar

Outputs:
A multinational team using the Parkes radio telescope has found the first instance of two pulsars orbiting each other. The discovery and analysis of the system has been published in the scientific journals *Nature* and *Science*.

Outcomes:
The double pulsar presents the scientific community with opportunites to test theories of gravitation and the formation of radio pulsars and binary stellar systems (more information see page 11).

C1

Tracking Mars Probes

Outputs:
During the year a large number of simultaneous space missions to the planet Mars stretched the world's spacecraft ground station resources. CSIRO used the Parkes radio telescope to track spacecraft en route to and orbiting Mars over a six month period, supplementing NASA's Deep Space Network antenna at Tidbinbilla, in the Australian Capital Territory.

Outcomes:
The use of Parkes allowed several spacecraft missions to be serviced; that is, spacecraft health and science data were received at Parkes while the Tidbinbilla facility was tracking other missions, thereby maximising the scientific return from all those missions. Simultaneous use of the Parkes and Tidbinbilla stations enabled spacecraft navigation measurements to be made. The cooperation has strengthened the CSIRO-NASA relationship.

New Spectrometer for the Mopra Radio Telescope

Outputs:
A digital spectrometer with a 256-megahertz bandwidth has been built and installed on the Mopra telescope in New South Wales.

Outcomes:
The new instrument has boosted the telescope's ability to study molecules in star-forming regions in both our own Galaxy and distant galaxies. It has successfully demonstrated powerful new 'polyphase digital filterbank' technology that the ATNF will use in building new instruments for Mopra and the Australia Telescope Compact Array, and which may be the core signal-processing technology for the Square Kilometre Array.

C2

Discovery of a New Spiral Arm in our Galaxy

Outputs:
Many galaxies in the Universe have a central bulge of stars, with 'spiral arms' of stars, dust and gas that curve out from the bulge. Astronomers using the CSIRO's Parkes Radio Telescope have detected a previously unknown spiral arm belonging to our own Galaxy. The new feature can be traced around a large segment of the Galaxy's circumference.

Outcomes:
The discovery reveals previously unknown details and provides improved understanding of the structure of our own Galaxy.

C1

Sustainable Minerals and Energy

New CRC for Sustainable Resource Processing

Outputs:
CSIRO researchers, mineral companies and other organisations developed a business case proposing the establishment of a new Cooperative Research Centre as the best vehicle for developing technological solutions for progressively and systematically eliminating waste and emissions in the minerals cycle, while at the same time, enhancing business performance and meeting community expectations.

Outcomes:
The CRC for Sustainable Resource Processing was established in 2004. Expected outcomes include better resource utilisation; reduced energy consumption and greenhouse gas emissions; reduced process waste and enhanced co-product values; reduced water consumption; better control of minor elements and their dispersion in the environment; and capture of regional synergies in the resource processing intense areas of Kwinana, WA and Gladstone in Queensland.

A2 A1 A6

Improving Thickener Technology for Minerals Processing

Outputs:
Gravity thickeners are used in mineral processing to separate fine particles from the fluids holding them in suspension. They are crucial to the industry but notoriously erratic and inefficient in operation. Through the AJ Parker CRC for Hydrometallurgy, a comprehensive set of tools and techniques for solving problems with the operation of full-scale thickeners has now been developed.

A thickener at a WMC Resources' operation in Western Australia. Photo: John Farrow

Outcomes:
The new techniques have been used by companies in the alumina, gold, base metals and mineral sands industries to solve a range of processing problems. A recent independent survey of end-users identified direct financial benefits with a net present value of $295 million as being achieved by sponsors as a result of these new techniques.

A1 | A2 | C1 | C2

Adding Value to Lignite

Outputs:
In 2000, Pacific Edge Holdings (PEH) approached CSIRO to establish if patented technology already available could be used in the treatment of lignite from Victoria's Latrobe Valley. CSIRO established the necessary conditions and developed a process that allows most of the water inherent in the Latrobe Valley's notoriously wet lignite to be easily removed to produce char and other carbon based products and for power generation.

Outcomes:
PEH established a pilot plant using the conditions established by CSIRO. The plant captures and reuses the high and low-grade waste heat generated in char production in an efficient process that also produces dried lignite which can be used for power generation (with the associated significant reduction in greenhouse gas generation). The commissioning of a 50 tonnes per hour demonstration plant in the Latrobe Valley is scheduled for the last quarter of 2004.

A4 | A2 | A6 | C5

Commercialisation of QEM*SEM

Outputs:
CSIRO's QEM*SEM technology performs Quantitative Evaluation of Minerals using Scanning Electron Microscopy. In 2003, a company called Intellection Pty Ltd was established as a vehicle for the commercialisation of QEM*SEM technology as a wholly owned subsidiary of CSIRO. Intellection provides 'Services' (testing mineral samples for Australian and international companies), 'Solutions' (interpretation of test results), and 'Systems' (QEMSCAN software and equipment to companies throughout the world).

Outcomes:
Mineral processing companies are achieving economic benefits by applying QEM*SEM technology to perform automated analysis of ore samples with accuracy and speed orders of magnitude better than manual systems, enabling product recoveries to be maximised at a minimum cost. The establishment of Intellection Pty Ltd provides the operational and commercial platform for the delivery of these outcomes well into the future.

A6 | A2 | C4

Australian Science Minister Peter McGauran holding QEMSCAN mineral sample disks after launching the CSIRO-owned spin-out company Intellection in November 2003. Photo: Steve Keough

Geological Storage of Carbon Dioxide
[Energy Transformed]

Outputs:
Working with the CRC for Greenhouse Gas Technologies, CSIRO has developed reservoir models of carbon dioxide movement in deep saline formations. These models enable the evaluation of sites for carbon dioxide storage and incorporate the eventual dissolution of the carbon dioxide into deep saline water where it becomes more dense than the surrounding water.

Outcomes:
Five different deep saline formations around Australia have been evaluated to determine their suitability for carbon dioxide storage. Four of these were assessed as being potentially suitable.

A4 A7

Improving Reservoir Prospectivity

Outputs:
Working with Santos, a major Australian oil and gas company, CSIRO research has led to an improved understanding of carbonate sedimentation and stratigraphy in the East Java Basin in Indonesia. The higher resolution technique allows more precise definition of reservoir characteristics than more conventional methods.

Outcomes:
The improved understanding of reservoir characteristics has enabled the discovery and evaluation of new oil and gas resources. The economic benefits of greater energy security and financial returns related to improved oil and gas exploration success flow to both Santos, its Indonesian joint venture partners and, indirectly, the people of Indonesia.

A6 C2 D2

Reducing Cost Blowouts due to Wellbore Collapse

Outputs:
Wellbore instability occurs when the support provided by drilling on wellbore walls is inadequate to counteract stresses. This instability can lead to wells collapsing. CSIRO's new numerical code, SHALESTAB, analyses complex time-dependent wellbore stability in shales. It enables optimisation of drilling mud design in troublesome shale formations subjected to complex interaction of various processes. The code has been provided to two national oil and gas companies.

Outcomes:
SHALESTAB is used in the development of in-depth understanding of time-dependent stability of high angle and long reach wells in both local and overseas fields. The understanding provides input to the development of technical solutions for managing wellbore instability and curbing associated cost blowouts. A saving of $9 million has recently been achieved in one field in the South China Sea.

A6

North Sea Hydrodynamics Database

Outputs:
CSIRO, in partnership with TNO-NITG in the Netherlands, has developed a quality-controlled pressure and hydrodynamics database for the southern North Sea. An evaluation of pressure and migration systems has identified overpressured compartments, seal integrity and the formation of water density as major problems facing petroleum companies operating in the southern North Sea.

Outcomes:
CSIRO's capability in basin hydrodynamics and seals analysis has been established in Europe and will benefit from continuing industry funding and collaboration with TNO in the Netherlands. Companies operating in the southern North Sea now have an improved understanding of the basin's hydrodynamics – reducing drilling,

exploration and production risks. Other projects in Australia will benefit from the technology developed in this project.

A4 | A6 | C4

Improving Sand Production Prediction

Outputs:
The influx of large amounts of sand into oil and gas wells may result in damage to equipment, loss of productivity and can be a major safety risk. CSIRO has provided a major Australian oil and gas company with a geomechanical model, to allow a better understanding of sand production processes, operating conditions and measures for mitigating the problems and optimising production.

Outcomes:
CSIRO's work has changed the company's view on coarse-grained formations which were previously perceived to be the weakest in the field. It has also helped to explain deficiencies in their existing sand strength model, leading to urgent action to update the model. Recognition of CSIRO's sand production technology has been established with several major operating companies in Europe, the Asia Pacific region and the USA.

A6

From sand failure to sand production – observations inside perforation tunnel (left) and post sand production sample across section (right). Both pictures were taken from laboratory sand production simulation experiments. Photo: Bailin Wu

Predicting Overpressure in Oil and Gas Exploration

Outputs:
The formation of fluid in oil and gas wells can cause a build up of pressure in the well which can be detrimental. CSIRO has provided new insights into the physics of overpressure in wells and its extraction through published papers, conferences and workshops. A new comprehensive and robust prediction methodology has been patented and is being transferred through CSIRO's sponsoring partners.

Outcomes:
Improved understanding reduces the risk of exploration. Prediction of overpressured zones can have substantial value to operating companies in design costs and safety concerns. A saving of $15 million has already been demonstrated for one well, together with an improved perception of risk through an integrated approach to prediction.

A6 | C1 | A4

Knowledge Management for Oil Well Operations

Outputs:
CSIRO has developed an integrated system to use historical information for operational performance improvement and risk evaluation of future oil well completion and workover operations. The system encompasses data storage, quality control, analysis, elaboration of new operational sequences, risk evaluation, cost estimates and reporting.

Outcomes:
The system improves the identification of operational problems (causes and solutions) and the development of contingency plans, provides greatly improved data quality through the application of 'enter data once' and 'report by exception' principles, and provides integration with the client's workflow and IT systems. Full implementation with a client company is in progress and expected to be completed by December 2004.

A6 | C4

Market Support for Australian Clean Coal Exports

Outputs:
Work with the CRC for Coal in Sustainable Development and the Australian Coal Association Research Program has identified the Australian coal deposits which are most suitable for use in Integrated Gasification Combined Cycle (IGCC) power plants. A number of possibilities have been identified for selective mining and/or coal blending to produce optimum products for export to IGCC plants.

Outcomes:
This knowledge has assisted Australian coal companies in planning strategic investments for future expansion. It has enhanced the competitiveness of Australian producers in the emerging overseas market for gasification coals for chemical, fertiliser and near-zero emission power generation. Major coal companies have sold trial shipments from areas under development to overseas gasification plants and have conducted in-house surveys of their coals. This has enabled coal companies to be prepared for the timely introduction of advanced clean coal technologies into Australia, with their consequent environmental advantages.

C4 A4

New Handbook for Sediment Quality Assessment

Outputs:
A new handbook for sediment quality assessment, developed by CSIRO in collaboration with the NSW Department of Environment and Conservation, the University of Canberra and the NSW Environmental Trust, provides state-of-the-art guidance on protocols for assessing contaminated sediments with sensitive new bioassays developed for Australian conditions and new understanding of the process by which contamination occurs.

Outcomes:
Improved sediment assessment protocols enable appropriate targeting of remediation options, and defensible approval of dredging and ocean disposal of dredged sediment. The advances will be incorporated in revisions of the Australian Interim Sediment Quality Guidelines.

A1 A5

New Treatment for Toxic Metals in Waters

Outputs:
Industry and regulators spend millions of dollars annually on sampling and measuring toxic metals in waters. Working with the NSW Department of Environment and Conservation, the Australian Nuclear Science and Technology Organisation, and the CRC for Waste Management and Pollution Control, CSIRO developed a method for better estimating the toxic fraction of metals in waters. This will allow compliance with water quality guidelines for metals to be assessed by most laboratories. At present this can be done only by a select few using complex specialist methodologies.

Outcomes:
The new method enables more complete and rapid assessment of the potential environmental impact of changes to water quality. The new technology will lower costs and enable industry to better manage their effluents within acceptable regulatory guidelines.

A1 A5

New Australian Business Formed

Outputs:
Substantial tonnes of used transformer oil contaminated with PCB are stored around Australia. Currently the oil is shipped overseas for incineration. CSIRO has now developed and patented a hydrogenation technique strong enough to destroy the PCBs, as well as the degradation by-products, while being mild enough to regenerate the transformer oil, such that it can be returned to service.

Outcomes:
A new Australian business, HydroDec Development Corp Ltd, has been formed to commercialise the new process, and a processing plant is being established at Young in rural NSW, providing a boost to the local economy. The plant will provide for the cost-effective and efficient destruction of PCBs in used transformer oil in Australia.

C1

Sirovision

Outputs:
In collaboration with industry partners, Sirovision has been developed as an inexpensive and fast way to build 3D digital models of a highwall mine face from pairs of images taken from a safe distance. The models can then be used to pick out features likely to become unstable when the wall is mined. The only viable alternative technology is laser scanning equipment which costs hundreds of thousands of dollars.

Outcomes:
Sirovision is being used by mines in Australia, North and South America, Africa, and by the Finnish Geological Survey, to gather valuable geotechnical information with a minimum of disruption and far more quickly, easily and cheaply than by other means, such as lasers. Sirovision is also being used underground and is being further developed to suit customer needs – eg for use from helicopters.

A6 C2 C4 A2 D1

Economic Benefits from Coal Preparation

Outputs:
The Blackwater coal preparation plant in Queensland operated by the BHP Billiton Mitsubishi Alliance (BMA) had significant problems distributing coal to its five parallel processing modules, which led to losses of saleable coal. The problem was exacerbated by the very limited area where coal distribution activity could be conducted. CSIRO designed a new hydraulic distributor and tested its capabilities with a one-sixth size model.

Outcomes:
BMA have now incorporated a full-scale unit into the Blackwater plant. There has been a marked improvement in the distribution of coal between the individual modules. The output of saleable coal has increased and there has been no decrease in plant efficiency.

A2

Improved Reporting of Hazardous Pollutants

Outputs:
National Pollutant Inventory (NPI) reporting of trace elements and metal compound emissions is required from larger power stations. A combination of field measurements and theoretical modelling was used by CSIRO and collaborators to show flaws in existing methods for calculating emissions and new, more precise factors were developed for emissions calculations.

Outcomes:
The findings address identified shortcomings in the NPI reporting manual for black coal electricity generators. Improved emission estimation techniques can now be included in revisions to the manual. The new methodology results in reduced variability of over and under reporting the emissions of toxic substances and provides a more direct means for risk based environmental assessments by regulators and generators.

A4 B1 C4

Centre for Distributed Energy and Power
[Energy Transformed]

Outputs:
Initiated by CSIRO, the Centre for Distributed Energy and Power (CenDEP) was formed in March 2002. The Centre has created a focus for Australia to explore and grow a presence in the emerging field of distributed energy and power through research and outputs such

as workshops, conferences and submissions to national enquiries. CenDEP is made up of CSIRO, energy operators, retailers and distributors, local government and state government authorities.

Outcomes:
Global trends and Australian forecasts reveal a growing gap between electricity supply and demand that will not be filled by conventional, coal fired, centrally located large generators. CenDEP is stimulating work to solve the peak demand problem and to provide more efficient, cleaner, more secure energy options to Australian consumers and utilities. CenDEP has enhanced knowledge exchange and the relevance of research activities. Members have had the opportunity to grow their business through participation in projects initiated or facilitated by CenDEP.

A4	A2	B4	D1	C5

CSIRO Energy Centre – an example of sustainable energy in action. Photo: Paul Foley's Lightmoods

Improving Mine Safety and Productivity

Outputs:
The behaviour of mine openings and therefore the safety of the mine is affected by the strength of rock around the mine. To assess the strength characteristics, the mining industry mainly relies on assessments of geophysical data from boreholes. CSIRO has provided new insights into the mineralogical distributions in the clastic rocks of the coalfields and developed computer based analytical techniques to provide a more detailed, cost-effective and reliable means of analysing the data from boreholes than is provided by current alternative methods.

Outcomes:
When applied in open cast and underground mines these techniques enhance safety and productivity. For instance, in underground mines, the data are used in the design and implementation of suitable support systems for the stability of openings. They can also be used for managing the collapse of old work areas, which is an important part of the process of longwall coal mining.

A6	A2	C4	C5	B4

Identifying Mineralised Environments

Outputs:
C-Vista is a method for reliably identifying potentially mineralised environments using airborne survey data. CSIRO has developed advanced algorithms and software to underpin the extraction of geological information from these data. This information is relevant to the minerals industry, government survey organisations and international scientific research organisations undertaking minerals exploration, mine-site monitoring and environmental management.

Outcomes:
In April 2004, CSIRO signed an unincorporated joint venture agreement with the Australian company HyVista Corporation to provide C-Vista as a commercial service. Airborne hyperspectral data will be acquired world-wide and large area multi-flightline data processed to produce seamless mineral mapping products. By more reliably identifying prospective environments before deploying ground personnel, the total costs of mineral discovery are reduced.

A6	C2	C4	A2

New Software for Minerals Exploration

Outputs:
Real time, internet based access and manipulation of geospatial data is critical to minerals exploration. However, this vital information is held across eight government agencies, each with its own data management system and structure. CSIRO has developed the eXploration and Mining Markup Language (XMML) as the foundation for the global interchange of geoscience data. Version One has now been released on the Solid Earth and Environmental Services community public website.

Outcomes:
Using XMML the minerals industry will, for the first time, be able to download data from different sources into a fully interoperable system across geographic boundaries, saving days or weeks of work and removing a significant impediment to exploration. XMML is also set to become the international standard through the International Union of Geological Sciences – Commission on Geoscience Information, and a large consortium of Australian and international collaborators is working towards the deployment of services that utilise the XMML information model.

A6 | C4 | D2 | A2

Environment and Natural Resources

Climate Change Research for Policy Development [Wealth from Oceans, Water for a Healthy Country]

Outputs:
Each year CSIRO's Major Cross-Divisional Climate Program, together with external collaborators, delivers specific scientific outputs including the development of, and applications from, its coupled climate model, climate change assessments and reductions in uncertainty of the underpinning climate science. These outputs are delivered to the Australian Government via reports and briefings to the Australian Greenhouse Office (AGO), and to the international science community through scientific publications and through the Intergovernmental Panel on Climate Change.

Outcomes:
CSIRO outputs are used in policy development. A major report on *Climate Change: an Australian Guide to the Science and Potential Impacts*, edited by CSIRO, was launched by the Minister for the Environment and Heritage, Dr David Kemp, in December 2003. According to the AGO, this report significantly influenced the decision to increase funding for climate change research in the May 2004 Federal Budget. Two CSIRO scientists were also invited to appear before a public hearing of the Senate Inquiry into the Kyoto Protocol Ratification Bill.

A7 | A4 | A2

Regional Climate Change Assessments [Water for a Healthy Country]

Outputs:
Regional assessments of the impact of climate change on the weather and climate of the Northern Territory, Tasmania, South Australia, Victoria, Queensland and NSW were completed. The results were delivered for use by policy makers through comprehensive and detailed reports and high-level briefings.

Outcomes:
The value of CSIRO's work in this area has been acknowledged in a number of ways. CSIRO researchers have been invited to make presentations to the South Australian Parliament and to serve on the NSW Government's Greenhouse Advisory Panel. CSIRO's work was highlighted in a public announcement by the Northern Territory Government in April 2004 and has been incorporated in the climate change section of the Victorian *Alpine Resorts 2020 Strategy.*

A7 | A1

Lifecycle Analysis of Biofuels
[Energy Transformed]

Outputs:
CSIRO, in collaboration with the Australian Bureau of Agricultural and Resource Economics and the Bureau of Transport and Regional Economics, provided assessments of the lifecycle environmental impact of using ethanol and biodiesel fuels. CSIRO also provided assessments of the air quality implications of using blended ethanol/petrol fuels.

Outcomes:
The economic, environmental and social costs outlined, assisted the Prime Minister to make decisions, which were announced in December 2003, on fuel excise. The photochemical smog results have been taken up by the NSW Environmental Protection Authority for use in policy development.

A7 | A4 | A2

Volcanic Ash Detection for Aviation Safety

Outputs:
CSIRO Researchers have developed and patented remote sensing technology for the detection of volcanic ash and sulphur dioxide, a known major aviation safety hazard.

The Ground-based Infra-Red Detection (G-bIRD) system, developed by Tenix with research support from CSIRO Atmospheric Research, during a field trial near Rabaul, Papua New Guinea. Photo: Dr Fred Prata

Outcomes:
Under an agreement with Tenix Industries for the commercialisation of CSIRO's patented technology, a Ground-based Infra-red detector (G-biRD) has been trialled successfully this year at Mount Etna, Sicily. It has the potential to become an integral part of air transport safety systems and further reduce the risks of air travel.

C2

Advanced Time Series for Natural Resource Management [Water for a Healthy Country, Wealth from Oceans]

Outputs:
A uniquely comprehensive 23-year time series of daily remotely sensed surface data of the entire continent and oceans (well beyond Australia's Exclusive Economic Zone), combined with CSIRO-developed best practice data processing and delivery infrastructure, provides new and enhanced products to researchers and to State and Federal Government agencies.

Outcomes:
The dataset enables improved understanding and management of the relationship between agricultural land use and sediment transport to the Great Barrier Reef. Uptake in the agricultural sector is delivering improved yield forecasting (eg dairy, sugar). The Bureau of Rural Sciences is investigating use of the dataset for drought exceptional circumstances assessment and monitoring.

A1 | A3 | A7 | C4

Emissions from Light Metal Production [Light Metals]

Outputs:
Perfluorocarbons (PFCs) are potent greenhouse gases released during the production of aluminium. The first instrument to measure PFCs in the background air over Australia was installed in January 2004 at Cape Grim, Tasmania in a joint operation between CSIRO, the Bureau of Meteorology and the University of California in San Diego.

Outcomes:
Several significant air pollution episodes from identified smelters were observed at Cape Grim during February-March 2004. The intensity of future episodes should be able to be estimated from Cape Grim observations and regional air transport pollution modelling, assisting industry to manage environmental emissions and informing the planning of future industry developments.

A4 A2

Climate Assessments for South-West Western Australia

[Water for a Healthy Country]

Outputs:
Through the Indian Ocean Climate Initiative (IOCI), there have been a number of reports and high-level briefings presented to the WA Government on climate model studies which have examined natural climate variability, the potential impact of climate change on global warming and in-depth analysis of climate observations.

Outcomes:
The research has been very influential in informing government policy and the results have been used in setting water resource use strategies. The Water Strategy for WA (2003) states, 'Information from climate modelling will be used to guide water resource and supply decisions. This will help secure a sustainable water future for all Western Australians'. Based on IOCI research, the Water Corporation has made changes that have potentially saved Western Australians hundreds of millions of dollars.

A1 A7

Eliminating Pesticide Residues

Outputs:
CSIRO, in conjunction with Orica Australia Pty Ltd and Horticulture Australia Ltd, has developed an enzyme bioremediation technology for the clean-up of pesticide residues in the environment. An enzyme that degrades synthetic pyrethroids has now been transferred to Orica, complementing the two enzymes transferred last year that hydrolyse organophosphates.

Outcomes:
Orica has trialled the enzymes successfully in a range of applications for use by farmers, dip operators, crop dusting pilots and fruit and vegetable packers, for degrading organophosphate insecticide residues. Residue reductions of over 90 per cent, often over 99 per cent, are achieved in a few minutes with amounts of enzyme that would be commercially reasonable to use.

A1 A2 C3 A3

CSIRO Plant Industry's Dr Danny Llewellyn is part of the team that developed GM cotton varieties for Australia. Photo: CSIRO Plant Industry

New Management Strategies for Bt Cotton

Outputs:
A critical risk for Bt cotton is that pest insects may evolve resistance to the Bt protein, an insecticidal protein expressed in the plant. CSIRO, working with the CRC for Australian Cotton and members of the Transgenic and Insecticide Management Strategy (TIMS) committee of the cotton industry, delivered a science based and comprehensive management strategy to address this problem.

Outcomes:
The Resistance Management Strategy was endorsed by the TIMS committee and Office of the Gene Technology Regulator and is now part of the contract signed by growers for access to genetically modified cottons. The strategy provides long-term stability and certainty for the whole management system based on Bt cotton. Bt cottons have so far reduced pesticide use in the cotton industry by an average of 60 per cent in the area on which they are grown (until recently restricted to 30 per cent of total cotton), significantly reducing offsite environmental contamination.

A2 | A5

Surveillance Program for the Cotton Industry

Outputs:
Silver leaf whitefly numbers in central Queensland had been steadily increasing for several years and had the potential to cause significant damage to cotton crops. A surveillance program, established in collaboration with the Queensland Department of Primary Industries (QDPI), provided warning that insect numbers were reaching a critical point before an outbreak occurred.

Outcomes:
Early warning allowed the industry to mobilise resources before the outbreak caused serious damage. Emergency permits were sought for a number of insecticides, and workshops held to plan options and develop tools for cotton growers and consultants. Close collaboration between CSIRO, QDPI, the cotton industry, cotton consultants and chemical companies ensures it is now possible to recognise the crucial threshold of numbers of silverleaf whitefly, allowing control practices to be put in place early to keep the insect under control to avert significant damage to crops and to the environment.

A2 | D3

New Software to Manage Pest Species

Outputs:
Management of pest species and conservation of biodiversity in changing environments involves numerous species for which data availability varies from sparse to (rarely) comprehensive. CLIMEX and DYMEX are software programs designed by CSIRO to extract maximum information from the available data. The software can predict potential geographical distributions and population dynamics, identify gaps in knowledge, assess the risks posed by the introduction of different organisms, and evaluate management options.

Outcomes:
Both software packages, which can be used on any plant or animal species, are being marketed world-wide by Hearne Scientific Software Inc, a company specialising in commercialising research software. CLIMEX assesses risks in relation to climate, while DYMEX allows the user to build population models rapidly. The models will benefit researchers, managers, policy makers and teachers in natural resource management, quarantine and agricultural pest management.

A7 | D3 | A5 | A2 | A1

New Genes for Protection of Grains Crops

Outputs:
Major grain crops suffer major economic losses to fungal diseases. Plants expressing potent, broad spectrum antifungal proteins offer an alternative to existing control options based on chemicals and traditional plant breeding. Three novel proteins with good activity against the major organisms that cause blight in chickpeas and wilt in cereals have been identified, and the genes that code for these proteins isolated. The new gene/protein systems form the basis of the first patent application arising from the CSIRO/ Grains Research and Development Corporation Grain Protection Joint Venture.

Outcomes:
The new antifungal proteins provide seed companies and plant biotechnology researchers

with new resources for the development of disease resistant crops, and the consequent avoidance of economic losses associated with the incidence of fungal diseases.

A1

Yield Prophet

Outputs:

CSIRO's Yield Prophet program is designed to assist grain growers in making 'best bet' risk management decisions. The model simulates crop production based on various input scenarios. A Yield Prophet service – including nine reports during the growing season and a post-harvest report – was provided to groups of Western Australian farmers. Farmers in the Victorian Wimmera and Mallee districts were also provided with a yield forecasting service based on data measured in their paddocks.

Outcomes:

The assistance provided in making management decisions allows producers to maximise yield for a given level of inputs, and thus to maximise the profit gained from their crops. Yield Prophet also facilitates sustainable production by preventing overuse of inputs to cropping. All respondents to a survey of clients in late 2003 indicated they will subscribe again in 2004, for reasons ranging from education and learning, to helping with business decisions.

A1 | A2 | C4 | A3 | A7

Better Management of Ecosystem Services [Water for a Healthy Country]

Outputs:

CSIRO, with a number of collaborative partners, studied the services people obtain from their environments in the Goulburn Broken Catchment area. Case studies were produced showing how the community can better manage ecosystem services including climate regulation; habitat; shade and shelter; aesthetic value; water filtration; erosion control; soil health; healthy waterways; regulation of river flows; and groundwater levels.

Outcomes:

The project has successfully connected researchers with the community to combine local and scientific knowledge to improve information delivery to policy makers and decision makers with a view to moving towards more sustainable land management practices. The concept of ecosystem services has become an integral part of the Goulburn Broken Catchment Authority's activities, at both the strategic and operational levels.

A1 | A3 | A5 | C1 | A2

Management of the Murray Darling Basin [Water for a Healthy Country]

Outputs:

State Governments have adopted integrated catchment management (ICM) programs to integrate community, government and industry perspectives for sustainable resource use. Based on a review of the different approaches adopted by each state, seven principles and a related set of essential characteristics of ICM have been developed as the basis for improving existing and future ICM programs.

Outcomes:

The principles and characteristics were developed for the Murray-Darling Basin Commission to guide the future evolution of ICM in the Murray-Darling Basin and elsewhere. They accommodate the variety of natural resource problems, legislative arrangements and social conditions that must be taken into account to achieve more sustainable use of natural resources.

A1 | A3 | A5

Exposure to Woodsmoke

Outputs:

Measurements of personal exposure to woodsmoke for a group of Launceston volunteers were related to the use or non-use of compliant and non-compliant woodheaters in the home. Surprisingly, whether or not the

resident had a woodheater had little effect on indoor woodsmoke exposure, indicating that the pollutants are well mixed through Launceston air.

Outcomes:
Launceston has a major problem with woodsmoke as a result of its local geography, wintertime meteorological conditions and high use of wood-fired heaters by the local community. The study will underpin the work of the Launceston City Council and Department of Environment and Heritage to manage woodsmoke pollution and improve air quality through the Launceston Woodheater Replacement Program.

B3

Researchers from CSIRO Atmospheric Research asked people in Launceston, Tasmania, to take part in an experiment to detect city residents' exposure to woodsmoke as part of a study to determine the impact of air pollutants on health. Photo: Jim Markos

Eradication of Pest Ants

Outputs:
The African Big-headed Ant was found within Kakadu National Park in 2001. An intensive detection and mapping program identified 24 outbreaks covering approximately 30 hectares. Every infestation has been chemically treated and post-monitoring surveys indicate successful eradication.

Outcomes:
The eradication of the African Big-headed Ant, one of the world's worst invasive pests, has enormous conservation benefits in protecting native species in Kakadu National Park from the impact of this ant. The project has also led to enhanced public awareness of the importance of pest ants in the Top End, and to the collaborative development of an eradication plan for the Yellow Crazy Ant in Arnhem Land.

D3 A5

Innovation in the Desert

Outputs:
In a collaborative pilot project funded as part of the National Innovation Awareness Strategy, two operators of successful Small and Medium Enterprises (SMEs) from desert areas shared their stories of best practice using video, audio and written material on the project website (www.desertknowledge.com.au/innovation). These stories address the particular challenges faced by operators in desert Australia. Littlefish Pangaea develops financial reporting material tailored to remote Aboriginal communities and Diab Engineering serves the mining industry in remote locations.

Outcomes:
This project acknowledges best practice in desert businesses, and ensures it is accessible to others. It is now widely accessible to other SMEs, the general public and the education sector, strengthening the skill base of businesses and the level of services available to consumers in desert areas.

B4 C5

Monitoring Biodiversity in Australia's Rangelands

Outputs:
Within the framework of the Australian Collaborative Rangelands Information System – a partnership developed by the Commonwealth, State and Territory Governments – CSIRO produced a special issue of the Austral Ecology Journal on *Biodiversity Monitoring of Australia's*

Rangelands. This edition includes background, potential indicators and surrogate indicators of land use pressure in the rangelands, and issues of monitoring and analysis of the data.

Outcomes:
This special edition journal provides a shared understanding of the complexity of biodiversity monitoring in Australia's rangelands and draws attention to the important guiding principles needed to underpin any operational framework for rangeland Australia. A whole-of-nation approach to biodiversity monitoring and reporting will underpin future policy and management decisions and assist in targeting funding at a national scale. The Federal Department of Environment and Heritage will use the outputs to direct conservation planning in Australia's rangelands, and information will be distributed to natural resource management agencies and Land Care groups.

A5

Efficient use of Water in the Australian Sugar Industry

[Water for a Healthy Country]

Outputs:
Efficiency of water use is a significant issue for the Australian sugar industry. Water limits production and many growers have limited access to irrigation to supplement rainfall. Outputs developed working with partners in the sugar industry include, the 'Caneoptimiser' decision tool, improved knowledge of sugarcane physiology, a stress index for sugarcane, and enhanced sugarcane systems modelling.

Outcomes:
A network of industry extension officers with decision tools customised for local conditions, a thorough understanding of crop physiology and of the contribution of water tables to crop growth, is now able to assist growers to develop improved irrigation management plans that contribute to improved water use efficiency. This encourages better use of this limited natural resource and provides economic benefits for sugarcane growers.

A1 A2

Assessing the Health of the Murray River

[Water for a Healthy Country]

Outputs:
The Murray Flow Assessment Tool (MFAT) is a decision support system that provides technical analysis of flow management options within the Murray-Darling Basin. By examining responses – ranging from waterbird nesting to floodplain vegetation health, for ten river reaches for many flow management scenarios – MFAT provides scientifically robust, comparable, repeatable and transparent ecological assessments.

Outcomes:
Assessments of river health using MFAT, formed the basis of scientific advice to the Murray-Darling Basin Commission and the Murray-Darling Basin Ministerial Council and underpinned the Council of Australian Governments (COAG) water agreement (whereby 500 Gigalitres of flow per year will be returned to the River Murray to provide increased environmental flow).

A1

Drainage Reform Blueprint for Western Australia [Water for a Healthy Country]

Outputs:
Many unauthorised and deleterious drains have been dug in the Western Australian wheatbelt and there are now thousands of kilometres of drainage systems. CSIRO research has shown the potential effectiveness of drainage schemes in shifting between 300 and 1 000 tonnes of salt a day, with groundwater discharging at a rate of up to 15 megalitres per day, depending on the season. However, these drains export acidic water with high salt loads that can contain elevated levels of aluminium, iron and manganese – with environmental ramifications.

Outcomes:
Drainage has been a highly contentious area for water resource managers in Western Australia for several decades. CSIRO's research into the environmental effects of drainage and associated hydrological and social issues has played a pivotal role in the creation of a new model

for drainage in Western Australia by a multi-stakeholder Drainage Reform Group. A White Paper with recommendations for implementation of the model has been presented to the Minister for the Environment.

A1 | A3

Irrigation Research goes Global

[Water for a Healthy Country]

Outputs:

Working with water resources managers, industry and policy experts in the Murrumbidgee Basin Region, CSIRO researchers have developed a suite of innovative hydrologic, economic and community education tools relevant to managing complex catchment management issues.

Outcomes:

This new approach is being used by the United Nations Educational Scientific and Cultural Organisation (UNESCO) as a model for proposals for a full-scale implementation of the UNESCO-HELP program by approximately 100 other basins world-wide. The modelling tools and participatory methods developed by CSIRO and its partners in the Murrumbidgee region are being adopted by communities in the Liuyuankou irrigation area along the Yellow River in China and in Rechna Doab in the Indus Basin in Pakistan.

A1

Preventing Salinity across Australia

[Water for a Healthy Country]

Outputs:

CSIRO's Groundwater Flow Systems Framework (GFSF) developed in conjunction with the National Dryland Salinity Program, is a decision support tool for a consistent approach to managing and preventing salinity across Australia. The framework combines maps, knowledge from case study catchments across Australia, conceptual models of how salinity arises in different groundwater systems, monitoring data and mathematical models, and an understanding of groundwater movement.

Outcomes:

CSIRO's work on groundwater flow systems has changed the way salinity science and management is done by explaining spatial variability in salinisation processes and their implications for management. The GFSF effectively brings groundwater into salinity management at the catchment scale and provides resource managers with insights into the drivers of salinity, the risks it poses and the most appropriate planning and management options, at different scales for different outcomes.

A1 | A3

Polymer Mat System Cleans Up Pollution

Outputs:

A collaborative team from CSIRO and the University of Western Australia has developed a cost-effective and reliable technique – based on new bioremediation technology – that is being applied to the clean-up of an ever-increasing range of pollutants in groundwater and soils. The polymer mat system can decontaminate water while it is still in the ground. Once the mat

Point source pollution running into a drain. Photo: Willem van Aken

barrier is in place, the system is a low-cost, low-maintenance means of cleaning up point source contamination without the need for pumping – even below ground.

Outcomes:
The innovative permeable reactive barrier system is currently being evaluated by a number of potential commercial partners with respect to remediation of point source contamination that might arise from accidents or industrial spills.

C3 A1

Boost for Water Conservation and Reuse

[Water for a Healthy Country]

Outputs:
Stage One of the Australian Water Conservation and Reuse Research Program has been completed with the publication of 12 different, but inter-related, reviews encompassing agricultural and environmental issues, economics and contractual arrangements, health and risk assessment, and the implementation of new technology. Collaborators include CSIRO, the Australian Water Association (AWA), Cooperative Research Centres, Universities and the Australian Academy of Technological Sciences and Engineering.

Outcomes:
The results have been disseminated in a series of eight workshops organised by the AWA and attended by planners, managers, utilities, developers, local government and regulators across Australia. This work is expected to support new systems for domestic scale harvesting of rainwater and stormwater, reuse of grey water, on-site treatment of effluent and the development of new plumbing codes. The project is on track towards its long-term goal of conserving and generating, within 10 years, 1 000 gigalitres more water each year for Australian cities that need it most.

A1

Pre-treatment of sewage water in stabilisation lagoons at the Recycled Water complex at Bolivar, north of Adelaide, South Australia. Photo: Greg Rinder

Sentinel Hotspots goes International

Outputs:
Sentinel Hotspots is a computerised mapping system developed by CSIRO, Geoscience Australia and the Defence Imagery and Geospatial Organisation, that provides rapid access to up-to-date satellite-derived images of possible fire outbreaks across Australia. A customised system has now been developed to warn an Australian power company of fires approaching their infrastructure. Overseas, a Sentinel demonstration system has been set up in Italy to demonstrate application of this technology to local emergency services.

Outcomes:
An operational system is expected to be licensed and implemented in Italy for the monitoring of local fires and other natural emergencies. It will enable the transfer of freely available information from NASA or European Space Agency satellites to a mapping website within an hour of a satellite's overpass.

C4 D1

New Model for Forecasting Water Allocations [Water for a Healthy Country]

Outputs:
Working with a range of collaborators, CSIRO has developed an Artificial Neural Network model (ANN) for predicting water allocations in the Murrumbidgee Valley. The software package comprises a simple user interface requiring only three pieces of data (start of the season water allocations, acceptable farming risk and sea surface temperatures). Due to the adaptive nature of the ANN method, the model will continuously improve in future, as more data becomes available.

Outcomes:
This model is currently being tested by a group of selected farmers in the Murrumbidgee and Lachlan Catchments which will be followed by wider adoption efforts. Using this model, it is anticipated that irrigators and water managers will be able to gain lead times of up to six months in predicting the next season's water allocation. This will promote improved irrigation efficiency due to well informed cropping and water trading decisions, spreading of irrigation demand over summer and winter periods, and better environmental management (more information see page 16).

A1 | A7

Benefits from Sea Surface Temperature Data [Wealth from Oceans]

Outputs:
A dataset of high resolution sea surface temperatures for the Australian region over the last decade has been produced by CSIRO. A website – www.marine.csiro.au/remotesensing/oceancurrents/ – has been created where the data can be interactively viewed as single images or movie animations and/or downloaded in a number of formats. The website is updated daily.

Outcomes:
A major problem with any marine question, be it scientific, industrial or policy related, is the scarcity of information on the variability of the ocean environment. Accessibility of this sea surface temperature data to the entire Australian research and user community will underpin advances across a wide range of ocean-related fields (climate variability and prediction, operational ocean forecasting, fisheries and ecosystem environments), and thereby benefit a wide range of marine and terrestrial industries and resource managers. Daily access to current sea surface temperatures has a significant impact for recreational and commercial sailors and the navy.

A7 | A5 | D5

The NORFANZ Voyage of Discovery

Outputs:
A team of about 30 specialist scientists from a variety of science organisations in Australia, New Zealand, France and the United States has produced regional scale assessments of the biodiversity value of two submarine ridges, the Lord Howe Rise and Norfolk Ridge, in which the fauna was almost unknown. Data products are seabed maps, seabed images and samples, taxonomic inventories, and photographic catalogue of fauna collated into summary reports. Faunal collections have been distributed to international museums.

Outcomes:
A number of species new to science have been discovered, and the distributional ranges of many relatively well-known species have been extended. Collectively this information will enable Australia to assess the significance of the biodiversity of this part of its marine jurisdiction, and will inform consideration of possible Marine Protected Area status.

A5

Sustainable Fishing in Northern Australia

Outputs:
CSIRO, in collaboration with industry, regulatory and university partners has provided improved prawn stock assessments and management advice for the northern prawn fishery; a bio-economic model and evaluation of prawn stock enhancements for the Exmouth Gulf in Western Australia; an assessment of the biodiversity of sharks and rays caught in Indonesian and

Australian waters and has quantified the impacts and recovery of marine biota and their habitats after trawling.

Outcomes

The scientific advice provided has contributed to the environmental certification and enhanced marketability of prawns from the Northern Prawn Fishery. The information supports improved management of the resource and better catch prediction which, in turn, provides efficiency gains for fishing enterprises. The bio-economic assessment of prawn enhancement informed a decision by the MG Kailis Group of Companies not to pursue commercial scale enhancement, leading to a saving of about $5 million in capital investment.

A2 | A5 | D2 | A7

Southern Bluefin Tuna Stock Assessment

Outputs:

To address the lack of data on the movements of adult Southern Bluefin Tuna (SBT), pop-up archival satellite tags were successfully deployed to collect data on the movements, behaviour and habitat preferences of these fish in the Tasman Sea. A number of ways in which the tags, tagging methods and data analysis software could be improved for future studies have also been identified. New methods were developed to extract consistent information on growth parameters from three disparate sources: the tagging experiments; length sampling of commercial catches; and direct ageing studies of tuna. Improved estimates of growth rate parameters applying to the entire period of the commercial fishery (more than 30 years) were then obtained for input into stock assessment models.

Outcomes:

The movement data have been used in catch prediction software to assist the Australian Fisheries Management Authority (AFMA) in developing restricted access arrangements aimed at minimising SBT by-catch in the Eastern Tuna and Billfish Fishery. This mitigation of SBT by-catch is seen as an essential requirement for Australia to meet its obligations to manage SBT catch within quota imposed by the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). Improved estimates of growth rates in stock assessment models enables more robust scientific advice to be provided to the CCSBT on quotas for the sustainable management of the stock.

A5

Pop-up archival tags record time, depth, light (position) and water temperature. They are programed to release from the fish after a set time period and download these data to satellites. Photo: CSIRO Marine Research

Evaluating Strategies for Fisheries Management

Outputs:
CSIRO, in collaboration with the AFMA, resource managers, industry and other researchers, has developed analytical tools that evaluate the options that can be used to manage fishery resources to meet the needs of all sectors. The tools have enabled more robust advice to be provided to resource managers through scientific advisory groups and will support the development of an operational management plan for AFMA's south eastern fisheries that is tightly integrated with other uses of the marine environment. The outputs include integrated databases, models for evaluating alternative management options, and reports outlining the consequences of alternative strategies set against regional and fishery-specific management objectives.

Outcomes:
As part of a move towards ecosystem based fisheries management, these outputs will facilitate management decisions by providing a common framework for evaluations of alternative management strategies. In particular, they support the scientifically based evaluation of tradeoffs across conflicting management objectives, both within and between fishery sectors, and more broadly across multiple uses of the South East marine environment.

A5	C4

Agribusiness and Health

Bushfire Policy Research

Outputs:
In the wake of the Sydney 2002 and Canberra and Victorian 2003 bushfires, CSIRO has provided scientific input – including a unique fire spread timeline, damage assessments and staff secondments – to numerous Federal and State government reviews and inquiries into all aspects of bushfire management and mitigation.

The new Bushfire CRC has been established with CSIRO as a core member.

Outcomes:
The major anticipated outcomes of these activities are a reduction in the loss of life, property and biodiversity in future bushfires, and an improved capacity to include scientific knowledge, in a much more coordinated way, to bushfire management in Australia.

A5	D1	D4	A7

New Termite Resistant Wood Products

Outputs:
Two new termite resistant wood products have been launched for the Australian construction market. CSIRO's work involved evaluating new insecticidal/preservative additives, assisting companies to develop new formulations, and testing final products in the laboratory and in the field.

Outcomes:
Benefits include increased sales for Australian based manufacturing companies; replacement of highly toxic conventional preservatives with more benign alternatives, decreased maintenance costs for Australian householders, and increased consumer confidence in wood products in regions of high termite infestation. The technology is transferable to other markets (eg USA and Asia).

A2	C3	D3

SilviScan Heads for International Market

Outputs:
The first SilviScan machine designed specifically for commercial application was built at CSIRO's Clayton laboratories and delivered to our partners, the Swedish Pulp and Paper Research Institute. Discussions are underway for a second machine to go to a partner in North America. This is part of our strategy to set up a global network of SilviScan testing for the global forest industry. Validation of SilviScan outputs was done primarily in collaboration with New Zealand Forest Research.

Outcomes:
Until SilviScan was invented, measuring and quantifying fundamental properties of wood quality was extremely time consuming and expensive. Fast, accurate wood testing makes it possible to map the suitability of plantation timber for particular end-uses from paper to furniture. It also realises the potential of using timber quality as a key focus in tree breeding. These capabilities potentially add millions of dollars per annum to the value of Australian and international plantations.

A2 | A5 | C1 | C2

New Technology for Meat Processing

Outputs:
Food Science Australia's new technology takes less favoured meat cuts and meat trim generated during the boning operation and produces a restructured meat product with fibre alignment that results in a meat texture similar to the natural texture of real meat.

Outcomes:
There is significant interest from the meat industry in this technology that utilises low-value meat cuts to produce portion controlled 'centre of plate' items. Meat and Livestock Australia is promoting the technology to Australian meat product producers and has seconded a program manager to Food Science Australia to facilitate technology transfer.

C5

Improving Beef Cutting

Outputs:
CSIRO and collaborators have produced a commercial prototype beef carcass splitter that combines an industrial robot, ultrasonic imaging and analysis, laser and tempsonic sensors, and an industry approved splitting saw. The prototype has been installed in a Victorian export abattoir and is undergoing final commissioning prior to extended commercial production trialling.

Outcomes:
The robotic system removes operator ergonomic and safety issues associated with manual beef carcass splitting. The high-level of cutting accuracy improves downstream processing efficiency and maximises the yield of high-value cuts. A commercialisation partner for the technology is negotiating a proposed rollout program with CSIRO and Meat and Livestock Australia.

C4 | C5

Removing Fat from Sheep's Kidneys

Outputs:
A commercial prototype to remove the fat from sheep kidneys has been installed in an operating sheep abattoir. Combining an industrial robot, sensing instruments and an adapted vacuum nozzle, the system achieves consistent, accurate results and fast cycle times. It also caters for improved sterilisation and reduced carcass contamination as tools are washed after every cycle.

Outcomes:
The robotic system removes ergonomic and safety issues associated with what is described by operators as a tedious and repetitive manual task. The system caters for reduced carcass contamination, allows better utilisation of abattoir staff and has an estimated payback period of less than two years.

C4 | C5

Improving Health with Bioactive Ingredients [Preventative Health, Food Futures]

Outputs:
Three provisional patents have been filed during 2003–04 for 'microencapsulation' technology. The technology involves the incorporation of bioactive ingredients into foods such that the sensory appeal of the food is maintained and the bioactive is isolated from undesirable interactions and delivered to the desired site within the body.

Outcomes:
The technology produces superior microencapsulated bioactive ingredients which have been used in the development of a range

of functional foods aimed at improving the health and well-being of individuals. Work is continuing with a number of Australian and multi-national companies interested in the technology.

B3 C2 C3

Farmed Rabbits for Growth in Australian Agriculture

Outputs:

Since 1999, CSIRO, with industry partners, has developed the Crusader strain of rabbits selected for improved litter size, growth rate, disease resistance and other traits of prime economic importance to meat rabbit production. A software tool to calculate gross margins – the Crusader Enterprise Model – has been developed and distributed to over 1 000 users via the project website (www.csiro.au/crusader). Husbandry and management recommendations are also available via the website, which records in excess of 400 hits per month.

Kathleen Bowerman (left) and Dr Sandra Eady (CSIRO) with a Crusader rabbit on its way to its new commercial home at the Snowy Mountains Gourmet Rabbit Co, Bredbo, NSW. Photo: Rob Nethery

Outcomes:

The industry has grown over the life of the project from production of 106 tonnes of meat in 1999 to an estimated 270 tonnes in 2003. Approximately 25 per cent of the industry is directly using Crusader rabbit breeding stock, the genetic merit of which has improved by 9 per cent for the number of kittens weaned and 17 per cent for growth rate with an accompanying improvement in disease resistance. The breeding program has now been commercialised and will be run by industry, providing a reliable ongoing source of improved rabbits. Use of Crusader stock and the Crusader Enterprise Model has significantly reduced the financial risk and strengthened the viability of existing enterprises and assisted potential entrants to objectively evaluate potential returns.

High Value Ingredients from Meat Waste

[Food Futures]

Outputs:

Continuous separation technology has been adapted and applied to develop a cost-effective process for manufacturing high value food ingredients from meat waste.

Outcomes:

The new process enables high value products to be derived from a previously low-value waste stream, contributing to a new export business for Australia (potentially) worth more than $10 million per year. The ingredients have application in health-promoting foods and related products.

A2 C2 C5 C1

E.coli 0157 and *Salmonella* in Cattle

Outputs:

The numbers, prevalence and types of strains of *E.coli* 0157 and *Salmonella* isolated from animals at various stages during processing has indicated that contamination from animal hides and oral cavities is the source of carcass contamination.

Outcomes:

This new knowledge has been used by the meat industry in discussions with trading partners such as the United States. It is useful for developing control strategies to reduce carcass contamination during processing and for guiding investment in further research to target other areas of intervention. This research will assist the Australian meat industry to provide safe meat for consumers leading to increased food safety and subsequent benefits for human health.

New Genetically Modified Cotton

Outputs:
CSIRO has developed Bollgard® II genetically modified (GM) cotton varieties, using genes under license from Monsanto. Associated resistance management strategies have been developed in collaboration with the Australian Cotton CRC. Ingard®, the original GM cotton, will not be grown at all after the 2003–04 season to minimise the risk of insects developing resistance to Bt, an insecticidal protein expressed in the plant.

Outcomes:
Following the introduction of the GM cotton Ingard® in 1996, Australian growers have reduced their pesticide use by about 50 per cent where Ingard® is planted, compared to conventional cotton. Three years of field trials have established that Bollgard® II will reduce pesticide use even further, by up to 75 per cent compared to conventional cotton. By 2004–05, Bollgard® II could make up 80 per cent of the cotton crop, representing a large step forward in insect pest management and resistance management as well as environmental and community health.

A2 B1

A New Gene Test for Marbling

Outputs:
Work conducted in the CRC for Beef Quality has developed a new genetic marker for marbling in beef cattle. Marbling, a desirable heritable trait in cattle, enhances the flavour and 'juiciness' of beef. Genetic tests for marbling help farmers select animals to breed from and to select animals for premium quality markets.

Outcomes:
A full patent application has been lodged and discussions for commercialisation of the marker are being pursued. The addition of the new marker, to a currently available test for marbling, will double the predictive power of the test and ensure more accurate selection of cattle with high genetic potential to breed for the premium domestic and export high marbling markets. Cattle farmers will receive added income for producing a consistently high scoring marbled product.

C2

A Test for Avian Influenza Virus

Outputs:
CSIRO has developed a rapid diagnostic test for the H5N1 strain of avian influenza and has held two training programs on conventional and rapid avian influenza diagnostic techniques for scientists from five Asian countries. Diagnostic reagents and test protocols were provided to each participating facility. Research is continuing to ensure rapid detection of other strains and to transfer the technology to veterinary diagnostic laboratories throughout the region.

CSIRO, in collaboration with the Australian company Imugene, is applying its patented fowl adenovirus delivery system to create a vaccine for poultry, to protect them from the H5N1 strain of avian influenza. Photo: CSIRO Livestock Industries

Outcomes:
The recent avian influenza pandemic throughout Asia resulted in the death of millions of chickens and ducks and killed 22 people. Improving the emergency response of veterinary laboratories in Asian countries allows more rapid diagnosis of disease outbreaks, limiting the spread of the disease and resulting in fewer infected birds. The

economic burden on farmers is reduced and the risk of transmission to humans is reduced. Better control of avian influenza in Asia mitigates the risk of introduction to Australia.

D3 D4

Towards Protecting Humans from Avian Influenza Virus

Outputs:
Since no vaccine is available to protect humans against avian influenza viruses, CSIRO undertook laboratory tests with a sample obtained from an infected chicken from Vietnam. The tests showed that Relenza™ is effective against the current pathogenic strains and could be suitable for stockpiling in the event of adaptation of the avian viruses to spread in humans. Relenza™ is the anti-flu drug partly developed by CSIRO.

Outcomes:
It is important to know that a drug is available which could be used to treat humans infected with avian strains of influenza as well as the normal human types. This knowledge could reduce public concerns about the spread of avian 'flu, inform responses to an outbreak and reduce the economic impact of an uncontrolled epidemic.

B3

EvoGenix Pty Ltd

Outputs:
EvoGenix Pty Ltd is an expanding spin-off company founded on CSIRO intellectual property developed within the CRC for Diagnostics. Initially, EvoGenix established its protein diversity platform technologies as essential tools for biotechnology and pharmaceutical companies in their production of therapeutic, diagnostic, industrial or agricultural reagents.

Outcomes:
EvoGenix, founded in 2001, now has twelve scientists employed in Melbourne and was successful in raising $1.9 million in additional capital in April 2004. EvoGenix is now establishing an international position in the rapidly growing protein therapeutics sector, significantly expanding the capabilities of the company through partnerships with Genesis (NZ) and Domantis (UK), and a strategic alliance with Absalus Inc (USA).

C1 C2

Severe Acute Respiratory Syndrome (SARS) Diagnosis

Outputs:
In the immediate aftermath of the SARS epidemic, the National Health and Medical Research Council (NH&MRC) provided emergency funds for the development of rapid SARS diagnostic assays and national protocols to define their use and application. Working with a number of other laboratories, CSIRO helped produce and evaluate laboratory tests that reliably distinguish between SARS and other viral diseases with similar clinical presentations.

Outcomes:
Australia now has SARS diagnostic kits with high-quality reagents, together with national consensus protocols for their use. In the event of a SARS outbreak the Australian public will benefit substantially from the activation of the protocols and the rapid identification of SARS cases.

B3 D3 C2

Identifying Wheat Varieties

Outputs:
A simple testing system that accurately identifies wheat varieties has been developed with Grain*gene*® (a joint venture between CSIRO, the Grains Research and Development Corporation, AWB Ltd and Sygenta). The system tests leaf or grain samples using a panel of DNA Markers and outperforms previous tests in accuracy and throughput.

Outcomes:
Accurate identification of wheat varieties provides assurance of quality for products that require different grain characteristics, like bread and noodles. This is vital in maintaining Australia's

export reputation in product standards. Variety testing also helps ensure end-point royalties are paid on improved new varieties, giving breeders the resources to keep producing better varieties of wheat for farmers and consumers into the future. The wheat variety ID test is licensed by Agrifood Technology.

C2

Improving Paddock Health

Outputs:
An eight year CSIRO study, supported by the Australian Cotton CRC and the Cotton RDC, has established that a winter legume, vetch, provides cotton growers with an attractive option for improving paddock health and fertility, while increasing yields. Vetch is grown throughout winter then slashed and ploughed into the ground as a green manure crop. The field can then be planted with cotton. Although vetch is not an income producing crop, cotton lint yields can be increased by up to 18 per cent when cotton crops are rotated with vetch.

Success in domesticating the black tiger prawn will enable the application of advanced selective-breeding technologies.
Photo: CSIRO Marine Research

Outcomes:
Sales of vetch seed in the cotton industry increased by 20 per cent last year and, despite the drought, the area under rotation with vetch occupied 5 per cent of the cotton area in 2003–04. With a return to better water availability, 20 000 to 40 000 hectares of vetch rotation could be sown in future years. Vetch fixes large amounts of nitrogen, increases soil organic matter, improves soil structure, makes cultivation easier, increases soil water holding capacity and reduces the impact of black root rot.

A3

Commercial Production of Black Tiger Prawns [Food Futures]

Outputs:
A nationally coordinated research effort with industry and other partners has provided quantitative information on the reproductive output of Black Tiger prawns reared in captivity. Information on the viral pathogens that occur in wild founder stocks from different regions has also been obtained. Commercial production of the progeny of captive reared broodstock has been achieved.

Outcomes:
The Black Tiger prawn industry in Australia has been totally dependant on wild broodstock, a high risk strategy that precludes selective breeding to enhance the profitability of the industry. The industry now has the technology to progress from dependency on wild broodstock, reducing the pressure on wild stocks and opening the potential opportunity to supply Black Tiger postlarvae to the US$4 billion market in South East Asia. Core industry partners now have domesticated broodstock and postlarvae, together with the technology and rearing protocols developed on-site.

A2 | A5 | C1

Helping 'Re-Green' Australia

Outputs:

Field trials by the Centre for Plant Biodiversity Research, a joint initiative of CSIRO and the Australian National Botanic Gardens, have established that where the soil bacterium *Bradyrhizobium* was applied to wattle seed, establishment rates of wattle plants increased two to five times. Furthermore, other trees planted next to the bacteria-boosted wattles, like eucalypts, are healthier and grow faster than those planted further away.

Outcomes:

Bio-Care Technology Pty Ltd has taken up an exclusive license to market an inocculant containing *Bradyrhizobium*. Bio-Care has successfully cultured four 'elite' strains of *Bradyrhizobium* and added them to dry clay granules to create Wattle Grow™ which can be mixed into nursery potting media or applied into the sowing furrow with wattle seeds in direct seeding. Direct seeding enables large areas to be revegetated cheaply and easily. Improved rates of establishment and growth will improve the success of revegetation projects for landholders and increase their contribution to reversing the problems of biodiversity loss and dryland salinity.

A5

Growing Quality Grain Where it Rains

Outputs:

The world's first wheat variety resistant to the Barley Yellow Dwarf Virus (BYDV) Mackellar, was developed by CSIRO and is distributed by AWB seeds. BYDV is one of the greatest threats to wheat growing in high rainfall zones and can cause yield losses in Australian barley, oats, and wheat as high as 40-50 per cent. A new company that will focus on breeding and commercialising high-yielding, disease resistant, milling-quality wheat varieties for Australian high rainfall zones was launched in October 2003.

Outcomes:

HRZ Wheats Pty Ltd is a joint venture between AUSGRAINZ – comprising CSIRO and New Zealand Crop and Food Research – and the WA-based Export Grains Centre Ltd. HRZ Wheats will have access to BYDV resistant varieties through CSIRO's plant breeding program, and to international germplasm through New Zealand Crop and Food Research. The availability of improved wheat varieties tailored to the high rainfall environment has the potential to allow farmers to increase and stabilise incomes instead of being solely dependant on sheep and beef.

A3 A7

Cotton Irrigation Software Saves Water

Outputs:

HydroLOGIC, cotton irrigation software, has been developed by CSIRO and the Australian Cotton CRC for use by cotton growers during the growing season. Growers enter information on current weather, soil moisture deficit, fruit load and leaf area. HydroLOGIC then uses this information with long-term climate data to provide feedback on the optimum date of future irrigations. Over 120 growers, consultants and industry personnel have been trained in the operation of HydroLOGIC and interpretation of the various reports since its official launch in September 2003.

Outcomes:

Compared to other countries, Australian cotton growers are already at the forefront of water use efficiency. Benchmark surveys show a 12 per cent increase in water use efficiency in recent years and HydroLOGIC has been one component facilitating that progress. HydroLOGIC will continue to help growers to more effectively balance yield potential with water availability, maintaining cotton production and saving water, with economic benefits for the grower and environmental benefits.

A3 C4 A1 A7

Boost to Crop Research

Outputs:
CSIRO's patented RNAi technology is a breakthrough technology with potential for application across a number of fields including the development of novel traits in plants as well as animals. Using RNAi, CSIRO researchers first demonstrated 'gene-silencing' in an organism in 1995.

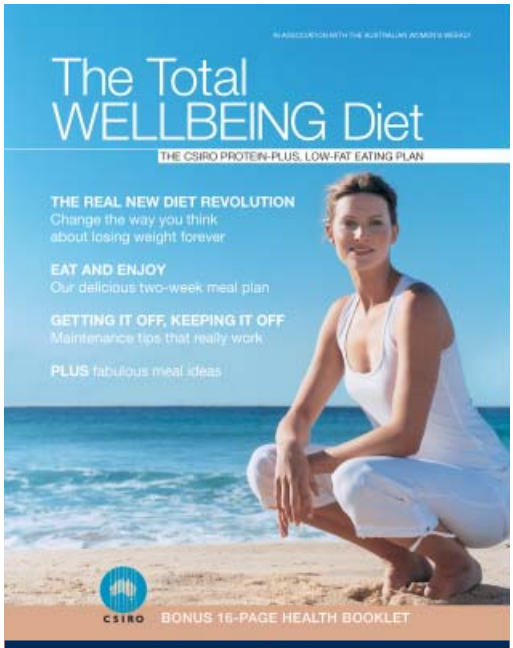
Outcomes:
CSIRO has entered a licence agreement with Bayer BioScience NV covering application of RNAi gene-silencing technology in certain major crops. This is the first licencing of this technology to a leading agri-biotechnology company. RNAi can be used to introduce disease resistance, enhance nutritional qualities and control flowering by removing unwanted gene functions. CSIRO has already applied RNAi to make healthier oils for cooking and margarine by 'switching off' genes that would otherwise produce the cholesterol raising fatty acids usually made as a by-product of oil processing.

C1 | C2

CSIRO's Total Well-being Diet

Outputs:
CSIRO research, undertaken in collaboration with the NH&MRC, Meat and Livestock Australia and Dairy Australia, has led to the development of a high protein dietary pattern for weight loss which has been extensively clinically evaluated for efficacy and safety. The 'CSIRO Total Well-being Diet' has been made available to the public via the CSIRO website, popular magazines and newspapers. The research has also contributed to the development of clinical practice guidelines for the management of overweight and obesity, which is implicated in the development of a number of chronic diseases.

Outcomes:
With increasing concern over obesity, and pressure to contain the costs of healthcare, successful lifestyle intervention strategies will be an increasingly important part of



CSIRO's Total Well-being diet was adopted by a large number of Australians during 2003–04. Photo: The Australian Women's Weekly

community health programs and personal health management. CSIRO's scientifically credible dietary information has been avidly received by the public and health professionals. The concept of low glycemic load diets, such as the CSIRO Total Well-being Diet, has been supported by Professor Jenny Brand-Miller, an expert in carbohydrate metabolism, and other researchers who believe that glycemic load plays a role in disease.

B2 | B3

Education and outreach

CSIRO Education

CSIRO Science Education Centres (CSIROSECs) reached a record 219 263 students in 2003–04. The nine Centres, located in each capital city plus Townsville, offer students hands-on sessions at the Centres and through the travelling *Lab on Legs* program. The range of teaching units offered to schools is constantly being increased. A new automotive technology unit has been developed in partnership with Holden to showcase the science associated with the automotive industry and to encourage young people to consider careers in this area. State and Territory Education Departments continue to be valued partners in CSIROSECs along with universities and corporations.

Science on Saturdays is a new project undertaken with the Queensland Government. It offers activity sessions to students in regional and metropolitan centres. The trial program was an outstanding success in six regional centres across Queensland with an average of 22.3 students attending each session – 1 853 students in all over six weeks.

Science by Email, the weekly science e-newsletter, continued to grow with subscriptions increasing to 7 960. A survey undertaken in late 2003 indicated that the newsletter is highly valued by both teachers and students, with a high proportion of subscribers reporting that they not only read the newsletter but undertake the experiments on a regular basis. Teachers, in particular, indicated that they use Science by Email in their classes each week and value the reliable activities as well as the interesting news stories. Members and Education Credit Union (**mecu**) continue to provide funding and support.

CSIRO's Double Helix Science Club continued to offer the choice of *The Helix* or *Scientriffic* magazines as well as member events at CSIROSECs. Membership of the Club was maintained at 15 500 members and, with increased marketing, it is hoped this number will rise. The Club's popular website was reorganised as part of a longer-term development of the site.

CSIRO continued to jointly produce a top-rating national science TV program (*Totally Wild*, Tuesdays 4pm, Network Ten). The program reaches an average of over 400 000 viewers providing a positive and entertaining approach to science.

The CREativity in Science and Technology (CREST) project encourages and supports school students to undertake their own scientific research or technology-based project. The number of students completing CREST Awards was estimated at over 6 000. The project is supported by Alcoa World Alumina Australia.

CSIRO's Student Research Scheme provides places for senior secondary students to undertake research, with 390 students completing the requirements of the Scheme in 2003. Topics studied under the supervision of research scientists included bioleaching – metals from mineral ores; ecology of fungi; UV exposure in veranda shade; the influence of ground cover on earthworm numbers in vineyards; and artificial photosynthesis. The scheme was supported by the University of New South Wales, the University of Western Australia, Biotechnology Australia, the Australian Capital Territory Department of Education, Youth and Family Services, the Australian National University and James Cook University. In 2003, a trial of an equivalent Teacher Research Scheme was undertaken involving five teachers. The success of the trial has seen the project expand to a national one with places being offered nationally in 2004.

CSIRO Education operates a number of other projects including the BHP Billiton Science Awards, providing prestigious prizes for students undertaking research projects in one of four categories – Biology and Microbiology; Chemistry and Biochemistry; Physics, Engineering and Technology; and Environmental and Earth Sciences. Outstanding science teachers were also recognised with one major winner each selected from the primary and secondary sectors, with four Highly Commended and ten Merit Awards also being awarded. Sixty teachers entered the competition in 2003.

The Discovery centre – a showcase for CSIRO

The CSIRO Discovery centre, located in Canberra, contains working science laboratories which allow the public to view research in progress and has interactive exhibitions, theatres and a science education centre.

Discovery continues to expand its outreach activities. It attracts domestic and international visitors as well as school children from every state and territory in Australia. Its school visitation levels have increased by 20 per cent since opening in 2000 and it has become a frequently requested attraction with groups visiting Canberra. Visitor numbers to Discovery totalled approximately 52 000 during 2003–04.

As the Discovery centre provides a snapshot of the entire organisation, it is also being used by CSIRO personnel to provide VIPs and other dignitaries with an overview of CSIRO. The Discovery team also provides an events coordination service to CSIRO and external groups. In June 2004, Discovery was incorporated under the Corporate Communications organisational structure.

CSIRO Media

The CSIRO Media Unit actively promotes the Organisation's diverse science and technology initiatives nationally and internationally using print, radio, television and the internet. In 2003–04, around 230 media releases were issued to stakeholders in research, industry, government as well as the general public. Media evaluation consultants, CARMA, have once again reported that CSIRO's average rating in the media is favourable.

The Media Unit is currently expanding its distribution database to reach an even wider audience especially the global business and research community. Greater use is being made of electronic media including webcast technology to assist in the promotion of CSIRO's work.

CSIRO Publishing

As an internationally recognised publisher of science journals, books and CD-ROMs, CSIRO Publishing carries the CSIRO brand to local and overseas markets. Two new journals, *Environmental Chemistry* and *Sexual Health* were launched in 2004 bringing to 20 its complement of peer-reviewed journals, publishing over 1 600 research papers annually. CSIRO Publishing also won contracts to create national online science curriculum material for state departments of education through the Curriculum Corporation and the Department of Education, Science and Training funded Learning Federation.

CSIRO Enquiries

CSIRO's Enquiries' mission is to provide world-class, effective, efficient and consistent customer service, in the area of science research and industrial development to both businesses and the community.

The CSIRO National Enquiries Centre has been evolving with the Organisation and is working towards the strategic goal of being the one communication point for CSIRO.

The Centre responds to over 40 000 calls per annum. Business enquiries to the Centre both nationally and internationally have increased by about 43 per cent over the past 18 months, with the 1300 number being more widely used and promoted as the One-CSIRO contact point.

Periods of high and low traffic interactions occur throughout the year (eg traffic is low over the Christmas period) and the consistent pattern of demand that has developed over the last three years has enabled the Centre to provide additional services to its internal customers, such as establishing a CSIRO Alumni database, undertaking the Customer Value Survey and undertaking specific market research for Divisions.

CSIRO's Total Well-being Diet generated high public interest during 2003–04, overtaking enquiries on termites that had been the highest rating public enquiry for the last three years. Enquiries relating to food, health and environmental issues were also of great interest to the public whilst CSIRO's Manufacturing and Information Technology Division received the most business and public enquiries in relation to building and infrastructure.

Awards and honours

In 2003–04, 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.

The Japan Prize

Dr Keith Sainsbury, a CSIRO marine ecologist and mathematical modeller, joins an elite group of scientists to win the Japan Prize. The award relates to food production based on sustainable ecosystems, a concept that Dr Sainsbury and colleagues has championed in both theoretical and practical ways for more than 20 years.

The Japan Prize is awarded to people from all parts of the world whose original and outstanding achievements in science and technology are recognised as having advanced the frontiers of knowledge and served the cause of peace and prosperity for mankind. The Prize is awarded in several scientific disciplines, also recognised by the Nobel Prize. However, in the field of ecology there is no Nobel Prize awarded.

Dr Sainsbury headed a research team to develop and apply the scientific basis for multiple-use planning and management of marine ecosystems in Australia's Exclusive Economic Zone, including the North West Shelf region and Australia's South East. This emphasis on understanding and managing fisheries and other human uses of marine ecosystems was one of the major achievements recognised in the awarding of the Japan Prize.

The research team was also responsible for the scientific input that resulted in the declaration of large marine protected areas around Macquarie Island and the Tasmanian Seamounts Marine Protected Area off southern Tasmania.

Dr Ito Masami, President of the Science and Technology Foundation of Japan presents Dr Keith Sainsbury with the Japan Prize.

Australian Honours

Member in the Order of Australia (AM)

Mr Alan Dyce (retired, Entomology) for service to science through research contributing to understanding of the taxonomy, biology and behaviour of a wide range of flies that affect native animals, livestock and humans.

Mr Clifford Thompson (retired, Sustainable Ecosystems) for service to soil science as a researcher and educator, and as an advisor in land management and practices and conservation issues.

Public Service Medal (PSM)

Mr Phil Cheney (Forestry and Forest Products) for outstanding public service to improving bushfire management and community safety in Australia for the last 40 years.

Australian Awards

Dr Nasir Ahmed (Manufacturing and Infrastructure Technology) received the *Dr Wilfred Chapman Award 2003* from the Welding Technology Institute of Australia in recognition of his contribution to the progress of welding research in Australia.

Dr Geoff Barrett (Sustainable Ecosystems), **Mr Jim Downey, Mr Rory Poulter, Mr Andrew Silcocks** and **Dr Mike Weston** (Birds Australia), **Mr Ross Cunningham** (Australian National

University) and **Dr Simon Barry** (Bureau of Rural Sciences) won the *2003 Royal Botanic Gardens Sydney Eureka Prize for Biodiversity Research*, for the *New Atlas of Australian Birds*. The Birds Australia atlas team was recognised for its innovative scientific research that makes an outstanding contribution to the conservation of Australia's biodiversity.

Ms Karen Barry, Dr Peter Dillon, Mr Jon Hanna, Dr Simon Toze and Ms Joanne Vanderzalm (Land and Water) won the R&D category of the *Australian Water Association* awards in 2003 for their international contribution to the understanding of subsurface processes during aquifer storage and recovery.

Dr Trevor Bird (ICT Centre) was named *Professional Engineer of the Year 2003* by Engineers Australia at the Engineering Excellence Awards. Dr Bird's achievements have been pre-eminent in putting Australia at the forefront of international technology in the field of antennas and microwave systems.

Dr Timothy Bowden, Dr Caroline Kerr and **Dr Sandra McKean** (Livestock Industries) were awarded the Australian Government's *Science and Innovation Awards for Young People in Agriculture, Fisheries and Forestry.*

Dr Peter Carberry (Sustainable Ecosystems) was awarded the inaugural *Farming Systems Research Practitioner* award at the first Australian Farming Systems Conference in recognition of his contribution to the field of farming systems research.

Mr John Carrig (Manufacturing and Infrastructure Technology) received the *Australian Die-Casting Association – Life Membership Award* for his valuable contribution to a wide range of activities in die-casting over many years.

Mr Phil Cheney (Forestry and Forests Products) received the Institute of Foresters of Australia *N W Jolly Medal* for his contribution in forest fire behaviour science and fire fighter safety as well as maintaining an active interest in forestry and fire management throughout Australia.

Dr Greg Constable (Plant Industry) was awarded The Bulletin magazine's *Australia's Smart 100* as winner in the IBM Science category for his cotton research.

CSIRO received an award honouring *Australia's 50 Most Beautiful Exports* in the 'Educators and Science' category of the First Charlton Communications Awards. The award recognises people, products and places that have contributed significantly to Australia's overseas image while earning the country export income.

CSIRO Publishing was awarded the *Reed New Holland Eureka Science Book Prize* and the *2003 Whitley Medal* for the book titled *The Waterbug Book*. They were also presented with a Certificate of Commendation for the *Best Zoological Series for the Zoological Catalogue of Australia Series* at the Whitley awards.

Mr Kelvin Davies (Visy Pak), **Dr Richard Donovan** (CRC for Polymers), **Dr John Forsythe** (Monash University), **Dr Graeme Moad** (Molecular Science)**, Mr Lance Nichols** (CRC for Polymers), **Dr Mike O'Shea, Mr Gary Peeters and Dr Ezio Rizzardo** (Molecular Science) won the *Chairman's Award for Excellence in Commercialisation* from the CRC for Polymers. The team developed a method of converting low-cost bottle grade plastics (pet) into a grade suitable for the production of dual ovenable trays (straight from the refrigerator to the microwave or thermal oven).

Dr Robert Evans (Forestry and Forest Products) and **Dr Ian Grey** (Minerals) were named *2004 Australian Academy of Technological Sciences and Engineering Clunies Ross Award* winners. Dr Evans won the award for his ground-breaking work on the development of SilviScan3™ – a third-generation device which can quickly analyse the properties of different kinds of wood. Dr Grey was recognised for his significant contribution to the Australian mineral sands industry.

Dr Michael Eyles (Agribusiness and Health) won the *2003 Australian Institute of Food Science and Technology Award of Merit* for

achievements in food science and technology. The award recognises contributions in research, industry and education that further the aims and objectives of the Institute.

Dr Cathy Foley (Industrial Physics) received the *Education, Science and Training Eureka Prize for the Promotion of Science* from the Australian Museum. The award recognises Dr Foley's outstanding dedication to science promotion, including the promotion of women in science.

Dr Greg Foliente and the **Asset Sustainability and Performance Team** (Manufacturing and Infrastructure Technology) received the *HIA Wesley Mission GreenSmart Partner Award*. The award recognises their work on three display homes on the Springfield Lakes Summit Display Village, which now serves as a demonstration and learning site for all aspects of leading-edge environmental practices in residential building and land development.

Food Science Australia's Werribee site won the Agribusiness category of the *2003 Wyndham Business Award* in recognition of good corporate citizenship.

Dr Steve Fraser, **Mr Melvyn Lintern** and **Dr Ian Robertson** (Exploration and Mining) received a *Highly Commended Award* at the Safety, Rehabilitation and Compensation Commission Awards for the Field Safety Initiative built around the StarTrack system for safer work in remote parts of Australia.

Dr Elizabeth Fulton (Marine Research) received the *Royal Society of Tasmania Annual Doctoral Award* for the quality of her thesis and her outstanding contribution to Marine Research's world-leading ecological modelling work.

Dr Patrick Hartley (Molecular Science) won the Melbourne University *Grimwade Prize in Industrial Chemistry 2003* in recognition of a high degree of originality, chemical knowledge and scientific ability displayed in a branch of industrial chemistry.

Dr David Hawking and the **Panoptic team** (ICT Centre) won an *Australian Information Industry Association iAward* in the Innovation category for the development and application of the Panoptic enterprise search engine.

Dr Chris Helliwell (Plant Industry) won the *Science Minister's Prize for Life Scientist of the Year*. Dr Helliwell made breakthrough discoveries of plant genes that are responsible for hormone production in plants, which would lead to the production of crops that produce better quality food.

Dr Andrew Higgins (Sustainable Ecosystems) was awarded the *2004 Sugar Research and Development Corporation Research/Extension Award* in recognition of his pioneering work in the application of operations research techniques in the sugar industry.

Mr Garry Jensen and **Dr Raj Rajakumar** (Minerals) received the *CAST Commercialisation Award* from the CRC for Cast Metals Manufacturing. This award recognised their contribution in progressing research on AM-cast through to the commercialisation stage.

Dr Ted Lefroy (Sustainable Ecosystems) was awarded the *Grains Research and Development Corporation Eureka Prize* for research to improve the environmental sustainability of grain growing.

Dr Brian Loveys (Plant Industry) won a *South Australia Great Award for Science and Technology*, for the development of the partial rootzone drying method of irrigation.

Dr Jane Maxwell (Textile and Fibre Technology) was awarded the *Australian Wool Innovation/ Deutsches Wollforschungsinstitut Award for Excellence in Wool* for her work in developing new techniques, by using the scanning probe microscope, to examine and expand our understanding about the surface of wool fibre.

Dr Ken McRae (Molecular Science) won the *Royal Australian Chemical Institute Cornforth Medal* for the best PhD thesis in 2002. The award was granted in early 2004.

Mr Ben Muir (Molecular Science) was awarded the *Treloar Prize* by the Royal Australian Chemical Institute for his paper titled *Characterisation of oxygen plasma treated bisphenol-A poly(carbonate) using time-of-flight secondary ion mass spectrometry (tof-SIMS) and principal component analysis.*

Ms Elisabeth Opie (Legal Counsel) was awarded the *Australian Corporate Lawyers Association's In-house Lawyer of the Year Young Achiever Award*.

Dr Mike Painter and **Dr Vinay Tyagi** (Manufacturing and Infrastructure Technology) were awarded the *Sir William Hudson Memorial Best Research Paper Award for 2003* from the Welding Technology Institute of Australia for their paper titled *The case for mechanised in-service welding of gas pipelines.*

Dr Andrew Parfitt (Industrial Physics) and the **CRC for Satellite Systems Team** won the *Engineers Australia ACT Engineering Excellence Award* and the *Australian Engineering Excellence Award* in 2003. The awards recognise the engineering achievement of the FedSat project, in building the satellite, payload development and integration, launching and operating the satellite.

Dr Terry Percival, **Dr Laurie Wilson** and the **Virtual Critical Care Unit (ViCCU™) Team** (ICT Centre) won an *Australian Information Industry Association iAward* in the Implementation category. The team developed the ViCCU™ system for broadband telepresence that allows a medical specialist located in a major centre to be part of a team taking part in a critical care episode at a remote hospital.

Mr Mick Poole (Plant Industry) was awarded the *2003 Urrbrae Memorial Award* for his outstanding contributions to Australian agriculture.

Dr Don Price and the **Ageless Aerospace Vehicles Team** (ICT Centre and Industrial Physics) were awarded the *AJB Technologies Award for Most Innovative Technology* as part of the ICT Industry trade show, CeBIT 2004, Australia technology awards. The Ageless Aerospace Vehicle prototype displayed at CeBIT demonstrated cooperative self-monitoring in a aerospace vehicle fabric.

Dr Nigel Ricketts and **Mr Craig Korn** (Manufacturing and Infrastructure Technology) based at the Queensland Centre for Advanced Technologies, along with **Mr Rob Bailey** and **Dr Simon Cashion** (Australian Magnesium Corporation), have won the *Excellence in Innovation* award from the Cooperative Research Centre Association. The award was received for the group's submission of a new cover gas system to prevent molten magnesium from burning.

Dr Brett Sexton and **team** (Manufacturing and Infrastructure Technology) and the **Royal Australian Mint** received the *Engineer's Australia Engineering Excellence Award (Canberra Division)* in recognition of engineering achievement for their work on Optically Variable Devices on coins.

Mr Chris Smitt (Land and Water) won the *Young Scientist award* at the 9th Murray-Darling Basin Commission's Groundwater Conference for his work on *The sources and processes of salt mobilisation in the Mt Lofty Ranges*. Mr Smitt showed that the salt is of marine origin and not from the weathering of rocks.

Dr Steve Swain (Plant Industry) was awarded the *Plant Science Australia – Goldacre Annual Research Award* from the Australian Society of Plant Scientists. Dr Swain will deliver a Plenary Lecture at the Annual Conference and will submit a paper in functional plant biology.

Dr Rob Walker (team-leader)**, Dr Peter Clingeleffer, Ms Jacqui Fitos**, **Dr Mark Gibberd** and **Dr Xike Zhang** (Plant Industry) received the *Riverlink Scientific Team Award* in collaboration with NSW Agriculture, Department of Primary Industry, Loxton Research Centre and the University of Adelaide. The team developed

new knowledge on water use efficiency in grapevines and the benefits of adopting strategic irrigation and pruning technologies.

Dr Ian Webster and **team** (Land and Water, Marine Research and the University of Queensland) won the *Excellence in Science* award from the Coastal CRC. The samples collected and predictive models developed will help landholders and government agencies better manage the Fitzroy catchment and the Great Barrier Reef Marine Park.

Dr Penny Whetton and members of the **CSIRO Climate Impacts Group** (Atmospheric Research) received the *2003 Sherman Eureka Prize for Environmental Research* from the Australian Museum. The prize recognises the group's contribution to our understanding of climate change and the implications this has for the environment, agriculture and health.

Dr Stuart Whitten (Sustainable Ecosystems) received the Australian Agricultural and Resource Economics Society, jointly with the American Agricultural Economics Association, *Young Professionals Exchange Travel Award – Heading North.* The award is to present his paper titled *A bio-economic model of wetland protection in Australia* at the American Agricultural Economics Association Annual Meeting in Denver.

Dr Susan Wijffels (Marine Research) won the Australian Academy of Science *Dorothy Hill Award* which supports research in the Earth sciences including reef science, ocean drilling, marine science and taxonomy, by female researchers under 40.

International Awards

Dr Roger Arnold (Forestry and Forest Products) received the prestigious *Jin Xiu Qiu Award* from the government of China's Guangxi Province for his successful discussions with China and forest-based companies under a program called ChangQing.

Dr Trevor Bird and **team** (ICT Centre) won the *2004 Industry Innovators Award of the Society of Satellite Professionals International* for the MultiBeam antenna. The award recognises technology developed by the public sector. Dr Bird has also been appointed Editor-in-Chief of the prestigious *IEEE Transactions on Antennas and Propagation*.

Mr Geoff Carlin and **Dr Freeman Cook** (Land and Water) received the *International Certification of Technical Excellence* by the International Vetiver Network 2003, for initiative in developing an innovative approach to acid sulfate soil research in Australia using Vetiver Systems.

Dr Ivan Cole, Mr Wayne Ganther and **Dr David Paterson** (Manufacturing and Infrastructure Technology) won the UK Institute of Materials, Minerals and Mining, *Guy Bengough Award 2004* for their paper titled *A Holistic Model for Atmospheric Corrosion.*

Dr Chris Dyt and **Dr Cedric Griffiths** (Petroleum Resources) received a *Technology Innovations and Applications* award from the Chinese Research Institute of Petroleum Exploration and Development, PetroChina, for significant contributions to the petroleum and natural gas industry of China.

Dr Greg Foliente and **Dr Phillip Paevere** (Manufacturing and Infrastructure Technology) with collaborators from the University of California in Berkeley and the Technical University of Hamburg-Harburg in Germany, won the *Best Paper Award* at the American Society of Mechanical Engineers' 2003 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. Their paper was titled *On Parametric Analysis of Differential Hysteresis*.

Dr Ben Gawne (Land and Water) received the *2003 Australian Society for Limnology Early Career Excellence Award* at the Joint 42nd Australian Society for Limnology Congress and 36th Congress of the New Zealand Limnological Society. Dr Gawne was recognised

for his substantial and tangible contributions to international limnology, both theoretical and applied.

Dr David Hawking and the **Panoptic team** (ICT Centre) won the *Network Computing's Annual Well-Connected Award* in the category of Business Applications: Enterprise Search Engine for CSIRO's Panoptic Enterprise Search Engine. Dr Hawking was presented with the award at a ceremony in Las Vegas as part of the giant Networld:Interop event. Panoptic also won the Network Computing magazine's Editors' Choice Award for superior indexing, speed and an easy interface.

Dr Bob Leicester (retired, Manufacturing and Infrastructure Technology) was honoured with the *Distinguished Alumnus Award* from the University of Illinois at Urbana-Champaign, USA.

Ms Meity Mandagie (Manufacturing and Infrastructure Technology) won the *2004 TMS Magnesium Technology Best Student Paper Award,* from the Minerals, Metal and Materials Society, USA.

Dr Sadanandan Nambiar (Forestry and Forest Products) received a *Commonwealth Forestry Association Medal of Excellence* from the South East Asia-Pacific Region in 2004 for outstanding contributions to forestry internationally from an Australian base.

Dr Richard Sakurovs (Energy Technology) won the *Best Published Paper* in the Journal of Japan Petroleum Institute, 2002.

Ms Tara Schiller (Manufacturing and Infrastructure Technology) received the *R F Bunshah Award 2003* at the International Conference on Metallurgical Coatings and Thin Films.

Dr Richard Stirzaker (Land and Water) won the *2003 Watsave Technology Award* from the International Commission on Irrigation and Drainage. Dr Stirzaker and the South African team won the award for their work with the FullStop wetting front detector for farmers in South Africa.

CSIRO Awards

The Chairman's Medal

The *2003 Chairman's Medal* was presented by Ms Catherine Livingstone, CSIRO Chairman and the *CSIRO Medals* were presented by the Hon Peter McGauran, Minister for Science. The Business Excellence Medal was presented by Mr Mehrdad Baghai, Executive Director, CSIRO Business Development and Commercialisation. The Lifetime Achievement Medals were presented by Dr Geoff Garrett, CSIRO Chief Executive. The Awards ceremony was held on 10 December 2003.

The Cotton Plant Breeding and Biotechnology Team won the *2003 Chairman's Medal* for their contributions to the development and delivery of genetically modified insect and herbicide resistant cotton varieties for the Australian cotton industry.

The winners of the *Chairman's Medal* were: **Dr Greg Constable** and **Dr Danny Llewellyn.**

From left to right: Ms Catherine Livingstone (Chairman), Dr Danny Llewellyn and Dr Greg Constable. Photo: CSIRO Plant Industry

CSIRO Medals

The *CSIRO Medals* for 2003 were awarded for:

- the development of a new process for polymer synthesis that has the potential to revolutionise a large part of the polymer industry by **Dr Ezio Rizzardo** (team leader), **Dr Mat Ballard, Dr John Chiefari, Mr Bill Chong, Ms Frances Ercole, Ms Amanda Finlay, Ms Justine Jeffery, Mrs Julia Krstina, Mrs Tam Le, Dr Roshan Mayadunne, Dr Gordon Meijs, Dr Cathy Moad, Dr Graeme Moad, Mr Almar Postma, Dr Melissa Skidmore, Mr Heng Taing** and **Dr San Thang**
- contributions to bushfire science and practice by identifying new factors that determine how bushfires behave by **Mr Phil Cheney** (team leader)**, Mr Sean Cheney, Dr Peter Ellis, Mr Jim Gould, Mr Peter Hutchings, Mr Ian Knight** and **Mr Andrew Sullivan**
- significant contributions to the discovery and industrial application of molecular genetic tests in cattle by **Dr Bill Barendse** (team leader)**, Ms Sharon Armitage, Mr Stuart Baud, Mr Rowan Bunch, Dr Roger Drinkwater, Mr Blair Harrison, Dr Rachel Hawken, Dr Yutao Li** and **Ms Merle Thomas.**

Business Excellence Medal

The *Business Excellence Medal* was awarded to the Schering-Plough Business Development Team (Molecular Science). The winners were: **Dr Kevin Winzenberg** and **Dr Paul Savage** (team leaders)**, Ms Samantha Carroll, Dr Craig Francis, Dr Adam Meyer, Dr Simon Saubern** and **Dr David Winkler** for excellent Customer Relationship Management and the relationship with Schering-Plough to deliver a mutually valuable strategic alliance.

Lifetime Achievement Medals

Dr Doug Cocks (Sustainable Ecosystems) and **Dr Michael Freer** (Plant Industry) were awarded a *Lifetime Achievement Medal.* Dr Cocks was recognised for his outstanding work leading research groups which used trans-disciplinary methods to pioneer and demonstrate multi-valued approaches to land use planning and management; and the use of national-scale computerised databases for resource policy analyses. Dr Freer is one of the pioneers of grazing systems science in Australia and its application to help farmers manage their flocks and herds. His enduring achievement is the development and adoption of GrazFeed, which has led to major improvements in the efficient use of supplements and pasture.

From left to right: The Hon Peter McGauran, Dr Doug Cocks, Dr Mike Freer and Dr Geoff Garrett (Chief Executive). Photo: CSIRO Plant Industry

One-CSIRO Award

The *One-CSIRO Award* was awarded to the **Agrifood Top 5 Flagship Project** team (now Food Futures Flagship) for their ability to undertake one of the largest multi-Divisional activities in CSIRO. The project involves around 250 staff from nine CSIRO Divisions working in multi-disciplinary research teams to develop new agrifood products and processing technologies. The winners were: **Dr Allan Green** (team leader), **Ms Marie Avellana, Mr Andrew Chalmers, Dr Martin Cole, Dr David Cox, Dr John Curran, Dr Gregory Harper, Ms Cher Jones, Dr Anna Koltunow, Dr Matthew Morell, Dr Laurie Piper, Dr Nigel Preston, Dr James Ridsdill-Smith, Dr Peter Rothlisberg,**

Dr Ranjan Sharma, Dr Geoff Smithers, Dr Cindy Stewart, Dr David Topping, Dr Carlene Wilson and **Dr Rob Woolaston.**

Look Out!!! Award

The Look Out!!! Award was awarded to the Sentinel Team (Land and Water) for their outstanding work on Sentinel Hotspots. Sentinel Hotspots currently delivers the fastest turnaround of satellite data for bushfire monitoring in the world. The continental-scale mapping system provides fire location data through the Internet within an hour of NASA satellites detecting the 'hotspots'. The winners were: **Dr Alex Held** (team leader), **Mr Peter Dyce, Ms Lynne Griffiths, Mr Alan Marks, Ms Suzette Searle** and **Mr Garry Swan.**

Partnership Excellence Award

The *Partnership Excellence Award* was awarded to the ***Ocean Forecasting Australia Team*** in recognition of the team's highly effective partnership with the Bureau of Meteorology and the Royal Australian Navy to deliver an operational ocean forecasting system that provides accurate information on the past, present and future ocean behaviour to support defence, marine safety and transport, the oil and gas industry and other resource managers. The winners were**: Dr Gary Meyers** (team leader), **Mr Rick Bailey, Mr Craig Roy, Dr Andreas Schiller** and **Dr Neville Smith.**

Occupational Health and Safety Achievement Award

The Occupational Health and Safety Achievement Award was awarded to **CSIRO Textile and Fibre Technology.** The award recognised sustained work to reduce the risks of injuries during research activities involving textile and leather processing plant and research equipment, through the identification of plant and equipment hazards, assessment of risk and implementation of controls. This initiative has substantially changed staff attitudes towards and awareness of safe working practices in research and development. Team Leaders were: **Dr Tony Hudson, Mr Rod Howard, Dr Shaun Smith** and **Ms Jacinta Wassenberg.** Team Members were: **Mr Jeff Baum, Mr Colin Brackley, Mr Frank Dean, Dr Ron Denning, Mr Lance Edwards, Ms Denise Elson, Mr Keith Fincher, Miss Debra Hamilton, Mr Phil Henry, Mr Andrew Jones, Mrs Geni Kozdra, Mrs Carmen Martin-Samos, Mrs Liz Middleton, Ms Martina Miksch, Ms Chris Nunn, Mr Chris Pickersgill, Mrs Brenda Roberts, Dr Ian Russell, Mr Cameron Simpson** and **Dr Peter Turner.**

Environmental Achievement Award

The *CSIRO Environmental Award* was awarded to the Ecocycle PET X-Ray Film Recycling Project team (Molecular Science). The team, with backing from Eco Cycle Industries, has developed a process for converting otherwise polluting x-ray film into liquid product that is a key ingredient of polyurethane foams. Working closely with Huntsman, one of the largest producers of polyurethanes world-wide, the team expects to be able to put the product to good use in developing building panels with excellent fire retardant properties. The winners were: **Dr Mike O'Shea** (team leader), **Mr Brian Carter, Mr Bruce Coley, Ms Aeron Coombes, Mr Kevin Esson, Mr Kevin Hynes, Mr Chris Kohle, Ms Carole Labram, Mr Lawry McCarthy, Mr Lance Nichols, Mr Gary Peeters, Mr David Quint, Mr Ray Smith** and **Dr Ru Yu Wu.**

Service from Science Award

The *Service from Science Award* was awarded to the **Australian National Insect Collection Volunteers and Honoraries** for the tremendous benefit each year Australia receives from the work of volunteers and honorary fellows in CSIRO's Australian National Insect Collection. The achievements and impact of this work is impressive, with people donating their time and effort out of their dedication to describing, classifying and managing CSIRO's insect biodiversity. The winners were: **Mr Tom Van Gerwen** (team leader),

Ms Cynthia Beasley, Mr Ted Beasley, Dr George Bornemissza, Ms Jennifer Campbell, Miss Jo Cardale, Dr Mary Carver, Ms Judith Clark, Mr Glenn Cocking, Dr Don Colless, Dr Ian Common, Mrs Helen Crompton, Dr Max Day, Ms Claire Edwards, Dr Matthew Gibbins, Mrs Barbara Hartley, Ms Alex Hodgson, Ms Mary James, Miss Fiona Johnson, Dr John Lawrence, Ms Erica Leslie, Ms Mary Lockett, Mrs Inelda Lovi, Dr Peter Macnicol, Mr Tony Martin-Jones, Mr Barry Mayfield, Mr Ray McInnes, Mr Clifford Meyer, Dr Leigh Miller, Dr Barry Moore, Dr Laurence Mound, Mr You Ning Su, Ms Claire Parmeter, Mrs Beryl Reed, Dr Barry Richardson, Ms Christine Roach, Ms Rita Romaniuk, Mr Alexander Roy, Mr Francisco Tula-Portillo, Ms Lydia Waldron, Mr Kenneth Webster, Mr James Woodman and **Dr Elwood Zimmerman.**

John Philip Award

Dr Michael Bange (Plant Industry), **Dr Andrew Groth** (Molecular Science) and **Dr Evelyn Krull** (Land and Water) were awarded a *2003 John Philip Award for the Promotion of Excellence in Young Scientists*.

Fellowships and Societies

Mr Mehrdad Baghai (Business Development and Commercialisation) was awarded a *2004 Henry Crown Fellowship* for young business leaders by the Aspen Institute, Colorado, US.

Dr Tom Beer (Atmospheric Research) was elected Vice-President of the *International Union of Geodesy and Geophysics*. He was also awarded a *Doctorate of Sciences* by the University of Canterbury, New Zealand.

Dr Jeremy Burdon (Plant Industry) was elected a Foreign Member of the *Royal Swedish Academy of Sciences* for extensive achievements in research.

Dr Peter Carberry (Sustainable Ecosystems) was elected President of the *Australian Society of Agronomy.*

Mr Brian Carter (Molecular Science) was elected a Fellow of the *Institution of Mechanical Engineers, UK.*

Professor Suzanne Cory (Board Member) was appointed as an *Academician of the Pontifical Academy of Sciences* by Pope John Paul II.

Dr Jim Cox (Land and Water) was awarded an *Organisation for Economic Co-operation and Development (OECD)* Fellowship.

Dr Nicholas Cutmore (Minerals); **Dr Rob Evans** (Forestry and Forest Products); **Dr Geoff Garrett** (CSIRO Chief Executive); **Dr Laurence Piper** (Livestock Industries); **Dr John Ramshaw** (Molecular Science); **Dr Michael Raupach** (Atmospheric Research) and **Dr Peter Randall** (Plant Industry) were elected as Fellows of the *Australian Academy of Technological Sciences and Engineering.*

Dr Grant Douglas (Land and Water) was awarded a Fellowship of the *International Association of Applied Geochemists* in recognition of his accumulated experience in a range of areas within the geochemical discipline.

Dr Neale Fulton (Mathematical and Information Sciences) was elected Fellow of the *Royal Aeronautical Society*, London, UK.

Dr David Hawking (ICT Centre) was awarded an Honorary Doctorate from the *Université de Neuchâtel* in Switzerland for his contribution to objective evaluation of information retrieval systems, and internet search engines.

Dr Ralph Holmes (Minerals) was elected as Chairman of the *International Sampling and Blending Forum.*

Dr Thomas J Higgins (Plant Industry) was elected as a Fellow to the *Australian Academy of Science.*

Dr Jon Olley (Land and Water) was elected as Vice-President of the *International Commission on Continental Erosion.*

Dr Jim Peacock (Plant Industry) was elected as a Foundation Member of the *Academia Bibliotheca Alexandrinae*, Egypt. Dr Peacock

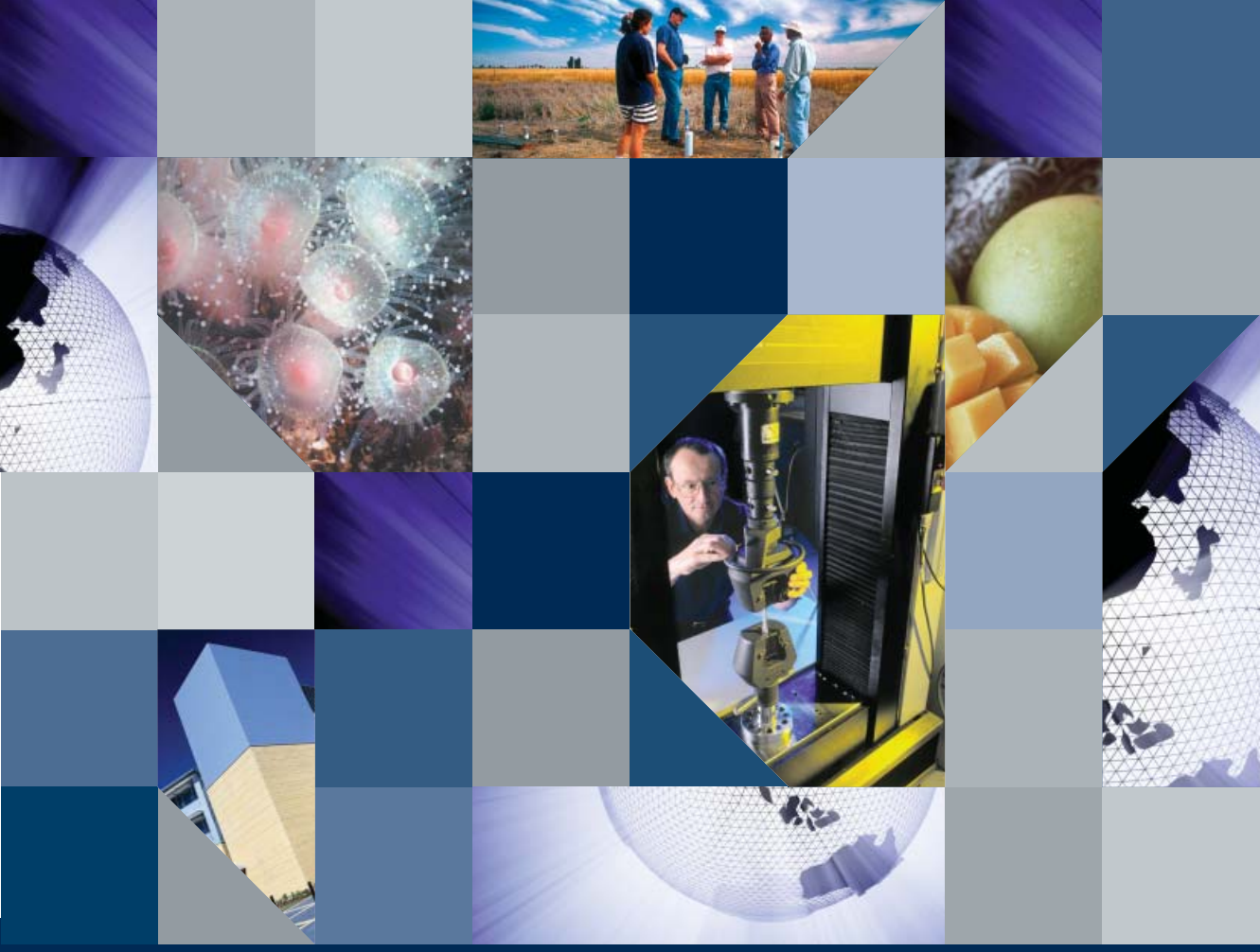
was also awarded a *University Institutional Doctor Honoris Causa* degree from the University of Gent, Belgium for his outstanding academic and professional career in the field of plant molecular biology and his eminent contributions to the community as a whole.

Ms Patricia Pilling (Health Sciences and Nutrition) received a *Young Scientist Fellowship* from the 10th International Conference on the Crystallisation of Biological Macromolecules, Beijing, China.

Dr Peter Ryan (Plant Industry) was awarded a Honorary Visiting Professor at the *University of Hangzhou, China.*

Dr Philip Smethurst (Forestry and Forest Products) was awarded a *Gottstein Fellowship* by the J W Gottstein Memorial Trust to study methods of managing commercial forest plantations in riparian zones of cleared agricultural land.

Dr Brian Spies (Exploration and Mining) was elected as First Vice-President of the *Society of Exploration Geophysicists*.



Governance

Enabling legislation, functions and powers	92
Responsible Minister	92
Governance	93
Service charter	99
CSIRO policies	101
Administrative law	102
Occupational health and safety	103
Commonwealth disability strategy reporting	108
Environmental management, energy and heritage reporting	109

Governance

Enabling legislation

CSIRO is an independent statutory authority constituted and operating under the provisions of the *Science and Industry Research Act 1949*. Reporting, accountability and other rules for CSIRO's operation are set out in the *Commonwealth Authorities and Companies Act 1997*.

Functions

In summary, CSIRO's primary functions 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 Commonwealth Government
- to encourage or facilitate the application and use of the results of its own or any other 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 2003 to 30 June 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.

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 2002–03.

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 for Education, Science and Training exercised this power during 2003–04 in relation to hedging and fraud control. (see page 97–98)

Governance

The CSIRO corporate governance framework covers the role and responsibilities of the Board and management of the Organisation and its policies and practices. It provides the framework by which the Organisation is directed and controlled.

In 2003, the Board initiated a dialogue with management on CSIRO's corporate governance framework. Policies and practices, risk management and reporting arrangements and related roles and responsibilities have been examined and, where necessary, clarified and improved to support the delivery of CSIRO objectives and to build and strengthen the Organisation's corporate governance culture.

During 2003–04, the Chairman conducted a review of the performance of the Board involving all Board members, the Board reviewed and agreed the formal charters for the operations of the Board and the three Board committees, and the Board reviewed and issued a new set of *Directions to the Chief Executive*.

The Board also conducted a major review of the organisational risk profile which formed the basis for the 2004–05 Audit Plan.

Management reviewed and updated the CSIRO Authorities Manual and commenced a project to review all existing policy aimed at:

- a standard format
- a clear distinction between policy, procedures and guidelines
- easy accessibility to all policy in a single place on the CSIRO intranet.

A number of new and revised policies were issued in 2003–04 as shown on page 101.

Management has mapped key processes with a view to improving efficiency, support systems and lines of accountability.

The Performance Measurement Framework implemented in 2003–04 provides enhanced information for management decision making and external reporting.

Role and responsibilities of the CSIRO Board and management

Under the *Science and Industry Research Act 1949* (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 SIR Act specifies that the affairs of CSIRO shall be conducted by the Chief Executive subject to any policies determined by the Board and any directions given to the Chief Executive by the Board.

The role of the Board is described in detail in the CSIRO Board Charter. Briefly, the Board is responsible to the Commonwealth Government for the overall strategy, governance and performance of CSIRO. This role includes:

- providing strategic direction to CSIRO
- ensuring best practice corporate governance is implemented in CSIRO, including legal compliance and risk management
- 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 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 the agreed goals. The Chief Executive is supported by an Executive Team and an Executive Management Council detailed in the organisation chart on page 117.

The *Directions to the Chief Executive* set out formal directions which have been given to the Chief Executive of CSIRO by the Board under

the SIR Act. The directions are intended to harmonise the requirements of the SIR Act and the *Commonwealth Authorities and Companies Act 1997* (CAC Act) so that CSIRO will be governed seamlessly and be fully compliant with the requirements of both Acts.

The Board meets formally every second month for one or two days. Additional meetings may be scheduled as required. In accordance with the SIR Act, Board members, with the exception of the Chief Executive, are not involved in the day-to-day running of the Organisation.

All new Board members receive a formal induction to inform them of their duties, obligations and rights.

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.

Management has in place an Authorities Manual that is available on the CSIRO intranet. The Manual is designed to support the corporate governance of the Organisation and the strategic decision to more closely align the roles, responsibilities and accountabilities of officers with the power to exercise certain delegations and authorities. The Manual sets out:

- principles for the devolution of powers within CSIRO and for the responsible and accountable exercise of those powers
- formal delegations and authorisations
- guidelines for use with delegations and authorisations
- approval processes.

Structure of the Board

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. Details of the 2003–04 Board members, including qualifications and terms of appointment, are shown on page 116. The Board has an Audit Committee, a Remuneration Committee and a Commercial Committee. Other committees can be established from time to time to assist in the execution of the Board's duties and to assist detailed consideration of complex issues.

All matters considered and determined by the Audit Committee, Remuneration Committee and Commercial Committee are submitted to the Board for information and, where appropriate, ratification or decision. The charters for the Board and committees are on the CSIRO intranet.

The Financial Statements contain details of remuneration of Board members and their attendance at Board, Audit Committee Remuneration Committee and Commercial Committee meetings.

Promoting ethical and responsible decision making

Section10F 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 provide for 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.

Since 1994, CSIRO has had in place a Code of Conduct that applies to the Organisation's Board, management and staff. The Code which is posted on CSIRO's intranet provides a benchmark against which conduct can be assessed to ensure that the highest ethical standards are met.

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 line management 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.

The Board Audit Committee and Board Commercial Committee also have roles in ensuring an effective control environment is in place.

Board Audit Committee

The Board Audit Committee meets quarterly or more frequently as required. As at 30 June 2004, the Audit Committee comprised Ms D O'Toole (Chairman), Dr T Cutler, Dr E Tweddell and Ms E Alexander (external advisor).

The Chairman of the Board, Ms C Livingstone, is an *ex officio* member of the Audit Committee. The Chief Executive, the Chief Finance Officer, the General Manager Finance, the General Manager, Risk Assessment and Audit (RA&A), the CSIRO General Counsel and representatives of the ANAO have a standing invitation to attend each meeting.

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 (ANAO)
  - CSIRO's process for monitoring compliance with laws and regulations, Government policy and its own Code of Conduct.

In fulfilling the purpose noted above, the Committee will maintain effective working relationships with CSIRO management and the Internal and External Auditors.

Under the CAC Act the Auditor General is the external auditor for CSIRO. The Audit Committee reviews the 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, and as at 30 June 2004 comprised Mr P Duncan (Chairman), Dr E Tweddell and Mr B Keane. The Chairman of the Board and the Chief Executive are both *ex officio* members.

The purpose of the Committee is to assist the CSIRO Board to fulfil 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 ComEx which provides advice on internal management processes and oversees commercial activities. ComEx comprises two part-time external commercial advisors together with senior management personnel.

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. Taking organisational risks into account, RA&A 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 Board Audit Committee reviews management's policies, procedures framework and internal compliance.

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 working group Chaired by the Chief Finance Officer.

Encouraging enhanced performance

The Board charter requires the Chairman to monitor Board performance and coordinate a review of the Board's performance at least every 18 months. Board committee charters require each Committee to meet alone at least once per year to assess their performance and report the outcomes to the Board.

The Organisational Performance Measurement Framework includes four primary groups of measures:

- effectiveness and outcomes measures
- program performance measures
- organisational health measures
- strategic implementation and achievement measures.

Security

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, Divisional and Site Security Officers.

Remunerating fairly and responsibly

The Remuneration Tribunal determines non-executive Board members' and the Chief Executive's remuneration and allowances.

The Board Remuneration Committee meets at least twice per year, and as at 30 June 2004 comprised Dr T Cutler (Chairman), Mr P Duncan and Mr B Keane. The Chairman of the Board is an *ex officio* member. Committee meetings are attended, when appropriate, by the Chief Executive.

The purpose of the Board Remuneration Committee is to assist 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.

Commonwealth Policies notified to CSIRO

Under s51 of the *Science and Industry Research Act 1949*, CSIRO's Annual Report must set out any policies notified by the Minister under s28 of the *Commonwealth Authorities and Companies Act 1997* (the CAC Act). Under s28(2) of the CAC Act, the Board must ensure that the notified policies are carried out in relation to CSIRO and, as far as practicable, its subsidiaries. The following policies were notified to the Board of CSIRO during the reporting year.

Restriction on Foreign Exchange Hedging

In August 2002, the Minister, The Hon Dr Brendan Nelson MP, gave preliminary notification to the Board of CSIRO of a general policy of the Government relating to future foreign exchange risk management by agencies. The general policy was that entities included in the General Government Sector (of which CSIRO is one) 'will be restricted from externally hedging forex exposures'. This notification initiated a process of consultation required under s28(1) of the CAC Act.

The Chairman of the CSIRO Board, Ms Catherine Livingstone, replied to Dr Nelson in October 2002, referring to particular problems which would arise if the general prohibition on hedging foreign exchange risks were to be applied to CSIRO and to start-up companies established to commercialise CSIRO technology. CSIRO's Minister referred this issue to the Minister for Finance in December 2002. On 24 June 2003, the Minister for Finance replied to Dr Nelson, saying:

> '*I note that restricting CSIRO from hedging could hinder its ability to enter into joint ventures involving commercial and industry partnerships and thereby restrict its capacity to earn external revenue. In light of this argument, I agree to grant CSIRO a limited exemption on external hedging restrictions of foreign exchange exposures.*
>
> *This exemption applies to joint ventures with commercial partners involving foreign currency contracts. In granting a limited exemption, CSIRO is required to consult with officers of my Department on a project-by-project basis for all joint ventures for which hedging of foreign exchange exposures is sought.*
>
> *I reserve the right to revisit this limited exemption should CSIRO's circumstances change or if the Government reviews its policy on foreign exchange exposure.*'

The Minister for Finance also noted in his letter that CSIRO would remain eligible for budgetary supplementation in respect of operations covered by the above exemption. Such supplementation would be triggered if foreign exchange losses exceeded the relevant materiality threshold and CSIRO could demonstrate that proper foreign exchange risk management practices had been implemented by CSIRO, consistent with the Government policy. In July 2003, CSIRO was provided with a copy of the Finance Minister's letter to Dr Nelson.

CSIRO is treating the provision to it of the copy of the Finance Minister's letter by Dr Nelson (as Minister for Education, Science and Training) as:

(a) formal notification to the Board of CSIRO of the general policy of the Government restricting external foreign exchange hedging (following consultation with the Board as required under s28(1) of the CAC Act)

(b) an exemption under s28(4) of the CAC Act from compliance with the general policy where, in relation to a particular project:

   i. a restriction on hedging could hinder CSIRO in its ability to enter into joint ventures involving commercial and industry partnerships and thereby restrict its capacity to earn external revenue

   ii. CSIRO has consulted with officers of the Department of Finance and Administration in relation to the project.

Fraud Control Guidelines

Following consultation with the Board of CSIRO, as required under s28 of the *Commonwealth Authorities and Companies Act 1997* (CAC Act), the Minister for Education, Science and Training on 1 August 2003 notified CSIRO of certain general policies of the Commonwealth Government relating to the application of Commonwealth Fraud Control Guidelines. The guidelines are available from the Attorney-General's website at: http://www.ag.gov.au/aghome/commprot/crjd/LECD/fraud.html.

In accordance with the Guidelines a comprehensive fraud risk assessment was completed in 2004. A fraud control plan was prepared as a result of the assessment in compliance with the Guidelines. In addition, appropriate fraud prevention, detection, investigation and reporting procedures and processes are in place.

Developments since 30 June 2004

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 2004, the National Measurement Laboratory transferred to the National Measurement Institute within the Commonwealth Department of Industry, Tourism and Resources.

Service charter

For a complete version of CSIRO's Service Charter see www.csiro.au/servicecharter or page 1 for more details.

Customer services

For organisations and individuals seeking scientific research expertise, we will:

- work with the customer to develop an in-depth understanding of their needs
- assist in clarifying the scientific expertise required to address the customer's needs
- where CSIRO has the available expertise, develop a proposal for CSIRO to provide a service to the customer
- negotiate a value-based contract with the customer
- conduct research or other scientific services as specified in the contract with the customer in a professional manner.

For governments and their agencies, we will provide:

- strategic and applied research in support of international, national and regional economic, social and environmental priorities
- independent expert advice on scientific issues and fact-based analysis and insights which can assist policy development
- submissions to enquiries and working parties where scientific and technical advice is required
- delivery of scientific and technological inputs to foreign trade missions and overseas aid projects.

For those groups seeking information from CSIRO we will:

- provide up-to-date, accurate information about CSIRO and its activities
- provide information and advice on national and international developments in areas of science and innovation in which CSIRO has expertise.

Our service standards

Our performance can be measured against the following standards:

- in our activities the potential benefit to the Australian community will be clearly identifiable and CSIRO will listen to the community concerns about its activities and research directions
- all scientific and commercial activity will be conducted with due professional care and skill
- the Organisation will seek the input of key industry, business, government and community leaders in deciding its research priorities
- the Organisation will seek and respond to feedback for each major research project undertaken
- the Organisation will utilise its scientific capability as effectively as possible
- advice given will be independent and based on appropriate expertise.

Staff conduct

The Staff Code of Conduct addresses issues and situations that may arise in day-to-day work and is based on four main principles:

- staff are expected to perform their duties with professionalism and integrity, and work efficiently to enable CSIRO to meet its research and corporate goals
- fairness, honesty, equity and all legal requirements are to be observed by all CSIRO staff in the conduct of official duties and during interactions with clients and members of the public
- real or apparent conflicts of interest are to be avoided and, if this is not possible, they should be declared
- intellectual property and confidential information will be properly protected during employment with CSIRO and afterwards, and appropriate business and commercial protocols will be strictly observed by staff.

Checking our performance

We will:

- evaluate our services against the standards we have set in this Charter, to see if we are meeting those standards
- informally review the standards set out in this Charter on a regular basis and respond to ongoing changes
- formally review the standards set out in this Charter as required and report the actions of such reviews.

How to give us feedback

CSIRO greatly welcomes feedback on its performance. Should you wish to contact us do so via CSIRO Customer Relations at:

The Gatehouse
Bayview Avenue, Bag 10
Clayton South VIC 3169
Email: customer-relations@csiro.au

We will deal with feedback quickly and effectively, passing on credit in the case of compliments and striving hard to make amendments and improve where concerns are expressed about our performance.

CSIRO policies

The Organisation is implementing a policy framework, as part of its focus on governance, which will improve the clarity and accessibility of policies, procedures and guidelines, enhance compliance, and involve the systematic review of all policy statements. In December 2003, the CSIRO Board approved the CSIRO Shareholding Policy and in January 2004 all of the Organisation's business development and commercialisation policies were reviewed, with the revised policies issued in June 2004.

During the financial year, operational policies were established or updated in the following areas:

Operational area	New and Updated Policies
Business Development and Commercialisation	■ All business development and commercialisation policies covering: – People related matters – Intellectual property management – Contracts and contract management – Complex commercial transactions – Shareholdings – Governance – Costing, pricing and debt recovery
Environment	■ CSIRO Guidance on the Management of Listed Threatened Species and Ecological Communities in a Commonwealth Area
Finance	■ Procurement policy and procedures, including procurement of consultants (effective 1 July 2004) ■ Budget management principles ■ Management of Foreign Exchange Exposure ■ Investment Policy and Procedures ■ Expenses Subject to Fringe Benefits Tax ■ Management of Third Party Deposits ■ Bank Accounts (Financial Directions) ■ Temporary Advances (Financial Directions)
Occupational Health and Safety	■ Electrical Safety Procedure ■ Workplace Housekeeping Inspection Procedure ■ Fume Cupboards Procedure ■ Gas Safety Procedure ■ Managing Occupational Health Safety and Environment (OHS&E) Projects Procedure ■ Rehabilitation and Compensation Procedure ■ Provision of Approved Eyewear Procedure ■ Medical Assessment Procedure

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 92
- information about CSIRO's procedures for external consultation is set out in Appendix 1
- 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 2004, CSIRO received 18 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 2004, 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 2004, 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).

CSIRO recognises that people's safety is paramount and has made significant advances in its occupational health and safety (OH&S) activities during 2003–04.

CSIRO Organisational OH&S risk profile

A review of the Organisation's OH&S risk exposure to CSIRO staff was conducted by the Risk Assessment & Audit (RA&A) group. The key objective was to establish an organisation-wide OH&S risk profile for CSIRO.

The risk review also aimed to:

- identify areas where management systems were not adequate, or more efficient and effective OH&S management practices could be implemented
- monitor activity by identifying high risk areas where management systems were already mitigating the risk to an acceptable level.

CSIROSafe Audits conducted by RA&A during 2002–03 and a review of OH&S performance, from incident reporting and claim statistics, were collated and analysed to develop a risk profile for CSIRO overall.

The diverse nature of CSIRO's activities contributes to high-levels of inherent OH&S risk exposure across a broad range of possible risk categories. An evaluation of existing controls to prevent and manage OH&S risks indicates that a large proportion (68 per cent or 40 of 59 potential hazards) are being managed effectively. This is indicative of the strength of current CSIRO OH&S management systems and procedures.

The key areas where shortcomings in management controls were identified include:

- manual handling activities
- mental stress
- vehicles and transport
- live electrical equipment
- slips, trips and falls.

These areas present opportunities for management to revise or implement further risk reduction strategies.

OHS&E Steering Group

An OHS&E Steering Group was formed to guide the strategic direction and operational planning to align with the CSIRO Strategic Plan 2003–07. The objectives of the group are to:

- identify and assess present and future key risks and impacts
- develop the OHS&E Strategy aligned with CSIRO strategic priorities and integrated with CSIRO business systems
- monitor and evaluate CSIRO's performance and progress against the strategic priorities.

The OHS&E Strategic Plan has a delivery timeframe consistent with the timing of CSIRO's Strategic Plan 2003–07, and will guide the development of future OHS&E Improvement and Operational Plans.

CSIRO OHS&E Annual Report

The first public CSIRO Annual Report on OHS&E was released in February 2004. The report illustrates the range of activities that have been implemented to improve OHS&E across the Organisation. It records the performance standards achieved. Divisional case studies were included to demonstrate the large number of innovative research, development and commercialisation activities that had the potential to, or had achieved, improvements in health, safety and the environment. The report is available on the internet for public access at www.csiro.au/ohsereport.

OHS&E Annual Conference – 'To be amongst the best'

The 2003 CSIRO OHS&E Conference was held in Sydney and featured internal and external presenters from a number of disciplines. The conference aimed to build on CSIRO's achievements in OHS&E.

Additional objectives included:

- advancing OHS&E initiatives in pursuit of industry best practice
- exploring the availability and application of internal and external tools, services and resources to assist the Organisation achieve its objectives
- reviewing major initiatives implemented, milestones achieved and their impact to date
- sharing and promoting OHS&E achievements, and learning from other organisations
- focusing on future directions and achieving a 'One-CSIRO' vision.

The conference provided an excellent opportunity for staff development, learning and networking with Divisions from around Australia.

Safety Officers Survey

A survey of OHS&E Officers and Specialist Officers was conducted with the aim of collecting feedback on a range of issues related to their role, ways to enhance their contribution through targeted skill development and opportunities to assist them in performing their role more effectively.

Notifiable incidents

Notifiable Incidents are required to be reported to Comcare under the OH&S Act. 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.

A total of 73 notifiable incidents were reported to Comcare over the year. This included 39 serious personal injuries, two cases of work incapacity greater than 30 days and 32 dangerous occurrences.

OH&S statistics

Injury statistics

CSIRO's OH&S performance has improved during the reporting year, as indicated in Figure 1. Three injury performance measures are reported quarterly. The Lost Time Incident Frequency Rate (LTIFR) and the Average Time Lost Rate (ATLR) have improved. The Medical Treatment Frequency Rate (MTFR) indicates a decline in performance since last year.

The highlight of injury performance has been the reduction in the amount of time lost due to injury/illness. This is reflected in the LTI and the ATLR.

Figure 1. CSIRO's OH&S Performance for the past four years

OHS INJURY PERFORMANCE OF CSIRO 2001 – 2004								
Year To Date	**Incidents** (including near misses)	**Number of Claims**	**LTI> 1 Day**	**Cost To Date ($)**	**Time Lost To Date** (weeks)	**MTFR**	**LTIFR**	**ATLR** (Weeks in 5 Days to a week)
YTD June 2001	975	290	78	392 525	225.01	25 (21)	7 (5)	2.8 (2.6)
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)

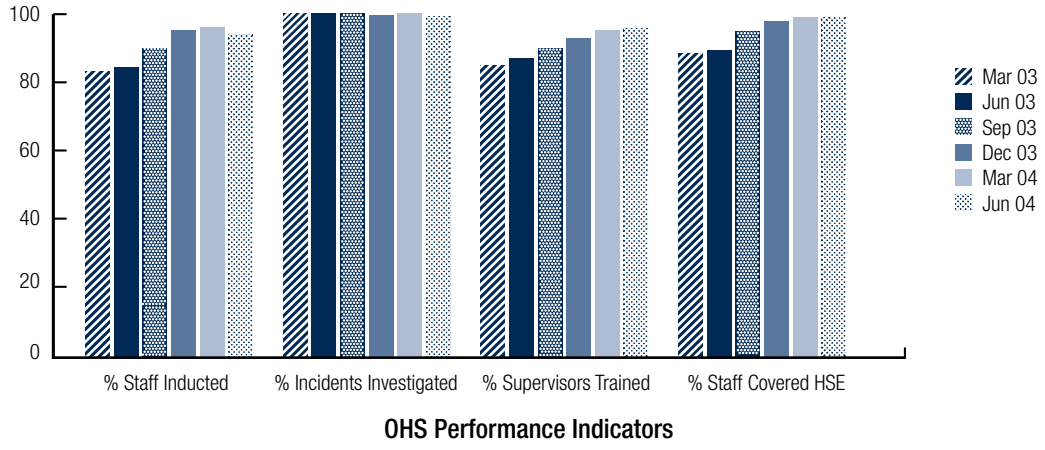
Definitions:

- *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.

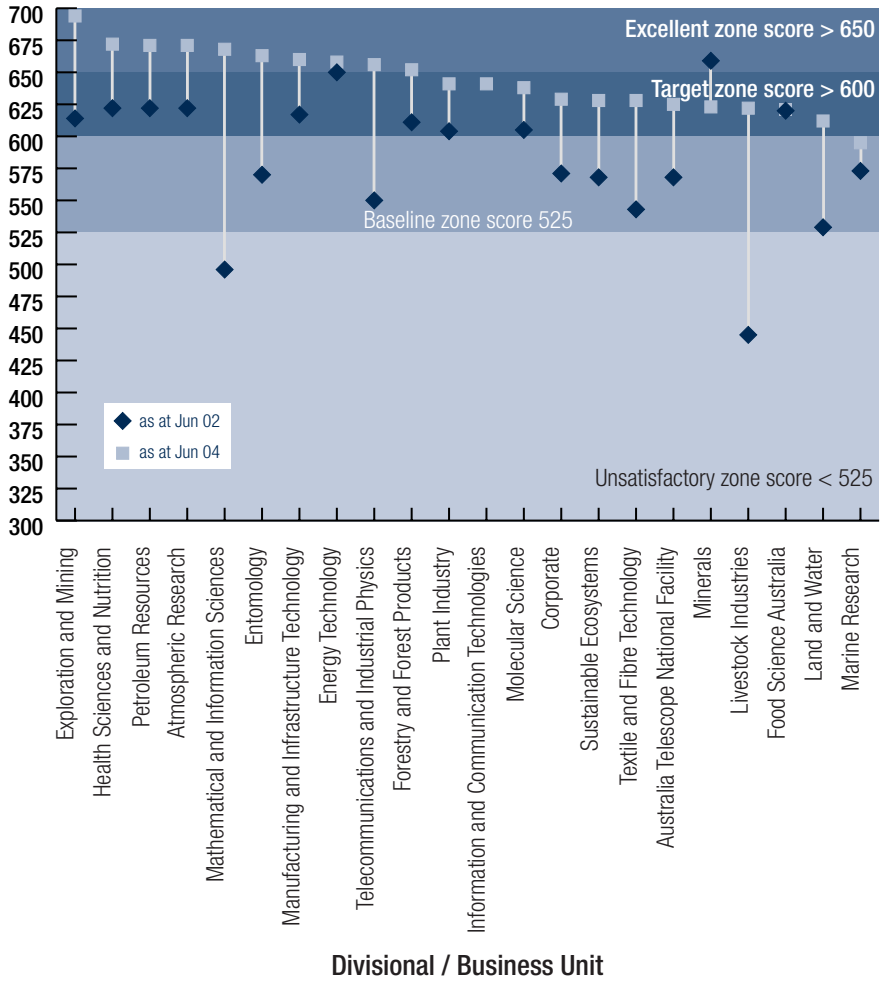
Figure 2: CSIRO Aggregated OHS Performance Indicator Mar 03 – Jun 04



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. See Figure 3 demonstrating improvement over the last year.

Figure 3: OHS Performance June 02 and June 04



OH&S investigations

Provisional improvement notices (PIN)

No Provisional Improvement Notices were raised.

Prohibition and improvement notices

Comcare issued two Improvement Notices at the Division of Forestry and Forest Products in Melbourne following an incident. These were raised to ensure that risk assessments were conducted on plant and that hazardous substances were properly stored and labelled. As at June 2004, these notices have not been revoked by Comcare.

No Prohibition Notices were raised.

Comcare audits

Comcare conducted an audit of CSIRO's OH&S Management System at Head Office and follow-up audits at the Divisions of Plant Industry, Canberra; Manufacturing, Infrastructure and Technology, Adelaide; and Marine Research, Hobart. Comcare was satisfied with the implementation of the system.

Comcare conducted a follow-up OH&S Management System audit of the Division of Manufacturing, Infrastructure and Technology in Melbourne, finding four deficiencies with procedures for purchasing, systematic assessment of plant, labelling of hazardous substances and provision of training. An action plan has been provided to their satisfaction.

Comcare also conducted an audit of compliance with plant legislation and regulations, finding deficiencies with licensing, registration, risk assessments and the provision of training in a new facility in the Division of Entomology. An action plan has been provided and the recommendations are being addressed.

Comcare investigations

Comcare conducted four reviews of previous investigations of incidents. They reported their satisfaction on the completion of action on recommendations to prevent re-occurrences. CSIRO is meeting Comcare expectations through detailed action plans which demonstrate commitment in addressing recommendations.

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.

A review in May 2004 of CSIRO's performance against its Workplace Diversity Plan, indicates that more work needs to be done in relation to staff with a disability. Of particular concern is the negativity evident in the annual staff survey, when comparing responses from staff with a disability to those of all other staff. 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. Because of this discrepancy, the differences in responses are not statistically significant. Nevertheless, the breadth of issues displaying this trend (17 of the 21 categories in the survey) is sufficient cause for investigation.

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.

Staff with a disability are employed evenly across all areas of activity and classification levels. This eliminates classification-specific and activity-specific trends from possible causes of the negative responses by staff with a disability.

CSIRO intends to conduct focus groups and a mini-survey of staff with a disability to assess whether similar concerns occur across a more complete sample.

Performance against the indicators issued by the Office of Disability is detailed in the following table:

Performance Indicator	Actions 2003–04
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: Equal Employment Opportunities (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.

Environmental management, energy and heritage reporting

CSIRO is required to report annually on ecologically sustainable development (ESD) and environmental matters under section 516A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

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

CSIRO is implementing an Environmental Management System (EMS) based on International Standards Organisation (ISO) 14001. Each Division has to identify and maintain a register of their legal obligations. A Legal Obligations Directory has been developed and provided on-line to users.

Environmental Policy

CSIRO's Environmental Policy was reviewed in 2003 to ensure that environmental management of CSIRO's operations remains a high priority and a key to sustainable development for the Organisation.

Environmental Management System

The CSIRO Executive Committee approved an EMS based on *AS/NZS ISO 14001 Environmental Management System Principles* in order to ensure consistent, comprehensive and pro-active management of CSIRO's environmental issues. A six stage EMS Implementation Plan was provided to assist Divisions in planning and tracking implementation. Baseline environmental audits have been completed on all CSIRO sites by third party auditors. Most sites have developed comprehensive Preliminary Environmental Assessment (PEA) Reports. The PEA reports incorporate the baseline report and data on resource usage and waste generation. The data is used as the reference point for setting environmental objectives, targets and improvement plans.

Environmental Management Systems Committee

The CSIRO Environmental Management Systems Committee (EMSC) is responsible for the development and implementation of Environment Policy and an Environmental Management System, and reports to the CSIRO Executive and Board on CSIRO's environmental performance. The Committee 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

There were two notifiable environmental incidents within CSIRO during the past year:

- a local water authority collected a sample of effluent being discharged to a sewer from a CSIRO laboratory. The subsequent analysis showed that the level of sulphide was above the legal limit, and in breach of the Trade Waste License. Corrective actions were put in place and subsequent testing for sulphide has confirmed that these controls were effective.
- boiler blowdown waste water was released to a stormwater drain. The Environmental Protection Authority (EPA) and local water authority were notified and informed that action had been taken to redirect boiler blowdown to a sewer.

CSIRO reports and investigates any incident deemed to have environmental impact through its Occupational Health Safety and Environment (OHS&E) incident reporting system.

Environmental remediation

Three sites underwent remediation management during 2003–04.

CSIRO National Environmental Protection Measures (NEPMs) submissions

Of the four NEPM's required to be reported by Commonwealth agencies, three were applicable to CSIRO in 2003–04:

- ***Assessment of site contamination***
  CSIRO reported on activities to which the Assessment of Site Contamination NEPM applies. These are:
  - baseline environmental audits of all sites
  - preliminary environmental assessment of all sites
  - removal of contaminants from any identified contaminated sites
  - validation of site remediation, final assessment audit and sign-off.
- ***Diesel vehicle emissions***
  CSIRO contributes to the Commonwealth's annual report on progress in reducing pollution from diesel vehicles. The EMSC has endorsed the Commonwealth Fleet Vehicle target of increasing the number of vehicles scoring 10.5 or more on the Green Vehicle Guide from 18 per cent to 28 per cent. This will necessitate the purchase of 'environmentally friendly' vehicles in the future, and will result in less diesel vehicles being in the CSIRO vehicle pool.
- ***National Pollutant Inventory (NPI)***
  CSIRO reported three sites that are above the emissions thresholds for the NEPM. These sites, Clayton (Vic), Black Mountain (ACT) and Geelong (Vic) burn natural gas in excess of 400 tonnes per year and will be added to the NPI database in 2004. All energy consumption data is reported to the CSIRO Energy Services unit. This data is used to promote and assist programs aimed at reducing energy use within CSIRO in-line with Government Energy Usage guidelines.

Environmental Management System improvements and review

Environmental Management System improvements

A corporate EMS manual and EMS procedure templates have been developed to guide and assist its implementation across CSIRO's diverse and geographically dispersed range of sites. In the past year significant improvements have been achieved:

- guidance has been provided on the use of green transport
- a procedure has been provided on the management of listed species and threatened ecological communities
- a guidance note was issued on the completion of NEPMs
- an environmental legal obligations directory for all States and Territories was released on the intranet
- the Chemwatch Gold© internet-based hazardous substances management and material safety data sheet program was provided
- Australian Standards were released on-line for all staff
- progress continued with a three year plan to remove out-of-use underground storage tanks
- an asbestos management plan is near completion
- all sites have established a waste management/recycling program
- environmental sessions have been included in our annual OHS&E Conference
- resource usage indicators are reported on a site-by-site basis to better reflect site rather than Divisional usage
- OHS&E procedures for reporting hazards, incidents and conducting risk assessments have been incorporated into the EMS
- a comprehensive register of CSIRO radiation sources has been developed.

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, incident reporting and investigation, and training has also been integrated into the OHS&E system.

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 Protection and Nuclear Safety Agency (ARPANSA) on a quarterly basis. As at January 2004, the reported inventory included 289 surplus to requirement sources (Woomera stockpile counted as one source). The EMSC recently encouraged Chiefs of Divisions to dispose of their surplus sealed radiation sources wherever there is a legal pathway for doing so.

Environmental Management System monitoring and review

Independent environmental audits have been completed on all CSIRO sites. The task of completing internal Preliminary Environmental Assessments is nearly complete, and implementation of EMS stages is well underway.

During 2003, an internal auditing tool, CSIROClean, was developed and EMS auditing commenced in October 2003. Risk Assessment and Audit branch is conducting CSIROClean environmental audits in each Division to provide independent verification of effective environmental management. This program is due for completion in August 2004.

An organisational-wide environmental risk review has been completed by the Risk Assessment and Audit branch. This will allow CSIRO to more easily identify its significant environmental impacts and ensure strategies and mechanisms are in place to reduce the risk of environmental damage.

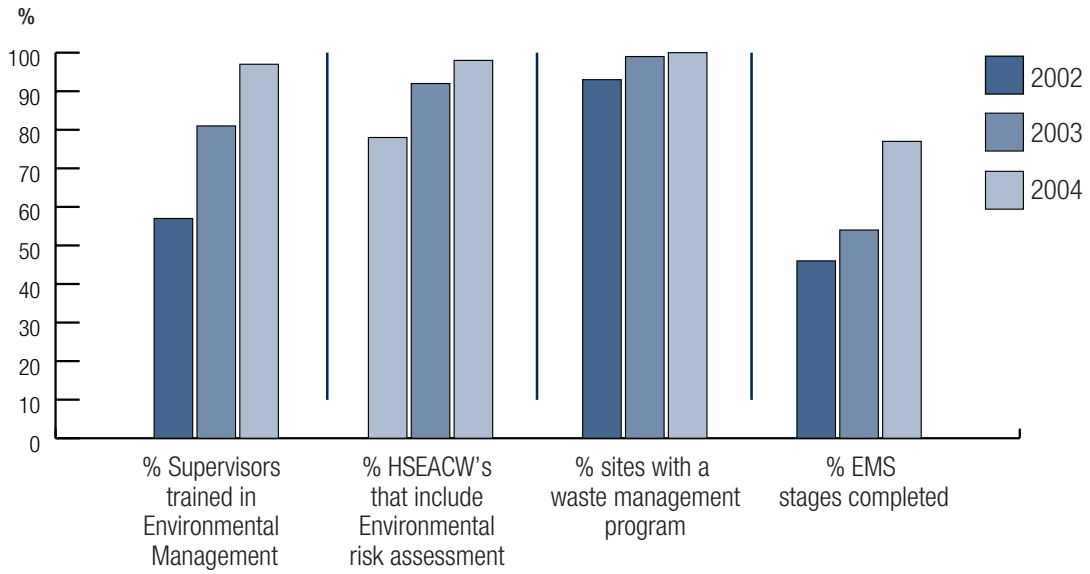
Environmental positive performance indicators

Positive environmental performance indicators are used to demonstrate continuous improvement. The four positive environmental indicators are highlighted in Figure 1 and are:

- ***Percentage of Supervisors/Line Managers trained in environmental responsibilities.*** Training in environmental responsibilities involves attendance at either an EMS training session or the CSIRO OHS&E Supervisors' course.
- ***Percentage of completed Health, Safety and Environment Assessment and Control of Work (HSEACW) forms where environmental aspects have been considered.*** This indicator reviews whether environmental aspects have been considered in the OHS&E risk assessment regardless of whether the work may or may not have an impact upon the environment.
- ***Percentage of sites with a waste management (reduce, reuse, recycle) program.*** This indicator reports on the percentage of Divisional sites that have a waste management program in place that incorporates each of the three components.
- ***Percentage of EMS implemented*** This indicator is reviewed quarterly and Divisions report on their progress in implementing the CSIRO EMS. CSIRO's target is to fully implement the EMS at all sites by December 2004.

Two new environmental performance indicators have been endorsed by the EMSC and will be introduced in July 2004. These new indicators

Figure 1: CSIRO environmental performance indicators 2002–04



will measure the percentage of sites that have environmental emergency response procedures in place and that have a current environmental improvement plan.

Environmental resource usage indicators

Accurate measurement and monitoring of environmental resource usage is an important part of effective and efficient science, management and business. Two indicators were selected for performance reporting: electricity and water consumption.

- ***Rate of electricity use***
  This measure allows CSIRO to monitor performance over time. It is of limited use in comparing performance across Divisions and sites as the different research varies in its energy requirements.
- ***Rate of water use***
  As with electricity use, this indicator is predominantly for monitoring overall organisational performance and Divisional performance over time. Limitations on comparing performance between Divisions apply as some sites have a disproportional water use, eg irrigation purposes.

Measurement of the usage of major fuel and energy resources has enabled CSIRO to monitor performance over time and achieve steady reductions in use with significant cost savings.

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
- updating the environmental reporting process
- quarterly meetings by the EMSC to review actions to improve the management of environmental activities
- bi-monthly reporting to the Board on environmental management.

Energy services

Corporate Property Energy Services is in business to minimise the environmental impact of CSIRO's operations by improving energy management, whilst supporting research. Energy management comprises all the sustainable environmental improvement practices to minimise energy wastage, optimise energy efficiency, use a sustainable mix of energy, monitor and target energy usage and greenhouse emissions, buy energy at best value for money, modify site operations to economically use energy tariffs and involve, train and raise energy and sustainability awareness of CSIRO people.

Energy Services provides professional advice to all CSIRO units and undertakes continuous auditing to achieve these objectives. CSIRO's energy usage has plateaued over the last three years.

Comprehensive energy and water audits of major CSIRO sites, Clayton Laboratories and Life Sciences Centre North Ryde have been commissioned. These audits will be utilised as a pilot study to include up-to-date energy conservation measures for eventual promulgation to other sites.

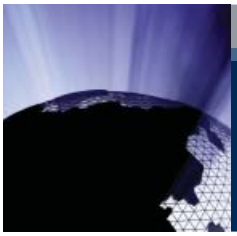
Finalisation of the new South Australian electricity supply account brings CSIRO's green energy usage to approximately 5 per cent across the Organisation, as from 1 July 2004. This will place CSIRO at the top of large Commonwealth operations for greenhouse abatement. A target of 10 per cent green power is currently being negotiated.

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.

People

CSIRO Board	116
Organisational chart	117
Staff demographics	118
CSIRO locations	119



People

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 – 7 January 2006

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 – 25 June 2007

Dr Jeffrey Harmer
BA(Hons) DipEd PhD
Secretary
Department of Education, Science and Training
16 April 2003 – 15 April 2008

Mr Brian Keane
FAICD
Director
30 July 2003 – 29 July 2008

Ms Deborah O'Toole
LLB
Company Director
16 April 2003 – 15 April 2008

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 – 25 June 2007

Terms completed during year:
Mr Don McDonald
and Professor Vicki Sara

Organisational Chart

1. Board as at 30 June 2004. For details of Board changes during 2003–04 see page 116.
2. Joint venture with the Victorian Government.
3. Formerly Telecommunications and Industrial Physics.

Staff demographics

CSIRO staff are employed under section 32 of the *Science and Industry Research Act 1949*.

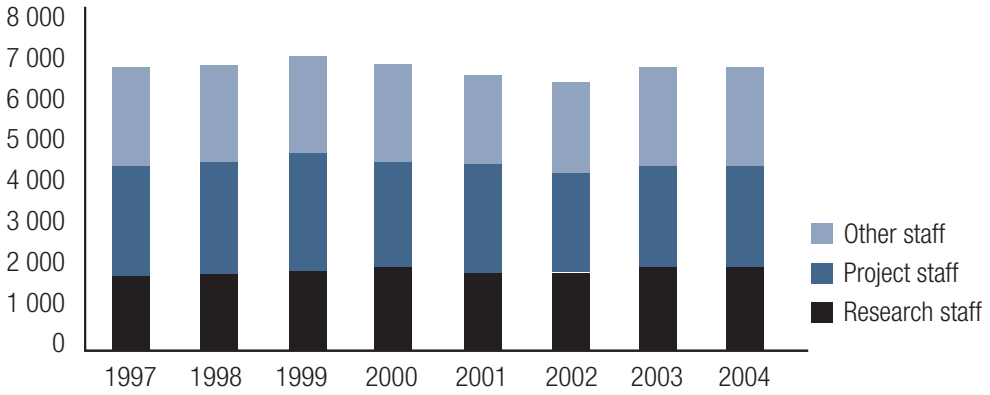
At 30 June 2004 CSIRO had a total staff of 6 574, which has an equivalent full-time (EFT) value of 5 964.

The numbers of staff employed in different job categories as at 30 June 2004 are shown below.

Staff by gender and principal functional area (comparisons with 2002–03)

	Female		Male		Total	
	2003–04	2002–03	**2003–04**	2002–03	**2003–04**	2002–03
Research Scientists	**296**	284	**1 329**	1 322	**1 625**	1 606
Research Project staff	**1 000**	1 009	**1 429**	1 507	**2 429**	2 516
Senior Specialists	**9**	9	**35**	40	**44**	49
Research Management	**16**	16	**177**	167	**193**	183
Technical Services	**92**	87	**566**	575	**658**	662
Communication & Information	**267**	247	**142**	135	**409**	382
General Services	**50**	68	**48**	61	**98**	129
Administrative Support	**730**	735	**257**	257	**987**	992
Corporate Management	**28**	17	**103**	100	**131**	117
TOTAL	**2 488**	2 472	**4 086**	4 164	**6 574**	6 636

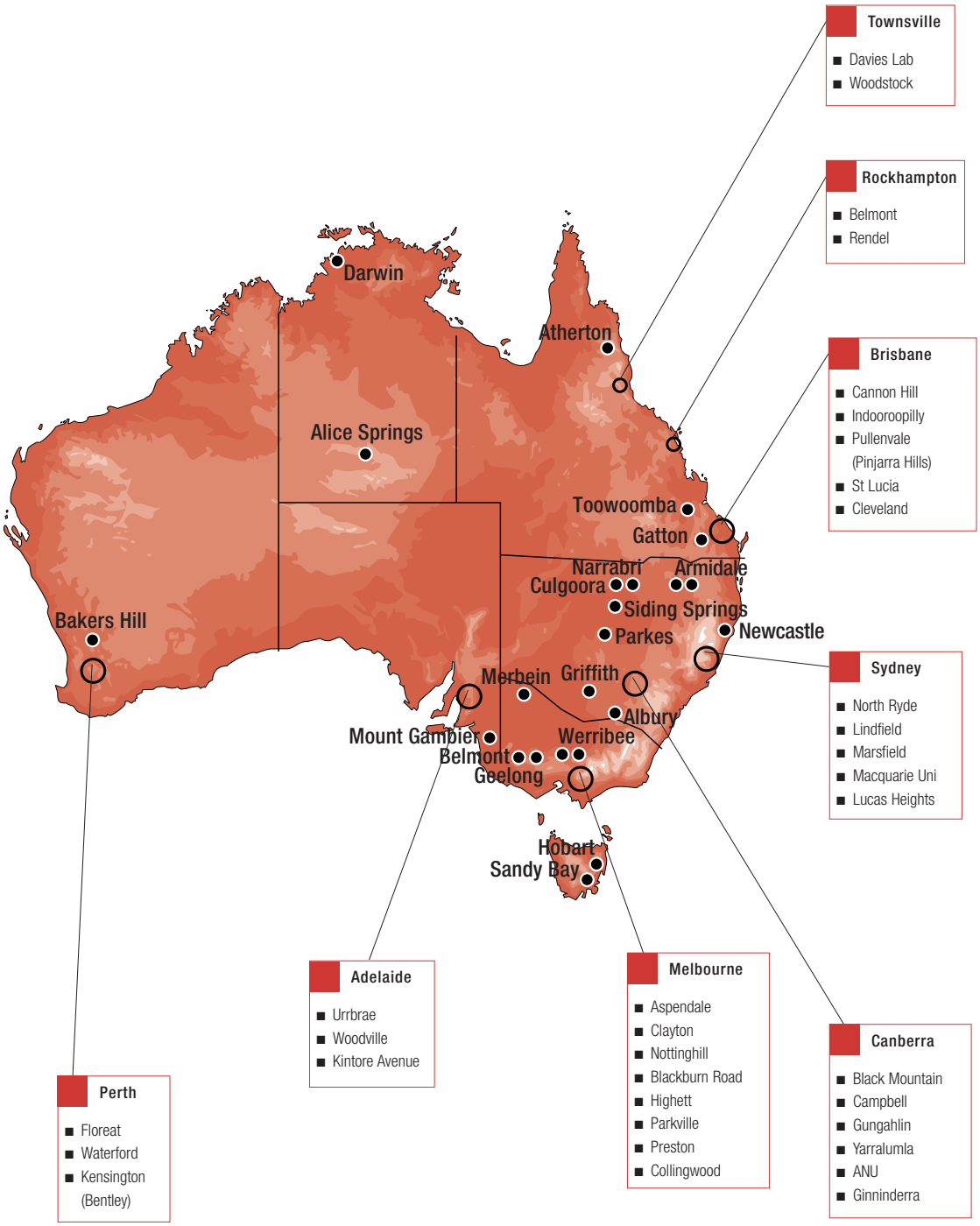
CSIRO Headcount[1]



1 *CSIRO Officers only. 1997–2004 figures at 30 June.*

Note that while CSIRO staff numbers have decreased from 6 709 in 1997 to 6 574 in 2004, the number of research staff (Research Scientists and Research Managers) has increased from 1 636 in 1997 to 1 818 in 2004.

CSIRO locations

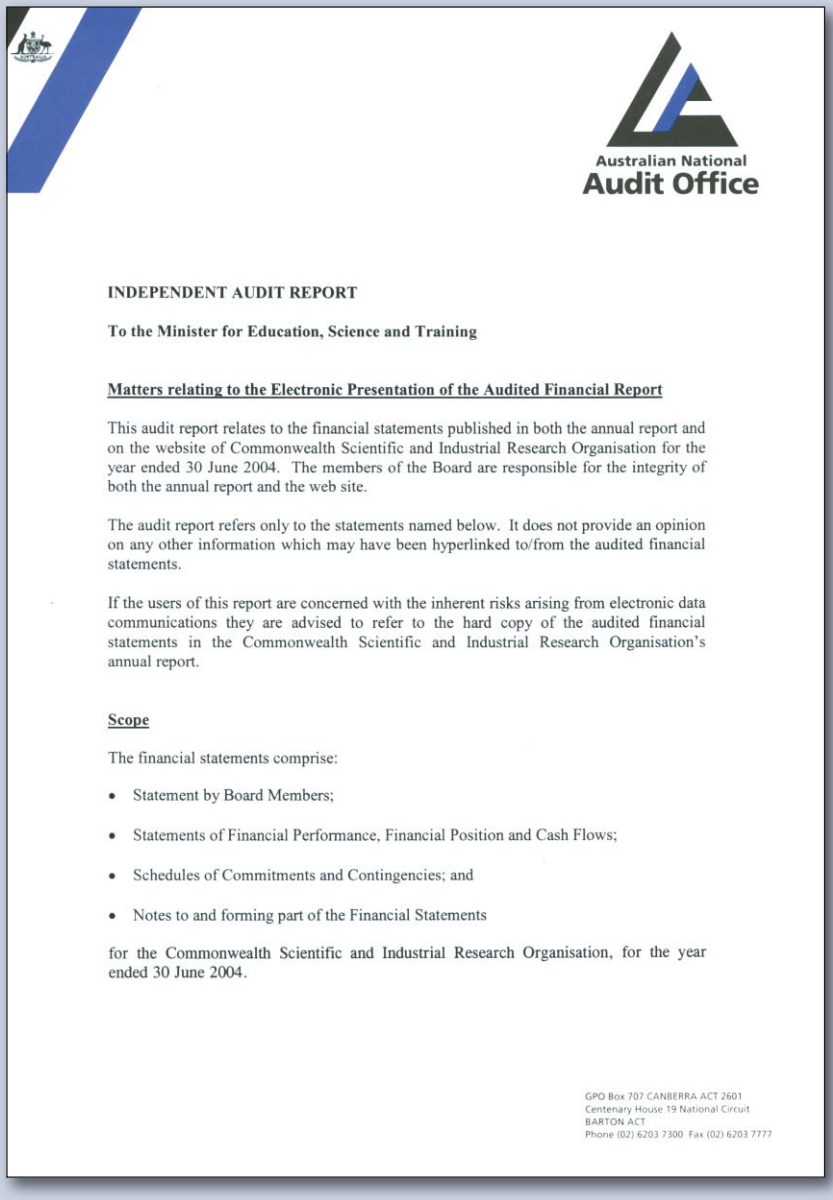


Internationally, CSIRO has staff located at the following locations: France; Ireland; Mexico; UK; and the USA.

Financial Statements

Independent audit report	122
Statement by board members and Chief Executive	124
Statement of financial performance	125
Statement of financial position	126
Statement of cash flows	127
Schedule of commitments	128
Schedule of contingencies	130

Independent Audit Report



Australian National
Audit Office

INDEPENDENT AUDIT REPORT

To the Minister for Education, Science and Training

Matters relating to the Electronic Presentation of the Audited Financial Report

This audit report relates to the financial statements published in both the annual report and on the website of Commonwealth Scientific and Industrial Research Organisation for the year ended 30 June 2004. The members of the Board are responsible for the integrity of both the annual report and the web site.

The audit report refers only to the statements named below. It does not provide an opinion on any other information which may have been hyperlinked to/from the audited financial statements.

If the users of this report are concerned with the inherent risks arising from electronic data communications they are advised to refer to the hard copy of the audited financial statements in the Commonwealth Scientific and Industrial Research Organisation's annual report.

Scope

The financial statements comprise:

- Statement by Board Members;
- Statements of Financial Performance, Financial Position and Cash Flows;
- Schedules of Commitments and Contingencies; and
- Notes to and forming part of the Financial Statements

for the Commonwealth Scientific and Industrial Research Organisation, for the year ended 30 June 2004.

GPO Box 707 CANBERRA ACT 2601
Centenary House 19 National Circuit
BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

The members of the Board are responsible for the preparation and true and fair presentation of the financial statements in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*. This includes responsibility 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 report is 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.

I 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*, 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 report; and
- assessing the appropriateness of the accounting policies and disclosures used, and the reasonableness of significant accounting estimates made by the members of the Board.

Independence

In conducting the audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate Australian professional ethical pronouncements.

Audit Opinion

In my opinion, the financial statements:

(i) have been prepared in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997* and applicable Accounting Standards; and

(ii) give a true and fair view, of the matters required by applicable Accounting Standards and other mandatory professional reporting requirements in Australia, and the Finance Minister's Orders, of the financial position of Commonwealth Scientific and Industrial Research Organisation as at 30 June 2004, and of its performance and cash flows for the year then ended.

Australian National Audit Office

B. M. Jarrett

Brandon Jarrett
Executive Director

Delegate of the Auditor-General

Canberra
19 August 2004

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 2004 are 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.

Signed on the 17th day of August 2004 in accordance with a resolution of the Board Members.

Catherine B Livingstone
Chairman of the Board

Geoff G Garrett
Chief Executive and Board Member

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
STATEMENT OF FINANCIAL PERFORMANCE
For the year ended 30 June 2004

	Notes	2004 $'000	2003 $'000
REVENUE			
Revenues from ordinary activities			
Revenues from Government	6.1	568 646	639 264
Goods and services	6.2	296 151	275 440
Interest	6.3	7 498	9 700
Revenue from sale of assets	6.4	15 281	12 924
Contributions	6.5	273	38
Other revenues	6.6	16 082	12 247
Revenues from ordinary activities		**903 931**	**949 613**
EXPENSE			
Expenses from ordinary activities (excluding borrowing costs expense)			
Employees	7.1	521 739	469 918
Suppliers	7.2	288 935	290 676
Depreciation and amortisation	7.3	79 486	81 640
Write-down of assets	7.4	5 846	3 943
Value of assets sold	6.4	10 332	14 952
Net foreign exchange losses	7.5	374	215
Other expenses	7.6	–	1 600
Total expenses from ordinary activities (excluding borrowing costs expense)		**906 712**	**862 944**
		(2 781)	**86 669**
Borrowing costs expense	7.7	(3 047)	(1 478)
Share of net operating surplus/(deficit) of joint ventures accounted for using the equity method	25(e) & (f)	502	–
Net operating (deficit)/surplus from ordinary activities	**22**	**(5 326)**	**85 191**
Net (deficit)/surplus	**22**	**(5 326)**	**85 191**
Total changes in equity other than those resulting from transactions with the Australian Government as owner		**(5 326)**	**85 191**

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 2004

	Notes	2004 $'000	2003 $'000
ASSETS			
Financial assets			
Cash	8	178 998	158 149
Receivables	9	50 063	66 741
Investments – other	10	13 087	5 861
Total financial assets		**242 148**	**230 751**
Non-financial assets			
Land and buildings	11	833 931	853 878
Plant and equipment	12	228 238	233 155
Intangibles	13	8 186	5 815
Inventories	14	796	771
Other non-financial assets	15	31 594	27 221
Total non-financial assets		**1 102 745**	**1 120 840**
Total assets		**1 344 893**	**1 351 591**
LIABILITIES			
Interest bearing liabilities			
Leases	16	85 032	88 025
Deposits	17	18 428	17 946
Total interest bearing liabilities		**103 460**	**105 971**
Provisions			
Employees	19A	179 855	187 374
Other provisions	19B	1 100	500
Total provisions		**180 955**	**187 874**
Payables			
Suppliers	20	40 659	32 700
Other payables	21	74 886	74 787
Total payables		**115 545**	**107 487**
Total liabilities		**399 960**	**401 332**
NET ASSETS		**944 933**	**950 259**
EQUITY			
Reserves	22	481 251	481 251
Retained surpluses	22	463 682	469 008
Total equity		**944 933**	**950 259**
Current assets		**261 451**	**252 882**
Non-current assets		**1 083 442**	**1 098 709**
Current liabilities		**188 181**	**186 177**
Non-current liabilities		**211 779**	**215 155**

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 2004

	Notes	2004 $'000	2003 $'000
OPERATING ACTIVITIES			
Cash received			
Appropriations	6.1	568 646	639 264
Sales of goods and services		324 537	321 834
Interest		7 048	9 615
GST received from the Australian Taxation Office		8 251	16 537
Deposits		–	1 202
Total cash received		**908 482**	**988 452**
Cash used			
Employees		529 283	461 023
Suppliers		297 227	327 172
Borrowing costs		3 047	1 478
Deposits		19 268	–
Total cash used		**848 825**	**789 673**
Net cash from operating activities	24	**59 657**	**198 779**
INVESTING ACTIVITIES			
Cash received			
Proceeds from sale of property, plant and equipment		35 536	12 924
Proceeds from equity instruments issued and the sale of intellectual property		10 390	–
Total cash received		**45 926**	**12 924**
Cash used			
Purchase of property, plant and equipment		67 325	115 001
Purchase of equity investment		11 980	5 037
Other investments		–	17 200
Loan to external body		2 436	–
Total cash used		**81 741**	**137 238**
Net cash (used by) investing activities		**(35 815)**	**(124 314)**
FINANCING ACTIVITIES			
Cash received			
Proceeds from loans		–	45 088
Total cash received		**–**	**45 088**
Cash used			
Cash used for other financing activities		2 993	1 693
Capital use charge – paid to Government	18	–	108 100
Total cash used		**2 993**	**109 793**
Net cash (used by) financing activities		**(2 993)**	**(64 705)**
Net increase in cash held		**20 849**	**9 760**
Cash at the beginning of the year		158 149	148 389
Cash at the end of the reporting period	8	**178 998**	**158 149**

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 2004

	2004 $'000	2003 $'000
By Type		
Capital commitments		
Land and buildings[1]	16 793	8 912
Plant and equipment	24 432	2 438
Investments	856	–
Total capital commitments	**42 081**	**11 350**
Other commitments		
Operating leases[2]	406 936	422 551
Research and development commitments	329 648	352 508
Other commitments	3 992	11 212
Total other commitments	**740 576**	**786 271**
Commitments receivable		
Research and development commitments	272 349	268 402
Other receivables	14 937	12 904
Total commitments receivable	**287 286**	**281 306**
Net commitments	**495 371**	**516 315**
By Maturity		
Capital commitments		
One year or less	22 699	11 335
From one to five years	19 382	15
Total capital commitments by maturity	**42 081**	**11 350**
Operating lease commitments		
One year or less	32 273	22 489
From one to five years	65 860	88 880
Over five years	308 803	311 182
Total operating lease commitments by maturity	**406 936**	**422 551**
Other Commitments		
One year or less	185 553	191 301
From one to five years	137 773	167 831
Over five years	10 314	4 589
Total other commitments	**333 640**	**363 721**
Commitments receivable	**(287 286)**	**(281 306)**
Net commitments	**495 371**	**516 316**

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 renewal or 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 2004

	Notes	2004 $'000	2003 $'000
Contingent liabilities			
Loan payable to the Commonwealth Government	23	70 000	70 000
Loan payable to the Queensland Government	23	5 000	5 000
Interest payable on the Commonwealth Government loan	23	11 855	9 376
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.	23	1 100	980
Total contingent liabilities		**87 955**	**85 356**
Contingent assets			
Receivable from AMC	23	75 000	75 000
Royalties receivable from AMC	23	11 855	9 376
Total contingent assets		**86 855**	**84 376**
Net contingent liabilities		**1 100**	**980**

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.

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 2004

Description	Note Number	Page Number
Summary of significant accounting policies	1	132
Adoption of Australian equivalents to International Financial Reporting Standards from 2005–06	2	139
Economic dependency	3	142
Segment reporting	4	142
Events occurring after reporting date	5	142
Operating revenues	6	143
Operating expenses	7	145
Cash	8	146
Receivables	9	146
Investments	10	147
Land and buildings	11	151
Plant and equipment	12	152
Intangibles	13	156
Inventories held for resale	14	156
Other non-financial assets	15	156
Leases	16	157
Deposits	17	157
Capital use charge provision	18	158
Employee provisions	19A	158
Other provisions	19B	158
Supplier payables	20	159
Other payables	21	159
Equity – analysis of equity	22	159
Contingent liabilities and assets	23	160
Cash flow reconciliation	24	162
Joint ventures	25	163
Related entities	26	167
Resources made available to the Organisation and not included in the Statement of Financial Position	27	167
Monies held in trust	28	168
Collections	29	168
Remuneration of Auditors	30	169
Remuneration of Board Members	31	169
Remuneration of Officers	32	170
Meetings of the CSIRO Board and Board Committees	33	171
Related party disclosures	34	171
Average staff levels	35	173
Financial instruments	36	173
Reporting of Outcomes and Outputs	37	178
Appropriations	38	180

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 2004)*)
- Australian Accounting Standards and Accounting Interpretations issued by the Australian Accounting Standards Board
- Consensus Views of the Urgent Issues Group.

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 2002–03.

In 2002–03, the Finance Minister's Orders (FMOs) introduced an impairment test for non-current assets which were carried at cost and were not subject to AAS10 *Recoverable Amount of Non-Current Assets*.

In 2003–04, the impairment test provisions of the FMOs have been extended to cover non-current assets carried at deprival value. There were no indications of impairment for these assets.

1.3 Consolidation

The Organisation acquired seven fully owned R&D Syndication companies listed in Note 10 during 2002–03, when investors in the Syndications exercised their put options under the Syndications' agreements. These companies are still in the process of being wound up by members' voluntary liquidation. In addition the Organisation has established other subsidiary companies listed in Note 10 as vehicles for the commercialisation of its intellectual properties.

These R&D Syndication companies and fully owned subsidiaries did not have material transactions in 2002–03 or in the twelve months ended 30 June 2004 which would affect the Organisation's financial position and/or performance. As a result, the Organisation has not prepared consolidated 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 asset has passed to the buyer.

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 to be 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 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 contributions 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 either 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 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 called '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 90 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 on '*Revaluation of Non-Current Assets*' allows a choice to either adopt the cost basis or the fair value basis in the valuation of 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 2004, the Organisation's investment in the listed companies, Australian Magnesium Corporation Ltd and Ambri Ltd have been written down to their recoverable amounts (Note 10(c)).

The Organisation has conducted a review of its investment in unlisted Research and Development (R&D) and subsidiary companies principally involved in R&D and high technology industries in June 2004. 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 Organisation has fully provided for diminution in value for the companies, except for Ceramic Fuel Cells Ltd, Evogenix Pty Ltd, Windlab Pty Ltd, Intellection Pty Ltd, Plantic Technologies Ltd, PolyNovo Biomaterials Pty Ltd (formerly PolymerCo Pty Ltd), VacTX Pty Ltd and SciVentures Pre-seed Fund.

The Organisation's investment in unlisted R&D companies is not material and is held with the intent for sale in the near future. As a result the equity method of accounting is not adopted.

The Organisations' investments in subsidiaries, funds and unlisted companies are distinct from those research and development costs included at note 1.5.

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

Property, plant and equipment, including assets under finance leases, were revalued in 2001–02 in accordance with the Finance Minister's Orders using the deprival method of valuation. In accordance with the Finance Minister's Orders and AASB 1041 any revaluation after 30 June 2002 must be on a fair value basis. Therefore, the Organisation will perform the next revaluation in 2004–05 in accordance with the latest Finance Minister's Orders that require all assets measured at deprival value to be revalued to the fair value by the end of the first reporting period ending after 30 June 2004.

Land and buildings were revalued in 2001–02. Land, which will continue to be used for research activity, was valued by the Organisation's registered valuer at 'existing use value' with the valuation methodology being approved by an independent valuer. 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, were valued at 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 were valued at market value by registered independent valuers.

Plant and equipment with historical costs of $75 000 and over were revalued by the Australian Valuation Office in 2001–02 using the 'deprival' method. Other plant and equipment under that $75 000 threshold was valued in-house at depreciated replacement cost. Any assets, which would not be replaced, or are surplus to requirements, were 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 the cost or revalued amount of each item of building, plant and equipment over its expected 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 cost or deprival value by the Organisation 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. (2003:nil).

1.13 Intangibles

Internally developed and externally acquired computer software with an estimated cost of more than $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 2004. 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. None were found to be impaired.

1.14 Inventories

Inventories held 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. 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.

Prior to the Commonwealth Government announcement restricting agencies from entering into external hedges for foreign currency transactions from 1 July 2002, the Organisation had taken out a number of specific forward exchange contracts to minimise possible adverse financial effects of movements in exchange rates. In respect of these contracts, where a purchase or sale is specifically hedged, exchange differences arising up to the date of the purchase or sale, and costs, premiums and discounts relative to the hedging transaction, are included with the measurement of purchase or sale.

As at 30 June 2004, the Organisation has no specific forward exchange contracts as all prior hedges have been completed.

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 the joint ventures operations are disclosed in Note 25(a) to (d).

Joint venture entities
The Organisation's interest in the joint venture entity, Food Science Australia (FSA) is not accounted for using the equity method. (Refer Note 25(e)). The share of the operating surplus of FSA and accumulated deficit are recognised as a liability. The interest in the Murray Darling Freshwater Research Centre's (MDFRC) is accounted for using the equity method. (Refer Note 25(f)). The share of operating deficit of MDFRC and accumulated surplus have been recognised as an investment asset in the Statement of Financial Position. Details of the joint venture entities are disclosed in Note 25(e) and (f).

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.

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 (IFRS) 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.

The purpose of issuing Australian Equivalents to IFRS is to enable Australian entities reporting under the Corporations Act 2001 to be able to more readily access overseas capital markets by preparing their financial reports according to accounting standards more widely used overseas.

It is expected that the Finance Minister will continue to require compliance with the Accounting Standards issued by the AASB, including the Australian Equivalents to IFRS, in his Orders for the Preparation of Authorities' financial statements for 2005–06 and beyond.

The Australian Equivalents contain certain additional provisions which will apply to not-for-profit entities, including this Organisation. Some of these provisions are in conflict with the IFRS and therefore the Organisation will only be able to assert compliance with the Australian Equivalents to the IFRS.

Existing AASB standards that have no IFRS equivalent will continue to apply.

Accounting Standard AASB 1047 *Disclosing the Impact of Adopting Australian Equivalents to IFRS* requires that the financial statements for 2003–04 disclose:

- an explanation of how the transition to the Australian Equivalents is being managed
- a narrative explanation of the key differences in accounting policies arising from the transition.

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 IFRS. 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. Once the final new standards are released, undertake a detailed analysis and assess the impact of the changes on CSIRO, including possible system implications. Develop IFRS implementation strategies.
- Phase 3. Implement IFRS, with external quality assurance.

The implementation phase includes the preparation of a transitional balance sheet as at 1 July 2004, under Australian Equivalents, within three months of 30 June 2004 and an Australian Equivalent balance sheet at the same time as the 30 June 2005 statements are prepared. In addition, it requires meeting reporting deadlines set by Department of Finance and Administration for 2005–06 balance sheet under Australian Equivalent Standards.

The Organisation has commenced 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 has been undertaken and has been quality assured by external consultants. The analysis includes risk assessment and an assessment of potential system changes.

The results of the analysis are summarised below:

- of the 28 current AASB, which are applicable to the Organisation, most are already substantially similar due to previous harmonisation work of the AASB.
- the major changes identified are contained within the following accounting standards:
  - Intangibles
  - Property, Plant & Equipment
  - Impairment of Assets
  - Financial Instruments.

Although the changes are considered to be major with regard to the harmonisation with 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.

Major changes in accounting policy

Changes in accounting policies under Australian Equivalents are applied retrospectively ie as if the new policy had always applied. This rule means that a balance sheet prepared under the Australian Equivalents must be made as at 1 July 2004, except as permitted in particular circumstances by AASB 1 *First-time Adoption of Australian Equivalents to International Financial Reporting Standards.* This will enable the 2005-06 financial statements to report comparatives under the Australian Equivalents also. Changes to major accounting policies are discussed in the following paragraphs.

Property plant and equipment

It is expected that the Finance Minister's Orders will require property plant and equipment assets carried at valuation in 2003–04 to be measured at up-to-date fair value from 2005–06. This differs from the accounting policies currently in place for these assets which, up to and including 2003–04, have been revalued progressively over a 3-year cycle and which currently include assets at cost (for purchases since the commencement of a cycle) and at deprival value (which will differ from their fair value to the extent that they have been measured at depreciated replacement cost when a relevant market selling price is available).

However, it is important to note that the Finance Minister requires these assets to be measured at up-to-date fair values as at 30 June 2005. Further, the transitional provisions in AASB 1 will mean that the values at which assets are carried as at 30 June 2004 under existing standards will stand in the transitional balance sheet as at 1 July 2004.

Borrowing costs related to qualifying assets are currently capitalised. 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.

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 Australian Equivalent on 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 on adoption of the new Australian Equivalent.

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 (impairment measurement must also be done, 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 and that assets carried at up-to-date fair value, whether for-profit or not, may nevertheless be required to be written down if costs to sell are significant.

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.

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.

Financial Instruments

Financial assets and liabilities are likely to be accounted for as '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). Fair values will be published prices where an active market exists or by appraisal. Cash and receivables are expected to continue to be measured at cost information. Financial assets, except those classified as 'held at fair value through profit and loss' will be subject to impairment testing.

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 due to complete in 2002–03 was extended by one year to cover 2003–04. The Organisation has entered into a new triennium funding agreement with the Commonwealth Government that 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

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 the decision, on 1 July 2004 the National Measurement Laboratory was transferred from CSIRO to the Department of Industry, Tourism and Resources together with appropriation funding of $11.9 million.

The event occurred after balance date and has not been brought to account in the 2004 financial statements.

		Notes	2004 $'000	2003 $'000
Note 6	**Operating Revenues**			
6.1	**Revenues from Government**			
	Appropriations for outputs	38	**568 646**	**639 264**
6.2	**Sales of goods and services** (a)			
	Strategic R&D – co-investment activities		195 435	177 971
	Services and consulting		78 690	83 681
	Intellectual property revenues including net gains from sale of equity investment (b)		22 026	13 788
			296 151	**275 440**
	Sales of goods and services			
	Goods		7 155	6 823
	Services		288 996	268 617
			296 151	**275 440**
	Provision of goods to:			
	Related entities		3	–
	External entities		7 152	6 823
			7 155	**6 823**
	Rendering of services to:			
	Related entities		48 876	37 760
	External entities		240 120	230 857
			288 996	**268 617**
	Cost of goods sold – inventory items only		**684**	**1 276**

(a) The Organisation's share of the Food Science Australia joint venture entity external revenue of $15.73 million (2003 $12.734 million) is not included in the Statement of Financial Performance under revenues from ordinary activities of $903.864 million (2003 $949.613 million). This represents 84.9% (2003 86.43%) of FSA's external revenue based on the Organisation's percentage contribution to FSA, (Note 25(e)).

(b) Net gains from sale of equity investment are included in intellectual property revenue (Note 6.2)

	2004 $'000	2003 $'000
Proceeds from sale	4 007	–
Less: Cost of equity investment	(359)	–
Net gains	**3 648**	–

		Notes	2004 $'000	2003 $'000
Note 6	**Operating Revenues (cont)**			
6.3	**Interest**			
	Bank and term deposits		**7 498**	**9 700**
6.4	**Revenue from sales of assets**			
	Land and buildings			
	Proceeds from sale		12 780	9 154
	Less: Net book value		4 800	9 241
	Net gain/(loss)		7 980	(87)
	Plant and equipment			
	Proceeds from sale		2 501	3 770
	Less: Net book value		5 532	5 711
	Net loss		(3 031)	(1 941)
	Total proceeds from disposals		**15 281**	**12 924**
	Total value of assets disposed		**10 332**	**14 952**
6.5	**Contributions**			
	Donations		**273**	**38**
6.6	**Other revenues**			
	Vehicle contributions – staff		114	120
	Rental		3 394	2 995
	Sale of primary produce		1 376	1 631
	Share of FSA Surplus for 2003–04		67	–
	Other		11 131	7 501
			16 082	**12 247**

		Notes	2004 $'000	2003 $'000
Note 7	**Operating Expenses**			
7.1	**Employees expenses**			
	Wages and salaries		405 809	386 133
	Superannuation		51 365	34 269
	Leave and other entitlements		64 952	54 898
	Separation and redundancy		11 776	5 441
	Workers' compensation		3 182	2 355
			537 084	483 096
	Less, Recovery of employee expenses from Food Science Australia (FSA)	25(e)	(15 345)	(13 178)
			521 739	**469 918**
7.2	**Supplier expenses**			
	Goods from related entities		203	–
	Goods from external entities		65 392	63 933
	Services from related entities		16 308	9 071
	Services from external entities		193 704	194 706
	Operating lease rentals		13 328	22 966
			288 935	**290 676**
7.3	**Depreciation and amortisation**			
	Buildings and leasehold improvements		39 175	39 872
	Plant and equipment		39 300	40 539
	Intangibles		1 011	1 229
			79 486	**81 640**
7.4	**Write-down of assets**			
	Bad debts		206	219
	Increase in provision for doubtful debts		172	2 246
	Increase in provision for diminution in value of investment		5 336	285
	Write down of investments to recoverable amount		132	1 193
			5 846	**3 943**
7.5	**Net foreign exchange losses**			
	Non-speculative		**374**	**215**
7.6	**Other expenses**			
	Contribution to FSA losses	25(e)	**–**	**1 600**
7.7	**Borrowing costs expense**			
	Finance charges on lease liabilities		**3 047**	**1 478**

		Notes	2004 $'000	2003 $'000
Note 8	**Cash** (current)			
	Cash at bank and on hand		28 998	58 149
	Deposits at call		150 000	100 000
	Total Cash*		**178 998**	**158 149**
	*Total cash includes deposits held on behalf of third parties totalling $18 428 404 (2003: $37 696 449)	17		
Note 9	**Receivables** (current)			
	Goods and services		43 579	44 024
	Provision for doubtful debts		(2 619)	(2 591)
			40 960	41 433
	Property sales		–	20 250
	Net GST receivable		899	788
	Interest receivable		1 024	575
	Loans receivable		2 436	–
	Other		4 744	3 695
	Total net receivables		**50 063**	**66 741**
	Gross receivables are aged as follows:			
	Not overdue		**37 076**	**54 464**
	Overdue by:			
	Less than 30 days		8 217	7 981
	30 to 60 days		1 795	2 373
	60 to 90 days		862	1 181
	More than 90 days		4 732	3 333
			15 606	**14 868**
	Total gross receivables		**52 682**	**69 332**
	Provision for doubtful debts is aged as follows:			
	Overdue by:			
	Less than 30 days		15	896
	30 to 60 days		20	–
	60 to 90 days		47	7
	More than 90 days		2 537	1 688
	Total provision for doubtful debts		**2 619**	**2 591**

	% CSIRO Interest	Notes	2004 $'000	2003 $'000
Note 10 Investments (non-current)				
Investments accounted for under the equity method				
Joint venture in MDFRC	50.0	25	**502**	**–**
Unlisted controlled companies (a) – at cost		1.3		
Aries Information Services Pty Ltd	100		–	–
Ascentia Pty Ltd	90		4 470	3 600
ATM Casting Technologies Pty Ltd	100		–	571
Betabiotics Pty Ltd	91		273	–
CSIRO Bioinformatics Pty Ltd	100		–	–
CSIRO FFP Pty Ltd	100		–	–
Entocosm Pty Ltd	100		–	–
Goldwood Holdings Pty Ltd	100		–	–
Intellection Pty Ltd	100		4 450	–
Polymer Surface Technology Pty Ltd	100		–	–
			9 193	4 171
Provision for diminution in value			(6 943)	(4 171)
			2 250	**–**
Unlisted companies/Funds (b) – at cost				
AARNET Pty Ltd	2.6		1	1
Ausmodel Pty Ltd	17.0		–	–
Australian Wool Innovation Ltd	0.8		–	–
Carbon Management Group Pty Ltd	50.0		400	–
Ceramic Fuel Cells Ltd	14.5		1 879	1 879
CO2 CRC Management Pty Ltd	7.7		–	–
ComEnergy Pty Ltd	50.0		250	–
Dunlena Pty Ltd	47.0		5	5
Evogenix Pty Ltd	3.3		181	181
Gene Shears Pty Ltd	50.0		580	580
HRZ Wheats Pty Ltd	24.6		316	–
Innovative Carbon Technologies Pty Ltd	16.5		–	–
Plantic Technologies Ltd	6.5		594	–
PolyNovo Biomaterials Pty Ltd (formerly PolymerCo Pty Ltd)	50.0		5 100	–
Provisor Pty Ltd	41.4		2 470	2 470
Quickstep Holdings Pty Ltd	20.2		480	480
SciVentures Pre-Seed Fund	3.4		144	1 000
VacTX Pty Ltd	15.6		689	–
Windlab Pty Ltd	44.6		2 700	2 700
WQI Pty Ltd	10.6		–	–
XRT Limited	25.1		1 390	1 390
			17 179	10 686
Provision for diminution in value		1.11	(7 925)	(5 932)
			9 254	**4 754**

	% CSIRO Interest	Notes	2004 $'000	2003 $'000
Note 10 Investments (non-current) **(cont)**				
Listed companies (c) – at cost				
Gropep Limited	8.18		186	545
Xceed Biotechnology Ltd	2.73		465	–
Listed companies (c) – at recoverable amount				
Ambri Ltd	0.87		424	539
Australian Magnesium Corporation Ltd	0.17		6	23
			1 081	**1 107**
Total investment – others			**13 087**	**5 861**

(a) Unlisted controlled companies

Names	Principal Activities
Ascentia Pty Ltd	Develop value added foods utilising a new cereal with nutritional and functional characteristics.
Betabiotics Pty Ltd	Research and development of antibiotics.
CSIRO Bioinformatics Pty Ltd	Commercialises algorithms for statistical analysis of massive multivariate data sets. The cost of CSIRO's investment in the company is $12.00 and it has been provided for diminution in value.
CSIRO FFP Pty Ltd	Act as a special purpose company in the joint venture between CSIRO and New Zealand Forest Research Institute. The cost of CSIRO's investment in the company is $1.00 and it has been provided for diminution in value.
Intellection Pty Ltd	Produce and sell complete systems that are used for process improvement in large mineral processing operations.
Other Subsidiaries Unlisted and De-registered	The following subsidiary companies: Aries Information Services Pty Ltd ATM Casting Technologies Pty Ltd Entocosm Pty Ltd Goldwood Holdings Pty Ltd Polymer Surface Technology Pty Ltd have been wound-up and de-registered in 2003–04.

(b) Unlisted Companies/Funds

AARNet Pty Ltd	To provide high-capacity, cost-effective internet services to the education and research communities and their research partners.
Ausmodel Pty Ltd	A CRC company researching issues that are of critical importance to mineral ore discovery. The cost of the Organisation's investment in the company is $1.00 and it has been provided for diminution in value.

Note 10 Investments (cont)

Australian Wool Innovation Ltd	To initiate research, development and innovation that will increase the long-term profitability of Australian woolgrowers. The cost of the Organisation's investment in the company is $306 and it has been provided for diminution in value.
Carbon Management Group Pty Ltd	A consulting company in the field of management of greenhouse gas emissions.
Ceramic Fuel Cells Ltd	Research and development of fuel cell technologies and analysing their market application opportunities. The company was listed in July 2004.
CO2 CRC Management Pty Ltd	A centre agent management company for a CRC. The cost of the Organisation's investment in the company is $1.00 and it has been provided for diminution in value.
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.
Dunlena Pty Ltd	A trustee company for an unincorporated joint venture to develop agricultural chemicals.
Evogenix Pty Ltd	Develop technologies for the production of high affinity targeting reagents for the diagnosis and treatment of diseases.
Gene Shears Pty Ltd	Conduct research projects based on the Ribozyme technology and investigate licensing and development of its commercial applications.
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	Provides cost-effective problem solutions to the Australian oil and gas industry in key sectors of exploration and production. The cost of the Organisation's investment in the company is $1.00 and it has been provided for diminution in value.
Plantic Technologies Ltd	Commercialise a technology of biodegradable, starch-based substitute for plastics that can be formed using industry standard equipment.
PolyNovo Biomaterials Pty Ltd (formerly PolymerCo Pty Ltd)	Commercialise biomaterials technology to improve biomedical and surgical outcomes.
Provisor Pty Ltd	Provide a research and development facility in the Australian grape and wine industry.
Quickstep Holdings Pty Ltd	Develop the Quickstep™ process manufacturing technology for uses with polymer composite.
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.
VacTX Pty Ltd	Commercialise peptide vaccine technologies that have potential application for treatment of infectious diseases, cancer and allergies.

Note 10 Investments (cont)

Windlab Pty Ltd	Develop and market 'Windscape' technology which allows developers and investors to find the best wind farm sites faster.
WQI Pty Ltd	Develop 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 Limited	Identify applications for phase contrast imaging technology and completing the first concept development prototype of an ultramicroscope.

(c) Listed Companies

The quoted market values of the following listed companies as at 30 June 2004 were:

	2004 $000	2003 $000
Ambri Ltd	424	539
Australian Magnesium Corporation Ltd	6	23
Gropep Limited	2 190	4 576
Xceed Biotechnology Ltd	639	–
	3 259	**5 138**

Note 11 Land and Buildings (non-current)	Notes	2004 $'000	2003 $'000
Land			
At cost		5 555	1 555
At 2001–02 valuation	1.12	127 159	131 726
		132 714	**133 281**
Buildings			
At cost		28 089	13 336
At 2001–02 gross valuation	1.12	1 262 418	1 270 583
		1 290 507	1 283 919
Accumulated depreciation		(788 487)	(765 592)
		502 020	518 327
Capital works in progress – at cost		18 928	16 972
		520 948	**535 299**
Leasehold improvements			
At cost		52 775	50 276
At 2001–02 gross valuation	1.12	77 393	85 856
		130 168	136 132
Accumulated amortisation		(41 148)	(45 288)
		89 020	**90 844**
Buildings under finance lease			
At cost		37 516	36 929
At 2001–02 gross valuation	1.12	71 537	71 536
		109 053	108 465
Accumulated amortisation		(17 804)	(14 011)
		91 249	**94 454**
Total land and buildings		**833 931**	**853 878**

	Notes	2004 $'000	2003 $'000
Note 12 Plant and Equipment (non-current)			
Plant and equipment			
At cost		118 280	86 734
At 2001–02 gross valuation	1.12	479 595	500 161
		597 875	586 895
Accumulated depreciation		(387 747)	(370 531)
		210 128	**216 364**
Research vessels			
At cost		4 592	2 160
At 2001–02 gross valuation	1.12	8 932	8 731
		13 524	10 891
Accumulated depreciation		(3 124)	(2 023)
		10 400	**8 868**
Plant and equipment under finance lease			
At cost		7 620	6 034
At 2001–02 gross valuation	1.12	3 786	4 509
		11 406	10 543
Accumulated amortisation		(3 696)	(2 620)
		7 710	**7 923**
Total plant and equipment		**228 238**	**233 155**

(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 2003					
Gross book value	133 282	1 545 489	608 329	18 862	2 305 962
Accumulated depreciation/amortisation	–	(824 893)	(375 174)	(13 047)	(1 213 114)
Net book value	**133 282**	**720 596**	**233 155**	**5 815**	**1 092 848**
Additions:					
by purchase	4 232	19 208	38 329	3 382	65 151
by finance lease	–	588	1 586	–	2 174
Depreciation/amortisation expense	–	(39 175)	(39 300)	(1 011)	(79 486)
Disposals:					
Other disposals	(4 800)	–	(5 532)	–	(10 332)
As at 30 June 2004					
Gross book value	132 714	1 548 656	622 805	22 244	2 326 419
Accumulated depreciation/amortisation	–	(847 439)	(394 567)	(14 058)	(1 256 064)
Net book value	**132 714**	**701 217**	**228 238**	**8 186**	**1 070 355**

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 2004					
Gross value	127 159	1 411 347	492 315	–	2 030 821
Accumulated depreciation/amortisation	–	(842 735)	(368 438)	–	(1 211 173)
Net book value	**127 159**	**568 612**	**123 877**	**–**	**819 648**
As at 30 June 2003					
Gross value	131 726	1 427 975	513 401	–	2 073 102
Accumulated depreciation/amortisation	–	(824 319)	(363 160)	–	(1 187 479)
Net book value	**131 726**	**603 656**	**150 241**	**–**	**885 623**

(c) Assets held under finance lease

Item	Land $'000	Buildings $'000	Plant and equipment $'000	Computer software $'000	Total $'000
As at 30 June 2004					
Gross value	–	109 052	11 406	–	120 458
Accumulated depreciation/amortisation	–	(17 803)	(3 696)	–	(21 499)
Net book value	–	**91 249**	**7 710**	–	**98 959**
As at 30 June 2003					
Gross value	–	108 465	10 543	–	119 008
Accumulated depreciation/amortisation	–	(14 011)	(2 620)	–	(16 631)
Net book value	**–**	**94 454**	**7 923**	**–**	**102 377**

(d) Assets under construction

Item	Buildings $'000	Plant and equipment $'000	Computer software $'000	Total $'000
Gross value at 30 June 2004	**18 928**	**5 852**	**5 212**	**29 992**
Gross value at 30 June 2003	**16 972**	**–**	**3 382**	**20 354**

Note 12 Plant and Equipment (cont)

(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 2004 $'000	Total 2003 $'000
Freehold	105 030	630 355	–	–	735 385	648 360
Commonwealth crown leases	4 150	180 526	–	–	184 676	183 265
Leasehold	–	130 168	–	–	130 168	132 145
National facilities	9 000	465 333	214 363	–	688 696	727 856
Finance lease	–	109 053	11 406	–	120 459	124 008
Designated for sale	14 534	14 293	–	–	28 827	65 088
Capital works in progress	–	18 928	–	–	18 928	16 972
	132 714	1 548 656	225 769	–	1 907 139	1 897 694
Plant and equipment	–	–	397 036	–	397 036	389 406
Intangibles	–	–	–	22 244	22 244	18 862
Gross value	132 714	1 548 656	622 805	22 244	2 326 419	2 305 962
Accumulated depreciation/ amortisation	–	(847 439)	(394 567)	(14 058)	(1 256 064)	(1 213 114)
Net book value as at 30 June 2004	**132 714**	**701 217**	**228 238**	**8 186**	**1 070 355**	**1 092 848**

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, National Measurement Laboratory and the Oceanographic Research Vessel 'Southern Surveyor' managed by the Organisation on behalf of the Commonwealth Government.
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'.

Note 12 Plant and Equipment (cont)

(f) National facilities

The Australian Animal Health Laboratory (AAHL), the Australia Telescope (AT), the Oceanographic Research Vessel (ORV) 'Southern Surveyor' and the National Measurement Laboratory (NML) 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. A review of the AAHL facility was undertaken by Corporate Property and the life and residual age across defined components of the buildings was reassessed. The financial impact of the reassessment was a reduction in AAHL annual depreciation of $3.45 million. A reassessment of the estimated useful life of the AT was also conducted resulting in increasing the estimated useful life by 15 years. The financial impact of the reassessment was a reduction in AT annual depreciation of $0.82 million.

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	**9 000**	**–**	**–**	**–**	**9 000**
Buildings	465 333	–	–	–	465 333
Accumulated depreciation	(256 626)	–	–	–	(256 626)
	208 707	**–**	**–**	**–**	**208 707**
Plant and equipment	10 826	172 175	13 524	17 837	214 362
Accumulated depreciation	(7 057)	(101 532)	(3 124)	(10 188)	(121 901)
	3 769	**70 643**	**10 400**	**7 649**	**92 461**
Net book value as at 30 June 2004	**221 476**	**70 643**	**10 400**	**7 649**	**310 168**
Net book value as at 30 June 2003	**231 002**	**72 445**	**8 868**	**7 614**	**319 929**

The operating expenses for the above National Facilities for the financial year amounting to $83 280 803 (2003 $79 066 838) are included in the Organisation's Statement of Financial Performance. NML's operating expenses include the costs of leasing buildings from the Organisation.

	Notes	2004 $'000	2003 $'000
Note 13 Intangibles (non-current)			
Computer software – at cost	1.13		
Internally developed and acquired software		17 032	15 480
Accumulated amortisation		(14 058)	(13 047)
		2 974	2 433
Internally developed software – in progress			
– Workflow software		–	879
– CSIRO Live software		4 791	2 503
– CSIRO *FastTrack* software		421	–
		5 212	3 382
Total intangibles – net book value		**8 186**	**5 815**
Refer also note 12(a) reconciliation of the opening and closing balances of property, plant and equipment and intangibles			
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	**796**	**771**
Note 15 Other Non-financial Assets (current)			
Contract research work in progress – at cost	1.4	26 958	23 464
Prepaid property rentals		2 660	1 997
Other prepayments		1 976	1 760
Total other non-financial assets		**31 594**	**27 221**

	Notes	2004 $'000	2003 $'000
Note 16 Leases			
Finance lease commitments:			
Payable			
Within one year		8 469	8 354
In one to five years		28 365	28 684
In more than five years		85 964	92 459
Minimum lease payments		122 798	129 497
Less: Future finance charges		(37 766)	(41 472)
Total finance lease liability		**85 032**	**88 025**
Lease liability is categorised as follows:			
Current		5 083	4 837
Non-current		79 949	83 188
		85 032	**88 025**

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% (2003: 4%). The lease liabilities are secured by the lease assets.

Note 17 Deposits (current)			
Deposits		**18 428**	**17 946**
Represents monies held on behalf of third parties:			
Co-operative Research Centres (CRC)		7 904	8 450
National Aeronautical Space Agency (NASA)		7 569	5 989
Department of Communications, Information Technology and the Arts		2 056	2 420
The Australian National Wildlife Collection Foundation		415	294
Others		484	793
		18 428	**17 946**

Cescade Pty Ltd monies received in advance, that were previously included in 2002–03 as monies held on behalf of third parties, have been reclassified in 2003–04 to Other Payables at Note 21. This change has been reflected in the comparatives.

	Notes	2004 $'000	2003 $'000
Note 18 Capital Use Charge Provision (current)			
Movements in capital use charge provision are:			
Balance owing as at 1 July		–	892
Capital use charge paid during year		–	(892)
		–	–
Capital use charge provided during year		–	107 208
			107 208
Capital use charge paid during year		–	(107 208)
Balance owing as at 30 June		**–**	**–**
Note 19A Employee Provisions			
Accrued wages and salaries		76	14 170
Annual leave		55 184	54 158
Long service leave		115 622	110 119
Severance pay		6 114	5 204
Redundancy		2 859	3 723
Total employee provisions		**179 855**	**187 374**
Employee provisions are categorised as follows:			
Current		48 025	60 244
Non-current		131 830	127 130
		179 855	**187 374**
Note 19B Other Provisions			
Provision for litigation		500	500
Provision for clean-up		600	–
		1 100	**500**

	Notes	2004 $'000	2003 $'000
Note 20 Supplier Payables (current)			
Trade creditors		**40 659**	**32 700**

Note 21 Other Payables (current)

Contract research revenue received in advance		45 627	43 554
Other creditors *		27 833	29 740
Amount owing to FSA	25(e)	1 426	1 493
Total other payables		**74 886**	**74 787**

* Cescade Pty Ltd monies received in advance that were previously included in 2002–03 in note 17, have been reclassified in 2003–04 as Other Payables. This change has been reflected in the comparatives.

Note 22 Equity – Analysis of Equity

Description	Accumulated Surplus		Asset Revaluation Reserve		Total Equity	
	2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 $'000	2003 $'000
Balance as at 1 July	469 008	491 025	481 251	481 251	950 259	972 276
Net surplus/(deficit)	(5 326)	85 191	–	–	(5 326)	85 191
Net revaluation increase	–	–	–	–	–	–
Transaction with owners:						
Capital use charge	–	(107 208)	–	–	–	(107 208)
Balance as at 30 June 2004	**463 682**	**469 008**	**481 251**	**481 251**	**944 933**	**950 259**

Note 23 Contingent Liabilities and Assets

Contingent liabilities

At 30 June 2004, 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.

Commonwealth and Queensland Governments/CSIRO/AMC Agreements

In 1992, the Commonwealth and Queensland Governments provided $20 million and $5 million respectively of non-recourse loans to the Organisation for it to contribute to a program to demonstrate the commercial feasibility of producing magnesium from magnesite in Australia. Australian Magnesium Corporation Limited (AMC) and the Organisation have a 50/50 joint interest in the AM Process technology. The Commonwealth Government loan of $20 million is indexed in line with CPI and the Queensland Government loan of $5 million is interest free.

In 2001, the Commonwealth Government provided an additional non-recourse loan of $50 million to the Organisation in order to enter into a commercial agreement with AMC to the value of $50 million for the further development and commercialisation of magnesium production technology. The $50 million loan will incur a commercial interest rate during the term of the loan.

The Organisation's obligation to pay the non-recourse loan liability totalling $75 million to the Commonwealth and Queensland Governments is dependent on the Organisation recovering a minimum receivable of $75 million owing by AMC on commencement of commercial production under the Commonwealth and Queensland Governments/CSIRO/AMC agreements. However, in June 2003 AMC announced it would not be able to complete its magnesium project unless new equity partners are found.

The non-recourse nature of the loans to the Organisation from the Government means that the Organisation will only repay the loans if and when it receives royalties.

Having considered all the available information and announcements made by AMC, its major creditors and a major shareholder, it was considered that it is less than probable that the Organisation will recover its $75 million from AMC to repay its non-recourse loans totalling $75 million. As a result, the liability of the Organisation to the Commonwealth and Queensland Governments in respect of the associated non-recourse loans was de-recognised. This amount is disclosed as a contingent liability in the Schedule of Contingencies.

During the pre-commercial phase of the project, the Organisation has not recognised its liability for interest on the Commonwealth Government loans because it was not considered probable that the Organisation would receive royalties in excess of $75 million. Interest amounting to $11.25 million (2003 $9.38 million) on the Commonwealth loan of $75 million (2003 $75 million) was also not recognised in the Statement of Financial Position and Statement of Financial Performance but disclosed as a contingent liability in the Schedule of Contingencies and Note 23.

On 25 March 2004, the Commonwealth and Queensland Governments agreed they would exit their position as secured creditors.

AMC is continuing to implement its business plans and the Organisation will continue to monitor its progress.

Note 23 Contingent Liabilities and Assets (cont)

Contingent asset

On 8 December 2003, CSIRO, the State of Queensland (acting through its Department of Primary Industries and Fisheries (QDPI&F), and Benitec Limited and its subsidiaries (Benitec) entered into agreements relating to the ownership of certain gene silencing technology and to share 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.

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 nor letters of comfort.

The indemnities and warranties issued cover potential losses or damages for which the Organisation would be liable. The majority of such indemnities and warranties are not capped because they are intended by the parties to reflect the outcome which would apply under common law or statute if they were to be triggered by an event of default.

Contingencies relating to such indemnities and warranties issued by the Organisation are considered too remote to be included in the Schedule of Contingencies.

Of the indemnities issued by the Organisation one is capped to the value of $1 million. The Organisation considers that there is a remote chance of one or more events occurring under the respective 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.

Similarly of the warranties issued by the Organisation one is capped to the value of $2.1 million. The organisation considers that there is a remote chance of one or more events occurring under the respective 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.

The Organisation has commenced a process of review of all contracts to determine the extent and materiality of any indemnities and other undertakings.

The Organisation had insurance coverage for indemnities and warranties in 2003–04 which lapsed at the end of 2003–04. At the date of signing, the Organisation was negotiating to renew its insurance coverage with Comcover, including insurance for indemnities and warranties on a case by case basis. Comcover has provided the assurance of continuing cover after 30 June 2004 in the interim period until the 2004–05 insurance premium is determined.

	Notes	2004 $'000	2003 $'000
Note 24 Cash Flow Reconciliation			
(a) Reconciliation of operating deficit to net cash from operating activities			
Operating surplus/(deficit)		**(5 326)**	**85 191**
Non – cash items			
Depreciation and amortisation of property, plant and equipment	7.3	78 475	80 411
Amortisation of intangibles	7.3	1 011	1 229
Increase write down to recoverable amount	7.4	132	1 193
(Profit)/loss on disposal of property, plant and equipment	6.4	(4 949)	2 028
(Profit)/loss on disposal of shares	6.2	(10 031)	–
Changes in assets and liabilities			
(Increase)/decrease in receivables	9	(52)	11 313
(Increase)/decrease in inventories	14	(26)	19
Increase in provision for diminution in value	7.4	4 765	284
(Increase)/decrease in investment in joint venture	25	(1 542)	1 600
Increase in other assets	15	(4 373)	(4 377)
Increase/(decrease) in employee liabilities	19A	(7 520)	8 891
Increase/(decrease) in liability to suppliers	20	(11 264)	2 923
Increase in other liabilities	19B & 21	39 738	6 787
Increase/(decrease) in GST receivable	9	(113)	86
Increase/(decrease) in deposits – liabilities	17	(19 268)	1 201
Net cash from operating activities		**59 657**	**198 779**
(b) Reconciliation of cash			
Cash balance comprises:			
Cash at bank and on hand	8	28 998	58 149
Deposits – at call	8	150 000	100 000
Balance of Cash as at 30 June shown in the Statement of Cash Flows		**178 998**	**158 149**

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 six incorporated CRCs, and their financial statements as at 30 June 2004 were not available. The net assets of these entities at June 2003 were $1.4 million and the Organisation's equity in these entities amounted to $121K. 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 $73.2 million; together with monies from the Commonwealth Government and external sources specifically for the CRCs, the total expended was $114.6 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 the Commonwealth Government and external sources, for CRCs listed below amounted to $428.8 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 $16 million or 7% of CSIRO's total plant and equipment assets are used for CRC activities.

Note 25 Joint Ventures (cont)

At 30 June 2004, CSIRO is a core participant in 50 CRCs and CSIRO's interest in each of the CRCs is determined by the individual CRC agreement. These are:

Names of CRC's	CSIRO's Equity Interest (%) (excluding Commonwealth contributions)	Actual Cash & In-kind Contributions 2003/04 $'000	Termination Date
AGRICULTURE AND RURAL BASED MANUFACTURING			
Australian Biosecurity: Emerging Infectious Diseases	40	3 373	1 Jul 2010
Australian Cotton	26	1 485	1 Jul 2006
Australian Poultry Industries	66	883	1 Jul 2006
Australian Sheep Industry	34	3 771	1 Jul 2008
Cattle and Beef Quality	21	2 473	1 Jul 2006
Innovative Dairy Products	7	799	1 Jul 2008
Sugar Industry Innovation Through Biotechnology	19	888	1 Jul 2010
Sustainable Aquaculture of Finfish	14	1 187	1 Jul 2008
Sustainable Production Forestry	32	3 191	1 Jul 2005
Sustainable Rice Production	16	556	1 Jul 2005
Tropical Plant Protection	27	681	1 Jul 2006
Viticulture	24	1 353	1 Jul 2010
ENVIRONMENT			
Antarctic Climate and Ecosystems	15	879	1 Jul 2010
Australian Weed Management	14	841	1 Jul 2008
Bushfire	12	654	1 Jul 2010
Biological Control of Pest Animals	57	1 608	1 Jul 2006
Catchment Hydrology	29	684	1 Jul 2006
Coastal Zone, Estuary and Waterway Management	27	1 250	1 Jul 2006
Desert Knowledge	8	222	1 Jul 2010
Freshwater Ecology	9	350	1 Jul 2006
Great Barrier Reef World Heritage Area	4	381	1 Jul 2006
Greenhouse Accounting	16	1 152	1 Jul 2006
Irrigation Futures	26	203	1 Jul 2010
Plant-based Management of Dryland Salinity	7	976	1 Jul 2008
Tropical Rainforest Ecology and Management	37	1 198	1 Jul 2006
Tropical Savannas Management	19	1 951	1 Jul 2008
Waste Management and Pollution Control*	8	357	1 Jul 2004
Water Quality and Treatment	8	765	1 Jul 2008

INFORMATION AND COMMUNICATION TECHNOLOGY			
Australian Telecommunications	3	254	1 Jul 2006
Satellite Systems	26	809	1 Jul 2006
MANUFACTURING TECHNOLOGY			
Advanced Composite Structures	6	480	1 Jul 2010
Bioproducts	18	626	1 Jul 2006
Cast Metals Manufacturing	47	4 322	1 Jul 2006
Construction Innovation	22	2 565	1 Jul 2008
Functional Communication Surfaces	29	2 101	1 Jul 2008
Intelligent Manufacturing Systems and Technologies*	7	291	1 Jul 2006
Polymers	10	755	1 Jul 2006
Welded Structures*	14	840	1 Jul 2006
Wood Innovations	5	607	1 Jul 2008
MEDICAL SCIENCE AND TECHNOLOGY			
Cellular Growth Factors	38	961	1 Jul 2004
Diagnostics	23	1 915	1 Jul 2008
Eye Research and Technology[a]	21	2 327	1 Jul 2004
Vaccine Technology	26	815	1 Jul 2006
MINING AND ENERGY			
A J Parker CRC for Hydrometallurgy	51	7 370	1 Jul 2006
Greenhouse Gas Technologies (Formally APCRC)[b]	53	2 628	1 Jul 2010
Clean Power from Lignite	15	983	1 Jul 2006
Coal in Sustainable Development	14	2 169	1 Jul 2008
Landscape Environments and Mineral Exploration	28	2 660	1 Jul 2008
Predictive Mineral Discovery[c]	16	2 247	1 Jul 2008
Sustainable Resources Processing	23	1 355	1 Jul 2010
Total actual Cash and In-kind contributions 2003–04		**73 191**	

(a) The Organisation is a participant in the CRC for Eye Research and Technology, which has a beneficial interest in Biocure Inc.

(b) The Organisation is a participant in the Greenhouse Gas Technologies CRC (formally APCRC), which has a beneficial interest in APCRC Commercial Ventures Pty Ltd.

(c) The Organisation is a participant in the CRC for Predictive Mineral Discovery, which has a beneficial interest in Ausmodel Pty Ltd.

(d) The Organisation was a participant in the CRC for International Food Manufacturing and Packaging Sciences. When the CRC was wound-up, the Organisation had a beneficial interest in its spin-off company, Plantic Technologies Limited.

Note 25 Joint Ventures (cont)

(b) Joint Venture Operations – High Performance Computing and Communication Centre (HPCCC)

The Organisation participates in a joint venture operation with the Bureau of Meteorology (BOM) in a 50/50 ownership and operation of a HPCCC. The Organisation and BOM jointly own the super computer and also jointly share in the usage and operating expenses of HPCCC. The Organisation held a 50% share of the super computer and other plant and equipment in the joint venture of a written down value of $1.9 million (2003 $3.1 million), until 31st May when it was decommissioned. The arrangement of a 50% share of the usage of the new super computer has remained after this date. The 50% share of operating expenses is included in the Organisation's Statement of Financial Position and Statement of Financial Performance respectively.

(c) Joint Venture Operations– Grain*gene*®

The Organisation has approximately 28.5% interest in the joint venture Grain*gene*® with the Grains Research and Development Corporation, the Australian Wheat Board Limited and Syngenta Ltd. Grain*gene*® 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 Grain*gene*® is included in the Organisation's Statement of Financial Performance.

(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 also share the characteristics of joint venture operations. The principal activities of these joint venture operations are scientific research and development with the ultimate aim of sharing in the output (ie intellectual property). The number of these arrangements make it impractical to list these separately but some of the significant arrangements include the Queensland Energy Centre for Low Emission Technology, Queensland e-Health Research Centre, Victorian Centre for Advanced Materials Manufacturing and the Centre for Plant Biodiversity Research. The Organisation's contributions to these joint ventures are included in the Organisation's Statement of Financial Performance.

(e) Joint Venture Entity – Food Science Australia (FSA)

The Organisation's 50% investment in FSA is not accounted for using the equity method due to the accumulated deficit. The discontinuation of equity accounting will remain until the accumulated deficits have been fully consumed by the operating surpluses. FSA undertakes both strategic and applied research, helping the food industry to develop, package, preserve and transport food products. During the year FSA incurred an operating surplus (unaudited) of $46K (2003 $3.2 million deficit). In accordance with the joint venture agreement the operating surplus/deficit is shared equally between the joint venture parties. The Organisation's share of the operating surplus was $23K (2003 $1.6 million deficit).

Movements in carrying amounts of investments/(liability) in joint venture entity, FSA is as follows:

	2004 $'000	2003 $'000
Carrying amount at beginning of the financial year	(1 493)	107
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	23	(1 600)
(Liability to) FSA at the end of the financial year	**(1 426)**	**(1 493)**

Note 25 Joint Ventures (cont)

(f) Murray-Darling Fresh Water Research Centre (MDFRC)

The Organisation's 50% investment in MDFRC has not been accounted for in prior years and it is accounted for in this financial year for the first time using the equity method, the carrying amount of $529K surplus in 2003–04 represents the initial recognition of this share of equity. MDFRC is a collaborative joint venture for the purpose of Murray-Darling Basin freshwater research and generate knowledge required to ensure the sustainable management of water and associated environmental resources of the Murray-Darling Basin. During the year MDFRC incurred an operating deficit (unaudited) of $54K. The Organisation's investment in MDFRC, representing a 50% share in the net asset of MDFRC was brought to account in 2003–04 as follows:

	2004 $'000
Carrying amount at beginning of the financial year	529
Share of MDFRC's net operating surplus/(deficit) for the year	(27)
Investment in/(liability to) MDFRC at the end of the financial year	**502**

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. CSIRO's cumulative in-kind contributions to 30 June 2003 amounted to $34.9 million. During the financial year 2003–04 CSIRO 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 CSIRO and BRI are accounted for as expenses in CSIRO's Statement of Financial Performance. As at 30 June 2004, CSIRO has a 63.5% interest in any repayments that may, under certain circumstances, be made by the company to CSIRO 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	3 181	908	29 982	34 071
Accumulated depreciation	–	(598)	(27 568)	(28 166)
Net value as at 30 June 2004	**3 181**	**310**	**2 414**	**5 905**
Net value as at 30 June 2003	**6 752**	**19 964**	**2 206**	**28 922**

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 1.6, 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

	2004 $'000	2003 $'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, except for monies relating to ANWC are:		
Sir Ian McLennan Achievement for Industry Award – established to award outstanding contributions by the Organisations' scientists to national development	213	211
The Ken and Yasuko Myer Plant Science Research Fund – established to fund plant science research.	98	375
The Elwood and Hannah Zimmerman Trust Fund – established to fund weevil research and the curation of the Australian National Insect Collection (ANIC) weevil collection.	1 370	1 266
The Australian National Wildlife Collection Foundation (ANWC) – established to advance the interests and activities of the Australian National Wildlife Collection, a national reference record of Australian vertebrate fauna.	415	294
Total monies held in trust as at 30 June	**2 096**	**2 146**

Movements of trust funds summary

	McLennan $'000	Myer $'000	Zimmerman $'000	ANWC $'000	Total $'000
Balance at 1 July 2003	211	375	1 266	294	2 146
Receipts during year	–	83	–	127	210
Interest and dividends	32	1	104	20	157
Expenditure	(30)	(361)	–	(26)	(417)
Balance at 30 June 2004	**213**	**98**	**1 370**	**415**	**2 096**

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.

Note 29 Collections (cont)

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.

Note 30 Remuneration of Auditors

	2004 $	2003 $
Remuneration to the Auditor-General for auditing the financial statements for the reporting period.	**219 000**	**183 200**

The Auditor-General received no remuneration for other services during the reporting period.

Note 31 Remuneration of Board Members

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	246 025	209 093
Payments to superannuation funds for Board Members	21 650	17 928
	267 675	**227 021**

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:

$			2004 Number	2003 Number
Nil	–	10 000	3	4
20 001	–	30 000	4	6
30 001	–	40 000	3	–
60 001	–	70 000	1	1
Total			**11**	**11**

	2004 $	2003 $
Note 32 Remuneration of Officers		
Aggregate amount of remuneration for Officers shown below	8 652 435	8 108 790
Aggregate amount of separation/termination benefit payments during the year to Officers shown below	56 912	66 653
	8 709 347	**8 175 443**

The number of Officers, who received or were due to receive total remuneration of $100 000 or more:

$			2004 Number	2003 Number
100 001	–	110 000	–	–
110 001	–	120 000	1	2
120 001	–	130 000	1	–
130 001	–	140 000	1	–
140 001	–	150 000	–	–
150 001	–	160 000	1	2
160 001	–	170 000	2	2
170 001	–	180 000	–	–
180 001	–	190 000	–	2
190 001	–	200 000	2	4
200 001	–	210 000	3	1
210 001	–	220 000	1	3
220 001	–	230 000	3	4
230 001	–	240 000	4	4
240 001	–	250 000	4	5
250 001	–	260 000	2	1
260 001	–	270 000	2	–
270 001	–	280 000	–	1
280 001	–	290 000	3	–
290 001	–	300 000	1	1
300 001	–	310 000	–	–
320 001	–	330 000	2	2
350 001	–	360 000	1	1
360 001	–	370 000	–	–
380 001	–	390 000	1	–
420 001	–	430 000	1	–
430 001	–	440 000	–	1
Total			**36**	**36**

The Remuneration of Officers table includes all officers concerned with taking part in the management of the Organisation during this financial year. They include the Chief Executive Officer, other members of the Executive Team and Chiefs of Divisions.

Note 33 Meetings of the CSIRO Board and Board Committees

During the financial year, six Board meetings, four Board Audit Committee, two Board Remuneration Committee and six 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	
	No eligible to attend	No attended	No eligible to attend	No attended	No eligible to attend	No attended	No eligible to attend	No attended
C B Livingstone (Chairman)	6	6	4	4	2	2	6	6
G G Garrett	6	6	4	4	–	–	6	6
S Cory	6	5	–	–	–	–	–	–
T A Cutler	6	6	4	4	2	2	–	–
P J B Duncan	6	6	–	–	2	2	6	6
B F Keane (appointed 30/7/03)	6	5	–	–	2	2	4	3
D F J McDonald (Term ended 14/7/03)	–	–	–	–	–	–	–	–
D M O'Toole	6	5	4	4	–	–	–	–
J A Harmer	6	4	–	–	–	–	–	–
V R Sara (Term ended 14/7/03)	–	–	–	–	–	–	–	–
A D Robson (appointed 30/7/03)	6	5	–	–	–	–	–	–
E D Tweddell	6	5	4	4	–	–	6	6

Note 34 Related Party Disclosures

Board Members – The Board Members of the Organisation during the financial year were:

C B Livingstone (Chairman)
T A Cutler
G G Garrett (Chief Executive)
B F Keane (appointed 30/7/03)
D O'Toole
V R Sara (term ended 14/7/03)
S Cory
P J B Duncan
J Harmer
D F McDonald (term ended 14/7/03)
A D Robson (appointed 30/7/03)
E D Tweddell

Remuneration – The aggregate remuneration of Board Members is disclosed in Note 31.

Board Members' interests in contracts

Since 1 July 2003, 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, and for the period to 18/10/2003 was a Director of Rural Press Ltd. Ms Livingstone is also a member of the Advisory Board of the Department of Accounting and Finance at the Macquarie University and 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 her.

Note 34 Related Party Disclosures (cont)

Professor S Cory is Director of the Walter and Eliza Hall Institute of Medical Research and Professor of Medical Biology at the University of Melbourne. She is also a Director of Bio21 Australia Limited, 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 a Director of Comindico Pty Ltd, 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. Dr Cutler is not aware of any contracts or transactions between these entities and CSIRO.

Mr P J B Duncan is a Director of Orica Ltd, National Australia Bank and GasNet. He is a member of the Advisory Board of Siemens Australia and 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 is the Chief Executive Officer and 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 him.

Mr B F Keane is the Principal of Brian Keane and Associates, a management and insurance consulting firm. He is also a member of the board of TAB Ltd and a Director of RAC Insurance Ltd (Western Australian Auto Club Insurance), Law Cover Pty Ltd (NSW Solicitors Professional Indemnity Fund), IT Insurance Services and Aurora Energy Pty Ltd. 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 a Director of Raheny Consulting Pty Ltd. Ms O'Toole is not aware of any contracts or transactions between this entity and CSIRO.

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.

Dr E Tweddell is Chairman of Ansell Limited and Nepenthe Group Pty Ltd and is a Director of National Australia Bank and Australia Post. 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 following Board Member is not a member or Director with a company:

– Dr G G Garrett

Note 35 Average Staff Levels

	2004 Number	2003 Number
The average staffing levels measured on a full-time equivalent basis for the Organisation during the year.	5 914	5 921

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 Deposits at call	8	Cash at bank and deposits 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 relates to temporarily surplus funds placed on deposit with a bank. Interest is earned on the deposit.
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.	–
Receivables from AMC	23	Receivables from AMC are not recognised in the Statement of Financial Position as at 30 June 2004. They are disclosed in the Schedule of Contingencies and Note 23.	Refer Note 23 for details of terms and conditions.

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 17 years and a maximum term of 25 years. The interest rate implicit in the leases averaged 4.4% pa. (2003 4.3%). The lease liabilities are secured by the lease assets and disclosed in Notes 10 and 11.
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 2004.	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.
Loans	23	Loans payable to the Commonwealth and Queensland Governments are not recognised in the Statement of Financial Position as at 30 June 2004. They are disclosed in the Schedule of Contingencies (refer Note 23 for details).	Loans from the Commonwealth and Queensland Governments are unsecured. Refer Note 23 for details of terms and conditions.

Note 36 Financial Instruments (cont) (b) Interest rate risk

Financial Instrument	Notes	Floating Interest Rate		Fixed Interest Rate: 1 year or less		Fixed Interest Rate: 1 to 2 years		Fixed Interest Rate: 2 to 5 years		Fixed Interest Rate: > 5 years		Non Interest Bearing		Total		Weighted Average Effective Interest Rate	
		2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 %	2003 %
Financial assets (recognised)																	
Cash at bank and cash on hand	8	28 998	58 149	–	–	–	–	–	–	–	–	–	–	28 998	58 149	5.0	4.7
Deposits – at call	8	–	–	150 000	100 000	–	–	–	–	–	–	–	–	150 000	100 000	5.3	5.0
Receivables for goods and services	9	–	–	–	–	–	–	–	–	–	–	40 960	41 433	40 960	41 433	n/a	n/a
Receivables for property sales	9	–	–	–	–	–	–	–	–	–	–	–	20 250	–	20 250	n/a	n/a
Loans Receivable	9	1 436	–	–	–	–	–	–	–	–	–	1 000	–	2 436	–	8.8	n/a
Net GST receivable	9	–	–	–	–	–	–	–	–	–	–	899	788	899	788	n/a	n/a
Other receivables	9	–	–	–	–	–	–	–	–	–	–	5 768	4 270	5 768	4 270	n/a	n/a
Investments	10	–	–	–	–	–	–	–	–	–	–	13 087	5 861	13 087	5 861	n/a	n/a
Total financial assets (recognised)		**30 434**	**58 149**	**150 000**	**100 000**	–	–	–	–	–	–	**61 714**	**72 602**	**242 148**	**230 751**		
Total assets														**1 344 893**	**1 351 591**		
Receivable from AMC including royalties	23	70 000	70 000	–	–	–	–	–	–	–	–	16 855	14 376	86 855	84 376	n/a	n/a
Total financial assets (unrecognised)		**70 000**	**70 000**	–	–	–	–	–	–	–	–	**16 855**	**14 376**	**86 855**	**84 376**		
Financial liabilities (recognised)																	
Finance lease liabilities	16	–	–	19 492	19 674			7 154	8 772	58 386	59 579	–	–	85 032	88 025	4.4	4.3
Trade creditors	20	–	–	–	–	–	–	–	–	–	–	40 659	32 700	40 659	32 700	n/a	n/a
Research revenue received in advance	21	–	–	–	–	–	–	–	–	–	–	45 627	43 554	45 627	43 554	n/a	n/a
Deposits	17	18 428	37 696	–	–	–	–	–	–	–	–	–	–	18 428	37 696	5.0	4.7
Other creditors	21	–	–	–	–	–	–	–	–	–	–	27 833	9 990	27 833	9 990	n/a	n/a
Total financial liabilities (recognised)		**18 428**	**37 696**	**19 492**	**19674**	–	–	**7 154**	**8 772**	**58 386**	**59 579**	**114 119**	**86 244**	**217 579**	**211 965**		
Total liabilities														**399 960**	**401 332**		
Legal claims and loans payable	23	70 000	70 000	–	–	–	–	–	–	–	–	17 955	15 356	87 955	85 356	n/a	n/a
Total financial liabilities (unrecognised)		**70 000**	**70 000**	–	–	–	–	–	–	–	–	**17 955**	**15 356**	**87 955**	**85 356**		

Note 36 Financial Instruments (cont)

(c) Net fair values of financial assets and liabilities

	Notes	2004 Total carrying amount $'000	2004 Aggregate net fair value $'000	2003 Total carrying amount $'000	2003 Aggregate net fair value $'000
Financial assets (recognised)					
Cash at bank and on hand	8	28 998	28 998	58 149	58 149
Deposits at call	8	150 000	150 000	100 000	100 000
Receivables for goods and services	9	40 960	40 960	41 433	41 433
Receivables for property sales	9	–	–	20 250	20 250
Loans receivable	9	2 436	2 436	–	–
GST receivable	9	899	899	788	788
Other receivables	9	5 768	5 768	4 270	4 270
Investments	10	13 087	13 087	5 861	5 861
		242 148	**242 148**	**230 751**	**230 751**
Financial assets (unrecognised)					
Receivable from AMC, including royalties	23	**86 855**	**86 855**	**84 376**	**84 376**
Financial liabilities (recognised)					
Finance lease liabilities	16	85 032	85 032	88 025	88 025
Trade creditors	20	40 659	40 659	32 700	32 700
Research revenue received in advance	21	45 627	45 627	43 554	43 554
Deposits	17	18 428	18 428	37 696	37 696
Other creditors	21	27 833	27 833	9 990	9 990
		217 579	**217 579**	**211 965**	**211 965**
Financial liabilities (unrecognised)					
Legal claims and loans payable	23	**87 955**	**87 955**	**85 356**	**85 356**

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. All prior hedges have been completed. These contracts were taken out before the Commonwealth Government restricted government agencies from entering into external hedges for foreign currency transactions from 1 July 2002.

(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 Outcomes 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

	2004 $'000	2003 $'000
Total expenses	**909 759**	**851 498**
Total costs recovered from provision of goods and services to the non-government sector	**1 359**	**1 361**
Other external revenues:		
Sale of goods and services – to related entities	47 876	37 760
Sale of goods and services – to external entities	246 916	236 319
Interest	7 498	9 700
Revenue from sale of assets	15 281	–
Contributions	273	38
Rental income	3 394	2 995
Sale of primary produce	1 376	1 631
Other	11 814	7 621
Total other external revenues	**334 428**	**296 064**
Net cost of outcome	**573 972**	**554 073**

Note to accompany the following table:

As disclosed in the Portfolio Budget Statements and Portfolio Additional Estimates for 2003–04, the Output structure for the Organisation was revised.

During the 2003–04 financial year, the Organisation also revised its methodology for the allocation of corporate costs to enable a more accurate pricing of outputs. The revised methodology involves management estimation and decision as to the most appropriate choice of cost drivers such as staff numbers and floor space. This revision to the methodology has been reviewed by an external consultant.

In addition, the Organisation allocates direct costs and revenues to outputs derived from the use of project codes within the Organisation 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, Manufacturing and 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			
	2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 $'000	2003 $'000
Operating Expenses										
Employees	168 575	153 290	80 360	72 040	135 999	120 869	136 805	123 719	521 739	469 918
Suppliers	86 664	83 196	43 988	44 170	70 112	75 905	88 171	87 405	288 935	290 676
Depreciation and amortisation	26 393	25 996	11 148	11 292	14 732	15 612	27 213	28 740	79 486	81 640
Value of assets sold	3 844	3 355	2 008	1 649	2 196	6 810	2 284	3 138	10 332	14 952
Write-down of assets	38	545	2 700	458	1 398	1 912	1 710	1 028	5 846	3 943
Other	1 277	697	591	236	615	323	938	2 037	3 421	3 293
Total operating expenses	**286 791**	**267 079**	**140 795**	**129 845**	**225 052**	**221 431**	**257 121**	**246 067**	**909 759**	**864 422**
Funded by:										
Revenues from Government	196 300	211 067	78 148	88 625	136 749	159 030	157 449	180 542	568 646	639 264
Sale of goods and services	85 573	76 458	50 858	50 338	76 069	75 411	83 651	73 233	296 151	275 440
Revenue from sale of assets	4 401	3 191	2 247	1 552	4 117	4 835	4 516	3 346	15 281	12 924
Contributions	53	26	25	4	60	8	135	–	273	38
Other	6 209	5 330	2 429	3 250	7 536	6 417	7 908	6 950	24 082	21 947
Total operating revenues	**292 536**	**296 072**	**133 707**	**143 769**	**224 531**	**245 701**	**253 659**	**264 071**	**904 433**	**949 613**

Note 38 Appropriations

Acquittal of Organisation to draw cash from the Consolidated Revenue Fund (Appropriation) from Acts 1 and 3

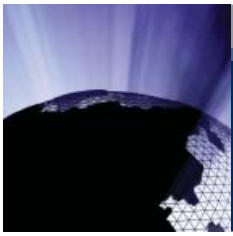
Particulars	Departmental Outputs		Loans		Equity		Total	
	2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 $'000	2003 $'000	2004 $'000	2003 $'000
Balance carried forward from previous year	–	–	–	17 200	–	–	–	17 200
Appropriation (Act No1)	568 107	639 629	–	–	–	–	568 107	639 629
Appropriation (Act No 3)	539	(365)	–	–	–	–	539	(365)
Sub total Appropriation Acts	568 646	639 264	–	17 200	–	–	568 646	656 464
Departmental adjustments by the Finance Minister (Appropriation Acts)	–	–	–	–	–	–	–	–
Advance to the Finance Minister	–	–	–	–	–	–	–	–
Refunds credited (FMA s 30)	–	–	–	–	–	–	–	–
Appropriations to take account of recoverable GST (FMA s 30A)	–	–	–	–	–	–	–	–
Annotations to 'net appropriations' (FMA s 31)	–	–	–	–	–	–	–	–
Other cash adjustments	–	–	–	–	–	–	–	–
Adjustments of appropriations on change of entity functions (FMA s 32)	–	–	–	–	–	–	–	–
Appropriation lapsed	–	–	–	–	–	–	–	–
Total appropriation available for payment	568 646	639 264	–	17 200	–	–	568 646	656 464
Total payments made (GST inclusive)	(568 646)	(639 264)	–	(17 200)	–	–	(568 646)	(656 464)
Appropriations credited to Special Accounts	–	–	–	–	–	–	–	–
Balance carried forward to next period	–	–	–	–	–	–	–	–
Represented by:								
Cash at bank and on hand	–	–	–	–	–	–	–	–
Appropriation Receivable	–	–	–	–	–	–	–	–
GST receivable from the ATO	–	–	–	–	–	–	–	–
Drawing Rights withheld	–	–	–	–	–	–	–	–
Savings offered	–	–	–	–	–	–	–	–
Other	–	–	–	–	–	–	–	–
Total	**568 646**	**639 264**	**–**	**17 200**	**–**	**–**	**568 646**	**656 464**
Reconciliation for Appropriations Acts (Nos 1 and 3)								
Paid to the entity from the OPA	568 646	639 264	–	17 200	–	–	568 646	656 464
Payable to the entity from the OPA	–	–	–	–	–	–	–	–
Total Appropriation Acts	**568 646**	**639 264**	**–**	**17 200**	**–**	**–**	**568 646**	**656 464**

Appendixes

Sector Advisory Councils 182

Cooperative Research Centres 187

Science and Industry Endowment Fund Report 190



Appendixes

Appendix 1. Sector Advisory Councils

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 2004.

Agribusiness Sector

Chair
Mr Trevor Flugge, AO
Farmer
Tel (08) 9330 4188
Email tflugge@iprimus.com.au

Members
Dr Geoffrey Annison
Head, Institute of Food Nutrition and Human Health
Massey University

Mr David Anthony
Managing Director
Auscott

Dr David Brand
Director, Carbon Programs
Hancock Natural Resource Group Australia Pty Ltd

Dr Tony Gregson
Farmer

Professor George Kailis
Professor of Management, College of Business
University of Notre Dame Australia

Mr Rod Kater
Cattle Producer

Dr John Keniry
Chairman
Ridley Corporation Ltd

Mr Phillip Laffer
Director
Orlando-Wyndham Group

Mr Ian Lindenmayer
Lindenmayer Consulting

Professor David Roberts
Director
Australian Food and Grocery Council

Mr Michael Taylor
Secretary
Agriculture, Fisheries and Forestry Australia

Mr Peter Zed
Group General Manager, Resources
Weyerhaeuser Australia Pty Ltd

Sector Coordinator
Mr Shaun Coffey
CSIRO Livestock Industries
Tel (07) 3214 2999
Email shaun.coffey@csiro.au

Energy and Transport Sector

Chair
The Hon Warwick Parer
Company Director
Tel (07) 3216 8318
Email wrktp@bigpond.net.au

Members
Dr Allen Beasley
Chief Executive Officer
Australian Pipeline Industry Association

Ms Tricia Caswell
Executive Director, Global Sustainability
RMIT University

Mr Drew Clarke
Head, Energy and Environment Division
Department of Industry, Tourism and Resources

Mr Roman Domanski
Executive Director
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 Lauchlan McIntosh
Executive Director
Australian Automobile Association

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 Brad Page
Chief Executive Officer
Energy Supply Association of Australia

Mr Andrew Stock
Executive General Manager, Generation
Origin Energy

Dr John Tilley
Executive Director
Australian Institute of Petroleum

Ms Anthea Tinney
Deputy Secretary
Environment Australia

Sector Coordinator
Dr Rod Hill
CSIRO Sustainable Minerals and Energy
Tel (03) 9545 8300
Email rod.hill@csiro.au

Environment and Natural Resource Management Sector

Chair
Mr Greg Bourne
Consultant
Tel 0410 479 253
Email gbourne@bigpond.net.au

Members
Mr Howard Bamsey
Chief Executive Officer
Australian Greenhouse Office

Mr Don Blackmore
Consultant
c/- Murray Darling Basin Commission

Ms Leith Boully
Farmer

Mr David Carter
Chief Executive Officer
Newfishing Australia Pty Ltd

Mr John Corrigan
Principal
Group 8 Management

Mr Richard Dinham
Chairman
DesignInc Sydney Pty Ltd

Mr Don Henry
Executive Director
Australian Conservation Foundation

Mr Oleg Morozow
Consultant

Dr Conall O'Connell
Acting Deputy Secretary
Environment Australia

Dr Peter Scaife
Director, Centre for Sustainable Technology
University of Newcastle

Mr Robert Stribling
Head of Market Risk
ANZ Banking Group

Mr Ian Thompson
Executive Manager, National Resource Management
Agriculture, Fisheries and Forestry Australia

Professor Beth Woods
School of Natural and Rural Systems Management
University of Queensland

Sector Coordinator
Dr Steve Morton
CSIRO Environment and Natural Resources Group
Tel (02) 6246 4551
Email steve.morton@csiro.au

Health Sector

Chair
Professor Terry Dwyer
Director
Menzies Research Institute
Tel (03) 6226 7702
Email t.dwyer@utas.edu.au

Members
Professor Warwick Anderson
Head, School of Biomedical Sciences
Monash University

Professor Bruce Armstrong
Head, School of Public Health
The University of Sydney

Professor Felix Bochner
Head, Department of Clinical and Experimental Pharmacology
University of Adelaide

Professor Tony Burgess
Director
Ludwig Institute for Cancer Research

Professor Don Chalmers
Dean
University of Tasmania

Professor Graham Colditz
Department of Medicine,
Department of Epidemiology
Harvard School of Public Health

Dr Alison Coutts
Director
Emerging Growth Capital Pty Ltd

Dr Murray Esler
Associate Director
Baker Medical 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 David Roberts
Director
Australian Food and Grocery Council

Mr George Savvides
Managing Director
Medibank Private

Dr Robert Wooding
First Assistant Secretary, Information and Communications Division
Department of Health and Ageing

Sector Coordinator
Dr Richard Head
CSIRO Preventative Health Flagship
Tel (08) 8303 8819
Email richard.head@csiro.au

Information, Communication and Services Sector

Chair
Dr Chris Beare
Independent Director
Tel (02) 9417 0270
Email chris.beare@rondeau.com.au

Members
Dr Rod Badger
Deputy Chief Executive Officer
National Office for the Information Economy

Mr Ric Clark
Business Development Director
National ICT Australia

Mr John Craven
Managing Director
Terranovate Group Pty Ltd

Mr Rob Durie
Executive Director
Australian Information Industry Association

Mr Karl Fender
Director
Fender Katsalidis Architects

Ms Judith King
Company Director
Federation Square Management

Mr John Kranenburg
Executive Director
Kranenburg and Associates

Dr Phil Robertson
General Manager, Solutions Division
Canon Information Systems Research Australia

Mr Silvio Salom
Managing Director
Adacel

Mr Stuart Simson
Executive Chairman
Emitch Ltd

Sector Coordinator
Dr Rhys Francis
CSIRO High Performance Scientific Computing
Tel (03) 9669 8135
Email rhys.francis@csiro.au

Manufacturing Sector

Chair
Mr Bob Herbert
Consultant
Tel (02) 9866 7830
Email rnh@sarfaribiz.com.au

Members
Mr Ron Adams
Managing Director
Sotico Pty Ltd

Mr John Blood
Director/Textile and Garment Consultant

Mr Phillip Butler
Managing Director
Textor Pty Ltd

Mr Russell Cooper
Managing Director
Sita Australia Pty Ltd

Dr Patricia Crook, AO
Managing Director
Dynek Pty Ltd

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
Director, Office of Manufacturing
Department of Innovation, Industry and Regional Development

Dr Stuart Romm
Retired

Professor Alan Seale
Department of Chemical Engineering
Monash University

Dr Mark Smith
Chief Executive Officer, FibreGen
Carter Holt Harvey Ltd

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
Tel (03) 9545 2050
Email larry.little@csiro.au

Mineral Resources Sector

Chair
Mr Andrew Michelmore
Chief Executive Officer
WMC Resources Ltd
Tel (03) 9685 6380
Email andrew.michelmore@wmc.com

Members
Mr Alan Broome
Chairman
Austmine

Dr Megan Clark
VP Technology
BHP Billiton

Dr Bobby Danchin
Chief Executive Officer, Exploration/Acquisitions
Anglo American Corporation of South Africa Ltd

Mr Richard Davies
Principal
CEO Partnerships

Mr Eduard Eshuys
Consultant
Sons of Gwalia

Dr Ian Gould
Consultant

Mr John Hartwell
Head, Resources Division
Department of Industry, Tourism and Resources

Mr Ron Knapp
Executive Director
Australian Aluminium Council

Mr Don Larkin
Chief Executive Officer
AusIMM

Mr Clive Latcham
Managing Director
Robe River Mining Co Pty Ltd

Ms Elizabeth Lewis-Gray
Executive Director
Gekko Systems Pty Ltd

Dr James Macdonald
Global Geoscience Leader
BHP Billiton

Mr John Marsden
Vice President Technology and Development
Phelps Dodge Mining Company

Mr Ian Nethercote
Chief Executive
Loy Yang Power Management Pty Ltd

Dr Ray Shaw
General Manager, Technology Support
Rio Tinto Technology

Sector Coordinator
Dr Rod Hill
CSIRO Sustainable Minerals and Energy Group
Tel (03) 9545 8300
Email rod.hill@csiro.au

Appendix 2. Our research through Cooperative Research Centres (CRCs)

The Commonwealth 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 2004 CSIRO was a participant in 50 of the 71 existing CRCs.

During 2003–04, CSIRO's total in-kind and cash contribution to CRCs from its own resources was $73.2 million. When combined with funding from the Commonwealth Government and external sources provided specifically for CRCs, the total expended during the financial year was $114.6 million.

Working in CRCs has enabled CSIRO to contribute to a range of exciting advances in research and development. Among those announced during 2003–04 were:

- a deep-sea camera to map the life on the sea floor
- techniques to accurately trace gradual vegetation change from grassy to more wooded ecosystems, that are being used to determine the extent and time-frame of this vegetation change across Northern Australia
- the 'Out-Fox in Tasmania' program has led to a sustained program of surveillance in an effort to detect and eliminate foxes from the island
- an Australian 'green calculator' is poised to transform the property industry. It provides building and construction professionals with an automated cost and environmental assessment for commercial buildings
- the development of a new long-life die coat for low pressure and gravity die-casting. 'CASTcoat™' has a longer and predictable life, which will allow automation and can tailor heat transfer and surface roughness for particular casting designs
- the development of a powerful new technique for uncovering hidden gold deposits
- the delivery of $295 million (net present value (NPV)) in direct financial benefits to the minerals-processing industry, through an industry-sponsored project to improve gravity thickeners. Gravity thickeners are a crucial piece of equipment in the processing of minerals. The project has the potential to deliver an additional $250 million (NPV) in benefits
- the development of a new technology designed to substantially reduce the $140 million lost each year due to Australian dairy cows contracting mastitis
- the development of rapid Severe Accute Respiratory Syndrome (SARS) diagnostic assays and national protocols which have assisted laboratory tests to reliably distinguish between SARS and other viral diseases with similar clinical presentations
- the development of an innovative technology that simplifies the management and gives more reliable call quality of Video and Voice over IP (VoIP) in large organisations.

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 2004:

Manufacturing Technology

Bioproducts	http://www.bioproducts.org.au/
Cast Metals Manufacturing	http://www.cast.crc.org.au/
Intelligent Manufacturing Systems and Technologies*	http://www.crcimst.com.au/
Polymers II	http://www.crcp.com.au/
Welded Structures*	http://www.crcws.com.au/
Construction Innovation	http://www.construction-innovation.info/
Functional Communication Surfaces	http://www.crc-fcs.com/
Innovative Wood Manufacturing	http://www.crcwood.unimelb.edu.au/
Advanced Composite Structures II*	http://www.crc-acs.com.au/

Note: CSIRO withdrew as a core participant from the CRC for Microtechnology during 2003–04.

Information and Communication Technology

Satellite Systems	http://www.crcss.csiro.au/
Australian Telecommunications	http://www.telecommunications.crc.org.au/
Enterprise Distributed Systems Technology*	http://www.dstc.edu.au/

Mining and Energy

AJ Parker CRC for Hydrometallurgy II	http://www.parkercentre.crc.org.au/
Clean Power from Lignite	http://www.cleanpower.com.au/
Coal in Sustainable Development	http://www.ccsd.biz/
Landscape Environments and Mineral Exploration	http://crcleme.org.au/
Predictive Mineral Discovery	http://www.pmdcrc.com.au/
Greenhouse Gas Technologies	http://www.co2crc.com.au/
Sustainable Resource Processing	http://www.csrp.com.au/

Agriculture and Rural Based Manufacturing

Sustainable Production Forestry[1]	http://www.forestry.crc.org.au/
Sustainable Rice Production[1]	http://www.ricecrc.org/
Australian Cotton	http://www.cotton.pi.csiro.au/
Cattle and Beef Quality	http://www.beef.crc.org.au/
Tropical Plant Protection	http://www.tpp.uq.edu.au/
Viticulture II	http://www.crcv.com.au/
Australian Sheep Industry	http://www.sheep.crc.org.au/home.php3
Innovative Dairy Products	http://www.dairycrc.com/
Sustainable Aquaculture of Finfish	http://www.aquafincrc.com.au/

Australian Poultry Industries	http://www1.poultrycrc.com.au/pages/about.aspx
Australian Biosecurity: Emerging Infectious Disease	http://www1.abcrc.org.au/
Sugar Industry Innovation through Biotechnology	http://www.crcsugar.com/

Environment

Biological Control of Pest Animals	http://www.pestanimal.crc.org.au/
Catchment Hydrology II	http://www.catchment.crc.org.au/
Coastal Zone, Estuary and Waterway Management	http://www.coastal.crc.org.au/
Freshwater Ecology II	http://enterprise.canberra.edu.au/WWW/www-crcfe.nsf
Greenhouse Accounting	http://www.greenhouse.crc.org.au/
Great Barrier Reef World Heritage Area*	http://www.reef.crc.org.au/
Tropical Rainforest Ecology and Management II	http://www.rainforest-crc.jcu.edu.au/
Australian Weed Management	http://www.weeds.crc.org.au/
Plant-based Management of Dryland Salinity	http://www1.crcsalinity.com/
Tropical Savannas Management	http://savanna.ntu.edu.au/
Water Quality and Treatment II	http://www.waterquality.crc.org.au/
Bushfire*	http://www.bushfirecrc.com/
Antarctic Climate and Ecosystems	http://www.acecrc.org.au/
Irrigation Futures	http://www.crcirrigation.nisn.com.au/perl/crc?event_id=11
Desert Knowledge	http://www.desertknowledge.com.au/crc_main.html

Medical Science and Technology

Cellular Growth Factors II[2]	http://www.ludwig.edu.au/crc-cgf/
Vaccine Technology II	http://www.crc-vt.qimr.edu.au/
Diagnostics	http://diagnosticscrc.org/
Vision	http://www.visioncrc.org/main_menu.asp

1 CRC granted extension to 30 June 2005 due to Round 9 application

2 CRC ceased operations 30 June 2004

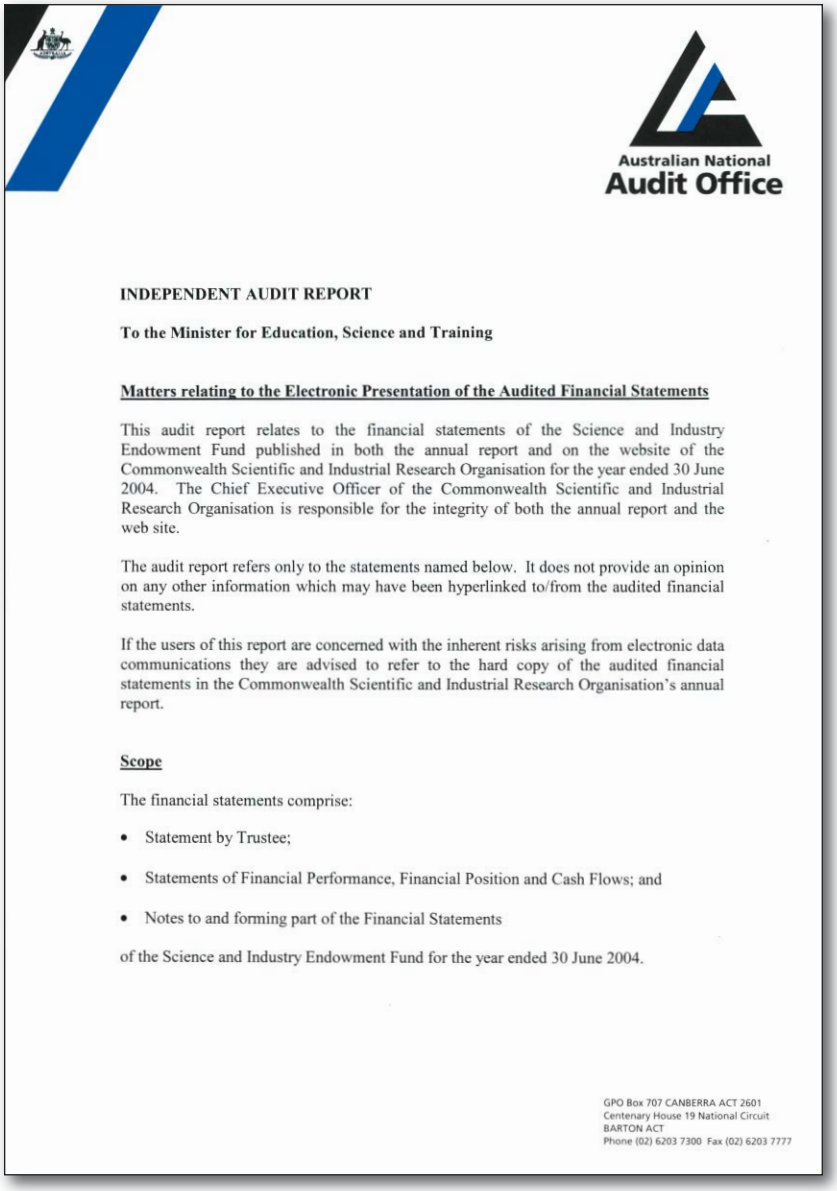
** CRC is an Incorporated Joint Venture*

Appendix 3.
Science and Industry Endowment Fund

The Science and Industry Endowment Fund (SIEF) was established under the *Science and Industry Endowment Act 1926* with the Trustee of the Fund being the members of the Executive of CSIRO. An amount of $200 000 (100 000 pounds) was initially provided with grants to be made from interest earned on these funds and any gifts or bequests to the fund.

The fund was established to support those engaged in scientific research and the training of students in scientific research. In general, applications have been sought from those who do not have access to the usual avenues of funding such as ARC grants. Groups that are supported include retired or amateur scientists or those encouraging young people to develop an interest in scientific research.

In 2003–04, 38 applications were received and grants totalling $24 655 were made to 17 recipients.



Australian National
Audit Office

INDEPENDENT AUDIT REPORT

To the Minister for Education, Science and Training

Matters relating to the Electronic Presentation of the Audited Financial Statements

This audit report relates to the financial statements of the Science and Industry Endowment Fund published in both the annual report and on the website of the Commonwealth Scientific and Industrial Research Organisation for the year ended 30 June 2004. The Chief Executive Officer of the Commonwealth Scientific and Industrial Research Organisation is responsible for the integrity of both the annual report and the web site.

The audit report refers only to the statements named below. It does not provide an opinion on any other information which may have been hyperlinked to/from the audited financial statements.

If the users of this report are concerned with the inherent risks arising from electronic data communications they are advised to refer to the hard copy of the audited financial statements in the Commonwealth Scientific and Industrial Research Organisation's annual report.

Scope

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 2004.

GPO Box 707 CANBERRA ACT 2601
Centenary House 19 National Circuit
BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

The trustee of the Science and Industry Endowment Fund is responsible for the preparation and true and fair presentation of the financial statements in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*. This includes responsibility 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.

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*, 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 Australian professional ethical pronouncements.

Audit Opinion

In my opinion, the financial statements:

(i) have been prepared in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997* and applicable Accounting Standards; and

(ii) give a true and fair view, of the matters required by applicable Accounting Standards and other mandatory professional reporting requirements in Australia, and the Finance Minister's Orders, of the financial position of the Science and Industry Endowment Fund as at 30 June 2004, and of its financial performance and cash flows for the year then ended.

Australian National Audit Office

Brandon Jarrett
Executive Director

Canberra
20 August 2004

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT BY TRUSTEE

In our opinion, the attached financial statements for the year ended 30 June 2004 are 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.

Dr Geoff Garrett
Chief Executive
18 August 2004

Mr Mike Whelan
Chief Finance Officer
18 August 2004

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF FINANCIAL PERFORMANCE
for the period ended 30 June 2004

	Notes	2004 $	2003 $
Revenues from ordinary activities			
Interest		26 693	23 929
In-kind contribution – CSIRO	4	4 220	3 400
Total revenues from ordinary activities		**30 913**	**27 329**
Expenses from ordinary activities			
Scientific research grants		24 655	–
Bank fees		25	86
Advertising		1 231	–
Accounting, secretarial and audit	4	4 220	3 400
Total expenses from ordinary activities		**30 131**	**3 486**
Net operating surplus from ordinary activities	7	**782**	**23 843**
Net surplus		**782**	**23 843**
Total changes in equity other than those resulting from transactions with owners as owners		**782**	**23 843**

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 2004

	Notes	2004 $	2003 $
ASSETS			
Financial Assets			
Cash	5	482 759	482 375
Receivables	6	2 042	1 644
Total assets		484 801	484 019
LIABILITIES			
Payables			
Awards		–	–
Total liabilities		–	–
NET ASSETS		**484 801**	**484 019**
EQUITY			
Contributed equity	7	200 000	200 000
Accumulated surpluses	7	284 801	284 019
Total equity		**484 801**	**484 019**
Current assets		**484 801**	**484 019**
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 year ended 30 June 2004

	Notes	2004 $	2003 $
OPERATING ACTIVITIES			
Cash received			
Interest		26 295	23 871
Total cash received		26 295	23 871
Cash used			
Grants		24 655	20 186
Advertising		1 231	-
Other		25	86
Total cash used		25 911	20 272
Net cash from/(used by) operating activities	8	**384**	**3 599**
Net increase/(decrease) in cash held		384	3 599
Cash at the beginning of the reporting period		482 375	478 776
Cash at the end of the reporting period		**482 759**	**482 375**

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 year ended 30 June 2004

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 2004) Orders)*

– Australian Accounting Standards and Accounting Interpretations issued by the Australian Accounting Standards Board

– the Consensus Views of the Urgent Issues Group.

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 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.

1.3 Revenue

Interest revenue is recognised on a proportional basis taking into account the interest rates applicable to the financial assets.

1.4 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.

1.5 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 2004.

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 earnt 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.

	2004 $	2003 $
Note 4 Resources Received Free of Charge		
Estimated value of resources provided free of charge by CSIRO are as follows:		
– accounting and secretarial services	3 020	2 200
– auditors remuneration paid and payable to the Auditor-General for auditing the financial statements of SIEF	1 200	1 200
	4 220	**3 400**

Note 5 Cash (current)		
Cash at bank	(10 620)	8 483
Deposits – at call	493 379	474 042
	482 759	**482 525**

Note 6 Receivables (current)		
Interest receivable	**2 042**	**1 644**
Gross receivables are aged as follows:		
Not overdue	**2 042**	**1 644**

Note 7 Equity – movement summary

Description	Contributed Equity		Accumulated Results		Total Equity	
	2004	2003	2004	2003	2004	2003
	$	$	$	$	$	$
Balance as at 1 July	200 000	200 000	284 019	260 176	484 019	460 176
Net surplus	–	–	782	23 843	782	23 843
Balance as at 30 June	**200 000**	**200 000**	**284 801**	**284 019**	**484 801**	**484 019**

Note 8 Cash flow reconciliation

Reconciliation of operating surplus to net cash from/(used by) operating activities:

Operating surplus/(deficit)	**782**	**23 843**
Changes in assets and liabilities		
(Increase)/decrease in receivables	(398)	(58)
Increase/(decrease) in payables	–	(20 186)
Net cash from/(used by) operating activities	**384**	**3 599**

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 5.41% (2003 5.03%).

Indexes

Acronyms

ACARP	Australian Coal Association Research Program
ADJR Act	*Administrative Decisions (Judicial Review) Act 1977*
AFMA	Australian Fisheries Management Authority
AGP	Australian Growth Partnerships
AGO	Australian Greenhouse Office
ANAO	Australian National Audit Office
ANN	A Neural Network
APGs	Annual Performance Goals
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASEAN	Association of South East Asian Nations
ATCA	Australia Telescope Compact Array
ATLR	Average Time Lost Rate
ATNF	Australia Telescope National Facility
AWA	Australian Water Association
AWTA	Australian Wool Testing Authority
BCC	Board Commercial Committee
BMA	Billiton Mitsubishi Alliance
BYDV	Barley Yellow Dwarf Virus
CAC Act	*Commonwealth Authorities and Companies Act 1997*
CBM	Crew Boat Mission
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CDS	Commonwealth Disability Strategy
CeNTIE	Centre for Networking Technologies for the Information Economy
CenDEP	Centre for Distributed Energy and Power
COAG	Council of Australian Governments
CRC	Cooperative Research Centre
CREST	CREativity in Science and Technology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSIROSEC	CSIRO Science Education Centre
CST	Client Service Teams
CUC	Capital Use Charge
CVS	Customer Value Survey
DAI	Development Alternatives Inc
DDA Act	*Disability Discrimination Act 1992*
DEST	Department of Education, Science and Training
DSTO	Defence Science and Technology Organisation
EEA	Energy Express for Architects
EEO	Equal Employment Opportunities
EMC	Executive Management Council
EMS	Environmental Management System
EPA	Environment Protection Authority
ESD	Ecologically Sustainable Development
ESI	Emerging Science Initiative
ESOC	Emerging Science Oversight Committee
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
FASTS	Federation of Australian Scientific and Technological Societies
FIAA	Furnishing Industry Association of Australia
FOI Act	*Freedom of Information Act 1982*
G-bIRD	Ground-based Infra-red Detector
GFSF	Groundwater Flow Systems Framework
GMOs	Genetically Modified Organisms
GRA	Global Research Alliance
GRDC	Grains R&D Corporation
GPS	Global Positioning System
HSEACW	Health, Safety and Environment Assessment and Control of Work
ICM	Integrated Catchment Management
ICT	Information and Communication Technology
IOCI	Indian Ocean Climate Initiative
IGCC	Integrated Gasification Combined Cycle
IPPs	Information Privacy Principles
ISI	Institute for Scientific Information
ISO	International Standards Organisation
IT	Information Technology

LTIFR	Lost Time Incident Frequency Rate
mecu	Members and Education Credit Union
MFAT	Murray Flow Assessment Tool
MTFR	Medical Treatment Frequency Rate
MXDPs	Major Cross-Divisional Programs
NASA	National Aeronautic Space Administration
NEPMs	National Environmental Protection Measures
NH&MRC	National Health and Medical Research Council
NIS	National Innovation System
NPPs	National Privacy Principles
NPV	Net Present Value
NRPs	National Research Priorities
NSW	New South Wales
NPI	National Pollutant Inventory
OIE	Office International des Epizooties
OH&S	Occupational Health and Safety
OHS&E	Occupational Health Safety and Environment
PEA	Preliminary Environment Assessment
PEH	Pacific Edge Holdings
PFCs	Perfluorocarbons
PIN	Provisional Improvement Notice
PMF	Performance Management Framework
PPF	Program Performance Framework
PMI	Program Management Improvement
PW	Project Workflow
QDPI	Queensland Department of Primary Industries
QEM*SEM	Quantitative Evaluation of Minerals using Scanning Electron Microscopy
RA&A	Risk Assessment and Audit
RDC	Research and Development Corporation
RIPPERS	Reclaimed Intellectual Property Promising Extraordinary Revenues
PLT	Precision Location Technology
SAC	Sector Advisory Council
SARS	Severe Acute Respiratory Syndrome
SIEF	Science and Industry Endowment Fund
SIR Act	*Science and Industry Research Act 1949*
SKA/LoFAR	Square Kilometre Array/Low Frequency Array for Radioastronomy
SMEs	Small and Medium Enterprises
SBT	Southern Bluefin Tuna
TIMS	Transgenic and Insecticide Management System
TFA	Triennium Funding Agreement
UN	United Nations
UNESCO	United Nations Educational Scientific and Cultural Organisation
UK	United Kingdom
USA	United States of America
ViCCTU™	Virtual Critical Care Unit
VOIP	Video and Voice over IP
WA	Western Australia
WAERA	Western Australian Energy Research Alliance
XMML	eXploration and Mining Markup Language

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.
- A core capability provides differential competitive advantage and will be an area of strength. The extent to which the capability is distinctive and receives recognition for leadership is a measure of its strength.

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.

OHS&E

- **Average Time Lost Rate** is the average time lost for the number of incidents during the period.
- **Lost Time Incident Frequency Rate** 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** is the number of compensation claims per million hours worked.

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).
- **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 within a Division. (eg developing novel diagnostics Stream in the Colorectal Cancer Theme) consists of numerous projects such as *Novel protein scaffolds* that is delivering protein structures and scaffolds for measurement of key markers of the disease and *Abnormal methylation for prognosis and early diagnosis of Colorectal Cancer* that is mapping methylation of DNA as an additional potential marker.

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.

Strategic goals and objectives

- Six strategic goals and 24 underpinning objectives articulated in CSIRO's Strategic Plan for 2003–07.

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.

Third horizon

- Activity at the leading-edge of science which will underpin future technological development.

Index

2003–07 Strategic Plan, 3, 4, 6, 8, 9, 18, 33, 36, 102
2004 Federal Budget, 2, 6, 18, 20, 31, 36, 60; *see also* Government funding
2004–05 Audit Plan, 93

A

accountability, 19, 37, 92, 93, 95; *see also* governance
acronyms, 200–201
Administrative Decisions (Judicial Review Act) 1977, 102
administrative law, 102
aerospace applications system, 49
African Big-headed Ant, eradication, 65
Agribusiness and Health Research Group, 38, 41
  outputs and outcomes, 71–78
agricultural pest management, 63
Air Cargo Scanner, 8, 12
air pollution assessment, 64–65; *see also* emissions
aircraft structures, safety of, 49
airport security, enhancement of, 8, 12
ALFA, telescope, 14
aluminium production, emissions from, 61–62
Analysis of Current Production Practices, 51
ANAO; *see* Australian National Audit Office
ANN water allocation model, 16, 69
Annual Performance Goals, 19; *see also* goals; performance measures
Annual Report, Occupational Health Safety and Environment, 103
antibodies, shark, 13
antifungal genes, 63–64
Appendixes, 181–204
aquaculture, Black Tiger prawn, 76
architectural design, energy efficiency in, 50
Archives Act 1983, 102
archives, management of, 102
Arecibo L-band Feed Array (ALFA), telescope, 14
Artificial Neural Network (ANN) model, 16, 69
ASEAN water strategy project, 28
asset management, new approach to, 46
assets
  cultural, 113
  intellectual property, 9, 37
  review of management of, 7, 37
astronomy research, 11, 14, 21, 25, 31, 47, 50, 51–53
Audit Committee, 94, 95, 96
Audit Plan, 2004–05, 93
audits
  assurance, 96
  Australian National Audit Office, 23, 122–123, 191–192
  Comcare, 107
  CSIROSafe, 103
  energy and water usage, 113
  environmental management, 110, 111
  functional, 96
  project management, 23; *see also* reviews, external scrutiny
Australia Telescope Compact Array, 52
Australia Telescope National Facility, 11, 25, 47
Australian Animal Health Laboratories, 23
Australian awards, 81–86
Australian Growth Partnerships program, 31
Australian honours, 81–86
Australian Information Industry Association Awards, 31
Australian National Audit Office (ANAO), 23, 95
  independent audit reports, 122–123, 191–192
Australian Synchrotron Project, 21, 25, 27
Australian Water Conservation and Reuse Research Program, 68
Authorities Manual, 93, 94
Average Lost Time, 33
Average Time Lost Rate, 104–105
avian influenza virus test, 74–75
aviation safety, 49, 61; *see also* airport security
awards and honours, 7, 23, 31, 81–90

B

Backing Australia's Ability – Building Our Future Through Science and Innovation, 2, 6–7, 18
Barley Yellow Dwarf Virus resistant wheat, 77
Bayer BioScience NV, licensing agreement, 78
beef
  carcass cutting, 72
  quality testing, 74
Benitec Pty Ltd, licensing agreement, 37
BHP Billiton Science Awards, 79
bioactive ingredients, patents, 72–73
Bio-Care Technology Pty Ltd, licensing agreement, 77
biodiversity monitoring
  marine, 69
  rangelands, 65–66
biofuels research, 61

bioremediation technology, 62, 67–68; *see also* environmental remediation
Black Tiger prawns, commercial production, 76
Board
  charter, 93
  committees, membership of, 95, 96, 97
  members, 116
  performance, 96
  role and responsibilities of, 93
  structure of, 94
Bollgard®II, 74
bone repair polymer gel, 10
Boron Molecular Ltd, sale of, 46
Bradyrhizobium, as boost to wattle growth, 77
brand name, CSIRO, 8, 27, 34, 80
Bt cotton, risk of pest resistance to, 62–63
Budget, Federal 2, 6, 18, 20, 31, 36, 60
  see also Government funding
Building One-CSIRO capability and commitment, Goal 5 performance, 32–34
bushfires
  policy research, 71
  satellite image mapping, 68
Business Excellence Medal, 87
by-catch, reduction of, 70

C

carbon dioxide, geological storage of, 55
Carbon Management Group Pty Ltd, 36
catchment management, 64, 66, 67
CenDEP, 58–59
Centre for Complex Systems Science, 32
Centre for Distributed Energy and Power, (CenDEP), 58–59
Centre for Low Emission Technology, 29
Centre for Plant Biodiversity Research, 77
cereal crops, gene research, 15, 75–76, 77
Chairman
  foreword, 2–4
Chairman's medal, 86
chart, organisational, 117
Chief Executive,
  foreword, 2–4
  role and responsibilities, 93
client satisfaction survey; *see* Customer Value Survey
Client Service Teams, 8, 30, 33
Climate Change: an Australian Guide to the Science and Potential Impacts, 60
climate research, 21, 43, 60, 62
Climate Science Program, repositioning of, 21
CLIMEX (software), 63
Closer Collaboration between Universities and the Major Publicly Funded Research Agencies, 25
coal
  distribution system, 58
  exports, market support for, 57
Code of Conduct, 94, 95, 99
collaboration; *see* partners; partnerships
Comcare, audits, 107
Comcover, risk management rating, 33
ComEnergy Pty Ltd, 36
Commercial Committee, 94, 96
Commercial Executive Committee, 96
commercialisation of research, 4, 36–37
  Air Cargo Scanner technology, 12
  beef carcass splitter, 72
  C-Vista technique, 59
  Energy Express for Architects, 50
  Ground-based infra-red detector, 61
  polymer gel, 10
  PCB destruction technology, 57–58
  QEM*SEM technology, 54
  see also licensing agreements; patents; spin-out companies
Commonwealth Authorities and Companies Act 1997, i, 92, 94, 95, 97, 98
Commonwealth Disability Strategy, 108
Commonwealth Fraud Control Guidelines, 98
Commonwealth policies, notification of, 97–98
Communication Strategy, 27
competitive advantage, 9, 29, 45, 57
compliance index, 215–216
consultants, engagement of, 7, 37
contracts, streamlining of, 8, 31, 34
Cooperative Research Centre for Sustainable Resource Processing, establishment of, 53
Cooperative Research Centres, 4, 7, 25–26, 187–189
  business case for new, 53
  partnerships with, 13, 53, 55, 57, 62–63, 74, 75
corporate culture, 7–8, 32–34; *see also* One-CSIRO
corporate governance, 4, 32–34, 37, 92–113
Corporate Property Energy Services, 113
Corporate Security Plan, 96

cotton industry
irrigation software, 77
resistance management, 62–63, 74
varietal development, 74
CREativity in Science and Technology project, 79
Crew Boat Mission scheduling systems, 45
cross-boundary science, 7, 32
cross-Divisional approach, 8, 20, 21, 25, 30, 32, 33, 60
Crusader Enterprise Model, 73
Crusader rabbits, 73
CSIRO awards, 86–90
CSIRO medals, 87
CSIRO Publishing, 80; *see also* publications and reports
CSIRO.au web project, 34
CSIROClean, 111
CSIROSafe Audits, 103
customer relations, contact details, 100
customer service, 99–100
Customer Value Survey, 8, 23, 27
large corporations, 30
overall results, 33–34
research and development corporations, 29
Small and Medium-sized Enterprises, 31
value for money consulting services, 37
customers, defined, 1
C-Vista, 59

D

Delivering world-class science, Goal 2 performance, 21–25
desert management practices, 65
diagnostic techniques, 13, 20, 74–75
die-casting technology, 50–51
diesel fuel emissions, 110
Directions to the Chief Executive, 33, 93–94
disability strategy, 108
Discovery centre, 80
disease resistance, wheat varieties, 77
divisional restructures, 19, 21, 31
documents, categories held, 102
Double Helix Science Club, 79
drainage reform, Western Australia, 66–67
dryland salinity, 67, 77
DYMEX (software), 63

E

E.coli research, 73–74
ecologically sustainable development, 109
ecosystem services management, 64
education and outreach, 79–80
e-Health Research Centre, 29
electricity use, organisational,112
Emerging Science Initiative, 3, 32
emissions
diesel fuel, 110
joint venture, 29
light metal 61–62
enabling legislation, 92
Energy Centre, 6, 19
energy efficiency, 50, 112–113
Energy Express for Architects, 50
energy services, 113
Energy Technology, 19
Energy Transformed Flagship, 19, 32, 50, 58–59, 61
ensis, 19
Environment and Natural Resources Research Group, 38, 41
outputs and outcomes, 60–71
Environmental Achievement Award, 88
Environmental Chemistry (journal), 80
environmental incidents, 109
Environmental Management System, 109, 110–111
environmental management, energy and heritage reporting, 109–113
Environmental Policy, 109
environmental remediation, 28, 57, 62, 68, 110
environmental sustainability, 42–43
e-procurement project, 7, 37
Essential Science Indicators, 7, 23–24
EvoGenix Pty Ltd, 75
Executive Management Council, 93
external revenue, 7, 35
external scrutiny, 19, 22, 102
ANAO audit report, 122–123, 191–192

F

farmed rabbits, 73
FastTrack, 8, 31, 34
Federal Budget, 2, 6, 18, 20, 31, 36, 60; *see also* Government funding
Federation of Australian Scientific and Technological Societies, sponsorship, 27

fellowships and societies (honours), 89–90
fibre testing, 45
financial performance, 7
  integrity of, 94
  summary, 35–36
  see also financial statements; performance
financial statements, 121–180
fisheries, sustainability, 69–71
Flagships Program, 2, 6, 8, 18–20, 26, 32
  funding, 3, 20, 35, 36
  see also Energy Transformed Flagship; Food Futures Flagship; Light Metals Flagship; Preventative Health Flagship; Water for a Healthy Country Flagship; Wealth from Oceans Flagship
flight software development, 45
Focusing science investment, Goal 1 performance, 18–21
FOI Act, 102
Food Futures Flagship, 72–73
food safety, 73–74
Food Science Australia, 72
food technology, bioactive ingredients, 72–73
foreign exchange hedging, restriction of, 97–98
forest management practices, 71–72
Forestry and Forest Products, joint venture, 19
foreword, 2–4
fraud control, 92, 98
fraud risk assessment, 33, 98
Freedom of Information Act 1982, 102
  contact, 102
fuel efficiency, 50
functions, under enabling legislation, 92
funding, Government; *see* Federal Budget; Government funding; revenue; Triennium Funding Agreement
furniture industry, efficiencies in, 51
future challenges and directions, 3, 8–9

G

gas pressure prediction methodology, 56
gas reservoir characterisation, 17, 55
G-biRD, 61
gene research
  beef quality, 74
  cereal crops, 15, 63–64, 75–76, 77
  cotton, 62–63, 74
  gene-silencing technology, 78
Global Research Alliance, 28
glossary, 202–204
GM cotton, 74
goals, in Strategic Plan, 3, 6, 8, 18, 20, 93
governance, 4, 32–34, 37, 92–113
Government funding, 4, 9
  Backing Australia's Ability, 2, 6, 18
  Flagship Program, 2, 3, 6, 20, 35, 36;
  see also Federal Budget; revenue; Triennium Funding Agreement
governments, engagement with; *see* partners, partnerships
grains industry, 29, 63–64, 75–76
Grain Protection Joint Venture, 63
Grain*gene*®, 75–76
gravity thickeners, development of, 53–54
green manure, for paddock health, 76
Ground-based infra-red detector, commercialisation, 61
Groundwater Flow Systems Framework, 67
groundwater pollution, bioremediation of, 67–68

H

hazardous substances, audit of procedures relating to, 107
health promotion, 43, 78
health services, 6, 10, 43, 51, 72–73
Hearne Scientific Software Inc, 50, 63
hedging, foreign exchange, restriction of, 97–98
Helix, The (magazine), 79
Heritage Register, 113
honours and awards, 31, 81–90
HRZ Wheats Pty Ltd, 37, 77
humanitarian projects, 28
Humanities, Arts and Social Sciences on the Hill, 27
HydroDec Development Corp Ltd, 58
hydrodynamics database, 55
hydrogenation technique for contaminated transformer oil, 57–58
HydroLOGIC, 77

I

ICT Centre, 6, 19, 21, 31
Improvement Notices, OH&S, 107
Indian Ocean Climate Initiative, 21, 62
Industrial Physics, 31
industry, partnerships with; *see* partners; partnerships
Information and Communication Technology Centre,

6, 19, 21, 31
Information Privacy Principles, 102
information technology, 4
standards implementation, 7, 34
Information Technology, Manufacturing and Services Research Group, 38, 40
outputs and outcomes, 45–53
Information Technology Services strategy, 7, 34
information, access to, 102
Ingard®, 74
injuries, statistics, 104–105
Innovators Award of the Society of Satellite Professionals International, 31
inquiries, submissions to, 26
insect pest management, 63, 65
Insight survey, 21–22, 34
integrated catchment management programs, 64, 66, 67
Intellection Pty Ltd, 36, 54
intellectual property revenue, 2, 4, 7, 9, 35, 36; *see also* patents
international collaboration, 11, 14, 25, 26, 28, 32, 47–48, 60, 67, 71–72, 77; *see also* partners; partnerships
investigations
Comcare, 107
occupational health and safety, 107
irrigation research, 16, 67, 77
IT; *see* information technology

J

Japan Prize, 81
John Philip Award, 89
joint initiative
re-greening Australia, 77
joint ventures, 8, 27, 97–98
Centre for Low Emissions Technology, 29
e-health Research Centre, 29
ensis, 19
Grain*gene*®, 75
Grain Protection, 63
HRZ Wheats Pty Ltd, 77
multibeam receiver, 11
R2D3, 30
unincorporated, 30, 59

K

'key messages', 6, 8, 9

L

Lab on Legs, 79
Land and Water, 28
landcover monitoring, 46
leadership programs, 4, 21
Leading the Research Enterprise program, 21
legumes, for paddock health, 76
letter of transmittal, i
library services, 34
licensing agreements
Bayer BioScience NV, 78
Benitec Ltd, 37
BioCare Technologies, 77
die-casting technologies, 50
Hearne Scientific Software, 50
Sentinel Hotspots, 68;
see also commercialisation of research; patents; spin-out companies
Lifetime Achievement Medals, 87
light metal, emissions from, 61–62
Light Metals Flagship, 61–62
lignite processing, 54
Livestock Industries, 23
restructure of research portfolio, 19
Look Out!!! Award, 88
Lord Howe Rise, biodiversity value of, 69
Lost Time Incident Frequency Rate, 104–105
Low Frequency Array for Radioastronomy (LoFAR), 25
Luneburg lens development, 47

M

Manufacturing and Infrastructure Technology, 31
marbling, in beef, 74
marine biodiversity, 69
Marine Research, sponsorship of PhD research, 26
Mars probes, tracking of, 52
Mathematical and Information Sciences, 31
Maximising Australia's Oil Self-sufficiency theme, 19
meat
processing, 72, 73
quality, 74
medals, 81, 86, 87; *see also* awards and honours
Media Unit, 80
medical technologies, 6, 10,31, 48, 51
Medical Treatment Frequency Rate, 104–105
Member of the Order of Australia, 81
memorandum of understanding, with AusAID, 28

microencapsulation technology, 72–73
mine safety, 58, 59
minerals exploration, 59, 60
minerals processing, 53–54
Minister for Education, Science and Training, 92
Minister for Science, 92
Ministerial powers, 92
Molecular Science, 10
Mopra telescope, 52
MultiBeam Antenna, 31
multibeam radio receiver, 11, 14, 52
Murray-Darling Basin, management, 66
Murray Flow Assessment Tool, 66
Murray River, health assessment, 66
MXDPs, 20, 21, 25; *see also* cross-Divisional approach

N

National Enquiries Centre, 80
National Environmental Protection Measures, submissions, 110
National Innovation Awareness Strategy, 65
National Innovation System (NIS), 2–3
National Measurement Laboratory, transfer of, 98
National Pollutant Inventory, 58, 110
National Privacy Principles, 102
National Research Flagships Program; *see* Flagships Program
National Research Priorities, 2, 3, 6, 18, contribution to, 42–44
natural resource management, 61, 66
NIS (National Innovation System), 2–3
NORFANZ Voyage of Discovery, 69
Norfolk Ridge, biodiversity value of, 69
North Sea hydrodynamics database, 55–56
notifiable incidents, occupational health and safety, 104

O

Occupational Health and Safety (Commonwealth Employment) Act 1991, 103
Occupational Health and Safety (OH&S), 7, 103–107
  Achievement Award, 88
Occupational Health and Safety and Environment, 21, 32–33
  incident reporting system, 109
  Steering Group, 103
oceans research; *see* sea surface temperature; Wealth from Oceans Flagship
office locations, 119
offset printing, monitoring system, 49
oil and gas reservoir characterisation, 17, 55
oil pressure prediction methodology, 56
oil well, integrated performance improvement, 56
On-Line Analysis and Control team, 12
On-Line recruitment system, 34
One-CSIRO approach, 4, 30, 37, 80, 104
  Award, 87–88
  collective strength of, 6
  culture of, 7–8, 32–34
  differentiating advantage of, 9
  processes, 34
Operational Plans, 3, 18, 21, 93, 107
Optiba, 49
Optical Variable Devices, 20–21
Orectolobus maculatus, 13
organisational chart, 117
outcomes and outputs, 38–78
  Agribusiness and Health, 71–78
  Environment and Natural Resources, 60–71
  Information Technology, Manufacturing and Services, 45–53
  Sustainable Minerals and Energy, 53–60
overpressure, prediction methodology, 56
Oxymix, 51

P

paddock health, improvement, 76
Panoptic Enterprise Search Engine, 31, 47
Parkes Radio Telescope, 11, 14, 51, 53
Parliamentary briefings, 26
Partnering for community impact, Goal 3 performance, 25–28
partners, 16, 64, 72, 76
  biotechnology industry, 10, 46
  Commonwealth Government agencies, 12, 28, 65, 69
  Cooperative Research Centres, 13, 53, 55, 57, 62–63, 74, 75
  energy industry, 8, 30, 55, 56
  industry, general, 33, 55, 67, 69, 73, 75, 76
  international agencies, 11, 25, 28, 71, 75
  livestock industry, 72, 78
  research and development corporations, 28–29, 33, 63, 75, 76
  State Government agencies, 21, 29, 33, 59, 65, 79
  sugar industry, 66

universities, 8, 22, 25–26, 31, 48, 69, 79; *see also* partnerships
partnerships, 28, 38
as critical element of future directions, 9, 18, 25–26, 28
fostering, 3, 25–26, 29, 30–31, 33
strengthening, 4, 6, 7, 8, 25–26; *see also* partners
Partnership Excellence Award, 88
patents, 20, 23, 24, 36
Air Cargo Scanner, 12
beef marbling, 74
bioactive ingredients, 72–73
G-biRD, 61
grains gene, 63
hydrogenation technique, for PCB contamination, 57
microencapsulation technology, 72–73
overpressure in oil and gas wells, 56
polymerisation, 47
remote sensing of volcanic ash, 61
RAFT, 47
RNAi, 78
see also commercialisation of research; licensing agreements, spin-out companies
people development programs, 4, 21
People Development strategy, 21
people, 115–119
perflurocarbons emissions, 61–62
performance
against strategic objectives, 18–37
Board, 96
Building One-CSIRO capability and Delivering world-class science, 21–25
Focusing science investment, 18–21
Partnering for community impact, 25–28
Securing a financial foundation for growth, 35–37
Serving as a catalyst for industry innovation, 28–31; *see also* financial statements; outcomes and outputs; performance measures
performance indicators
disability strategy, 108
environmental, 111, 112
occupational health and safety, 105
performance management, 21
commitment to, 32–34
framework, 4, 33
performance measures
Goal 1, 18, 19, 20
Goal 2, 21, 23, 25
Goal 3, 25, 26, 27, 28
Goal 4, 28, 30, 31
Goal 5, 32, 33, 34
Goal 6, 35, 36, 37
pest ants, eradication, 65
pest management software, 63
pest surveillance program, 63
pesticide residues, 62
petroleum reservoir characterisation, 17, 55
Petroleum Resources, 8, 19, 30
plans
Audit, 2004–05, 93
Emerging Science, 32
Operational, 3, 18, 21, 93, 107
Strategic, 2003–07, 3, 4, 6, 8, 9, 18, 102
Workplace Diversity, 108
Plant Industry, 15
policies, Commonwealth, notification of, 97–98
policy framework, review of, 101
pollution reporting system, 58
polymer development, 10, 46–47
PolymerCo Pty Ltd; *see* PolyNovo Biomaterial Pty Ltd
PolyNovo Biomaterials Ltd, 10, 36, 46
Positive Performance Indicators, OH&S, 105
Postdoctoral Fellowship Program, 22
Postgraduate Scholarship Program, 22
powers, under enabling legislation, 92
prawn fisheries, sustainability of, 69–70
prawns, Black Tiger, commercial production of, 76
Precision Location Technology, 47–48
Preliminary Environmental Assessment Reports, 109
Preventative Health Flagship, 72–73
Privacy Act 1988, 102
Prohibition Notices, OH&S, 107
procurement, 4, 43
review of, 7, 37
Program Performance Framework, 18–19, 21, 33
project management, audit of, 23
Project Workflow, 23
protein therapeutics development, 75
Provision Improvement notices, OH&S, 107
Public Service Medal, 81
publications and reports, statistics, 23–24; *see also* CSIRO Publishing
publishing, CSIRO, 80

pulsar systems, discovery, 11, 52
purpose, organisational, 1

Q

QEM*SEM, 54, 201
QEMSCAN, 54

R

R2D3, 30
rabbits, commercial production, 73
radar technology development, 49
radiation sources, disposal of, 111
radio pulsars, 11
radio telescope development, 14
radioastronomy; *see* astronomy
RAFT, 47
rangeland monitoring, 65–66
recruitment, on-line system, 34
re-greening Australia, 77
remediation, environmental, 28, 57, 62, 68, 110
remote sensing, time series data, 61
Remuneration Committee, 94, 97
research and development corporations
  engagement with, 28–29, 33, 63, 75, 76
Research Flagships Program; *see* Flagships Program
Research Priorities; *see* National Research Priorities
Research to Discover Develop and Deploy (R2D3), 30
resource usage, indicators, 112
restructures, 19, 21, 31, 98
revegetation projects, to reverse dryland salinity, 77
revenue
  appropriations, 36
  external, 29, 35
  intellectual property, 2, 4, 7, 9, 35, 36–37
  summary of, 35–36
reversible addition fragmentation chain transfer (RAFT), 47
review of the year, 18–37
reviews
  asset management, 7
  Authorities Manual, 93
  Board performance, 93
  business processes, 7
  environmental risk, 111
  Government, 3
  policies, 101
  procurement, 7, 37
  research, 19
  Strategic Plan, 3; *see also* audits; external scrutiny
Risk Assessment and Audit group, 102
risk assessment, fraud, 33, 98
risk management, 33, 111
  framework, 96
risk profile, occupational health and safety, 103
river health assessment, 66
RNAi technology, 78
role and responsibilities
  Board, 93
  Chief Executive, 93
  organisational, 1, 4, 7, 92
Royal Australian Navy, scheduling system, 45

S

Safeguarding Australia, 18, 20, 44
safety culture, 32; *see also* Occupational Health and Safety
safety officers, survey of, 104
salinity control, 67, 77
Salmonella research, 73–74
sand production, prediction of, 56
Science and Industry Endowment Fund, report, 190–198
Science and Industry Research Act 1949, i, 1, 92, 93, 94, 97, 118
Science by Email, 79
Science Education Centres, 79
Science meets Parliament, 27
Science on Saturdays, 79
scientific achievements, snapshots of, 10–17
Scientriffic (magazine), 79
sea surface temperatures, dataset, 69
Sector Advisory Councils, 182–186
Secure Australia Program, 20
Securing a financial foundation for growth, Goal 6 performance, 35–37
security
  airport, 12
  information technology, 7, 34
  national, 18, 20, 44, 49
security management, 96
sediment quality assessment protocols, 57
Sentinel Hotspots, 68
Service Charter, 99–100
Service from Science Award, 88–89
service standards, 99–100

Serving as a catalyst for industry innovation, Goal 4
performance, 28–31
Severe Acute Respiratory Syndrome diagnosis, 75
Sexual Health (journal), 80
SHALESTAB, 55
shark antibodies, 13
sheep kidney processing, 72
Silver leaf whitefly, 63
SilviScan, 71–72
SiroPulse II, 49
Sirovision, 58
SKA/LoFAR, 21
Small and Medium Enterprises
support of, 8
partnerships with, 30–31
SMEs; *see* Small and Medium Enterprises
Social and Economic Integration, 32
Societies and Fellowships, 89–90
soil bacteria, as boost to wattle growth, 77
soil pollution, bioremediation of, 67–68
solar astronomy, 50
Southern Bluefin Tuna, stock assessment, 70
South-West Western Australia, climate
assessment of, 62
space instrumentation, 49
spectrometers, 50
spin-out companies, 36–37, 46, 75
sponsorships, 27
Square Kilometre Array/Low Frequency Array for
Radioastronomy, 21, 25
Staff Code of Conduct, 99
staff survey, 21–22, 33, 34
staff, demographics, 118
stakeholder consultation, 3
statistics
injuries, 104–115
patents, 24
publications, 24
staff, 118
Strategic Plan 2003–07, 3, 4, 6, 8, 9, 18, 102
Student Research Scheme, 79
submarine ridges, biodiversity values, 69
submissions, to Government inquiries, 26
sugar industry, water use efficiency in, 66
Supporting Australia's Gas Future, 19
surgical training simulator, 48
surveys
staff, 21–22, 33, 34
safety officer, 104
see also Customer Value Survey
sustainable development, 6
sustainable fisheries management, 69–71
Sustainable Minerals and Energy Research Group,
38, 40
outputs and outcomes, 53–60
Synchrotron Project, 21, 25, 27
Syngenta, 75
synthetic polymers, 10

T

talent management, 7, 8, 21
Team Australia, 1, 3, 7, 25; *see also* partners;
partnerships
technology innovation, 44
telescope, radio, 11, 14, 25, 47, 50, 51, 52, 53
termite resistant wood products, 71
Themes-Streams-Project, 19
timber quality assessment methods, 71–72
Total Well-being Diet, 78
Totally Wild (TV program), 79
training programs, 4, 8, 21
Transgenic and Insecticide Management
Strategy, 62–63
transmittal letter, i
Triennium Funding Agreement, 18, 35
Tuna fisheries, stock assessment, 70

U

UNESCO, 28, 67
United Nations Millennium Development Goals, 28
universities, partnerships with, 7
urban design, health impact of, 32

V

VacTX Pty Ltd, 37
vegetation monitoring system, 46
vetch, for paddock health, 76
Virtual Critical Care Unit, 6, 31, 48
virus resistance, in wheat, 77
volcanic ash detection, 61

W

WAP1 gene, 15
water allocations, forecasting of, 69
water conservation, 68

in cotton industry, 77
in sugar industry, 66
Water for a Healthy Country Flagship, 20, 60, 61, 62, 64, 66, 67, 68, 69
water harvesting technologies, 68
water quality monitoring, 57
water reuse, 68
water use efficiency *see* water conservation
water use, organisational, 112
wattles, enhanced establishment of, 77
Wealth from Oceans Flagship, 60, 69
web site development, 34
websites
Attorney General's, 98
Crusader Enterprise Model, 73
CSIRO, 78, 79
desert knowledge, 65
Occupational Health Safety and Environment annual report, 103
sea surface temperature, 69
service charter, 99
wellbore collapse, mitigation of, 55
Western Australia, climate assessment, 62
Western Australian Energy Research Alliance, 26, 30
wheat
disease resistance, 77
variety testing, 75–76
woodsmoke pollution management, 64–65
wool fibre testing, 45
Workplace Diversity Plan, 108

Y

Yield Prophet, 64

Compliance index - statutory reporting requirements

	Page
Commonwealth Authorities and Companies Act 1997	
Certification (Letter of Transmittal)	i
Board Members' Statement	124
Board Resolution on Report of Operations Orders 2002	i
Report of Operations	
■ **General Information about Operations and Activities**	
– Enabling legislation	92
– Legislative objectives	92
– Legislative functions	92
– Name of responsible Minister	92
– Organisational chart	117
– Subsidiaries (details in Financial Statements)	147–150
– Location of major activities and facilities	119
– Review of operations and future prospects	6
– Performance review	6–90
– Statutory objectives and functions	92
– Strategic Plan	3, 4, 6, 8, 9, 18
– Principal outputs and contribution to outcomes	38–78
– Performance assessment	6–9, 18–37
– Efficiency and effectiveness in producing outputs	38–78
– Clear links between outcomes, strategies and principal outputs	38–78
– Influences on performance	6
– Current and future factors, events or trends	6
– Risks and opportunities and strategies	96
– Significant events (CAC Act s15)	6
– Operational and financial results	38–180
– Principal outputs	
– Major investing and financial activities	
– Key financial and non-financial performance indicators	
– Significant changes in state of affairs and/or principal activities	6
– Developments since end of financial year, affecting:	
– Operations in future financial years	98
– Results of those operations in future financial years	98
– State of affairs in future financial years	98
– Judicial decisions and reviews by outside bodies (Ombudsman, Auditor General, Parliamentary Committees)	102
– Effects of Ministerial directions	92
– during the financial year	
– since the end of the financial year	
– continuing from previous financial years	

– Effects of general policies of the Government
– during the financial year 92
– since the end of the financial year 92
– continuing from previous financial years 92

■ Specific Information

– Board Members 116
– Particulars 169–170
– current at the date of the report of operations
– ceasing as directors during the period covered by the report
– Meetings held 171
– Meeting attendance 171
– Statement on Governance 93
– Audit Committee and other Board Committees 95–96, 171
– Particulars
– Meetings held
– Meeting attendance
– Details of indemnities and insurance premiums for officers 135

■ Miscellaneous Information

– Commonwealth Disability Strategy 108

■ Financial Statements

– Statement of Financial Performance 125
– Statement of Financial Position 126
– Statement of Cash Flows 127
– Schedule of Commitments 128
– Schedule of Contingencies 130

Auditor-General's Report 122

Science and Industry Research Act 1949

Policies relating to scientific research 101
Developments in policies during the year 101
Ministerial determinations in relation to the functions of the Organisation 92
Ministerial directions or guidelines relating to the functions and powers of the Board 93
Policies of Commonwealth Government to apply to CSIRO 101

Other reporting requirements

Fraud Control 98
Intellectual property management 2, 4, 7, 9, 35, 36
Risk Management 96,111
Service Charter 99

Other legislative requirements

Freedom of Information Act 1982 102
Equal Employment Opportunity (Commonwealth Authorities) Act 1997 108
Environment Protection and Biodiversity Conservation Act 1999 109
Occupational Health and Safety (Commonwealth Employment) Act 1991 103
Privacy Act 1988 102

CSIRO – the Commonwealth Scientific and Industrial Research Organisation – is one of the largest and most diverse scientific organisations in the world. It has over 6 500 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.

Awards
CSIRO received a Silver Award at the Australasian Reporting Awards for the CSIRO Annual Report 2002–03.

Design and artwork by Spectrum Graphics

Printed in Australia by National Capital Printing

ISSN 1030-4215

Electronic version available at: http://www.csiro.au/annualreport0304

CSIRO **Annual Report** 2003 – 04

General Enquiries

Tel	1300 363 400
International	+61 3 9545 2176
Email	enquiries@csiro.au
Web	www.csiro.au