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CSIRO

Annual Report 2002 – 2003



CSIRO – the Commonwealth Scientific and Industrial Research Organisation – is one of the largest and most diverse scientific organisations in the world. We have over 6 600 staff located across 60 sites throughout Australia.

CSIRO is an independent statutory authority constituted and operating under the provisions of the *Science and Industry Research Act 1949* and the *Commonwealth Authorities and Companies Act 1997*.

Our purpose states:

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

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Cover images:

Dr Rana Munns worked with an ancient Persian Durum Wheat variety to develop the world's first salt tolerant commercial wheat strain. Photo: North Sullivan Photography

Wind powered electricity generator, New South Wales. Photo: Greg Heath, CSIRO Land & Water

Dr Louis Lu monitors growth of mammalian cells in the sterile environment at Melbourne's CSIRO Health Sciences and Nutrition facility, as part of the Growth Factor Receptor project. Photo: North Sullivan Photography



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-fifth 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*.

We commend the Organisation's achievements to you.



Catherine B Livingstone
Chairman of the Board

October 2003



Geoff G Garrett
Chief Executive



Board resolution

The 2002–03 CSIRO Annual Report has been approved for presentation to the Minister for Science.

Signed this 24th day of September 2003 in accordance with a resolution of the Board Members.

Catherine B Livingstone
Chairman of the Board

Geoff G Garrett
Chief Executive



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Chairman's foreword



In developing our vision for the future of CSIRO we have thought deeply about the question: does Australia need a CSIRO? Our answer is a resounding yes.

The more we understand the dynamics of Australia's National Innovation System (NIS) and the changing roles and relationships of the various players, the better placed we become to enhance the System's considerable potential. In this context, we see CSIRO continuing to have an essential and differentiated role in the NIS. CSIRO's special characteristics include:

- a proven ability to design, manage and deliver mission-directed strategic research, which addresses significant national issues and priorities, on a large scale and over long timeframes
- a national remit and perspective that enables us to work across boundaries and to provide impartial and scientifically rigorous advice
- the continuing maintenance and effective application of a critical mass of core scientific capabilities for Australia and the demonstrated ability to collaborate with other organisations within a multi-disciplinary environment
- a breadth and scale of operations that is internationally credible, enabling a broad spectrum of international linkages (scientific, business and government) with a commensurate suite of benefits for Australia
- a focus on working with others to transfer research results, facilitate innovation and create economic, environmental and social value for Australia.

Australia's ability to respond to emerging opportunities and threats depends significantly on our ability to maintain the multi-disciplinary, technological capacity and knowledge housed in CSIRO and embodied in our scientists and engineers, technicians and support staff. This capacity represents a major and continuing national investment that could not be readily replicated, especially in areas of knowledge associated with Australia's unique and fragile environment. CSIRO is also the custodian of much of Australia's research infrastructure and this constitutes an effective and fundamental component of the NIS; indeed, the success of many collaborative schemes depends on the ability to draw on this capacity.

CSIRO's particular role is at the heart of the recent launch of our Flagships Program. It was an auspicious start to this key initiative to have the Prime Minister launch the Program in April 2003. The audience of industry and government leaders who joined us for the occasion were left in no doubt as to the strength of the Prime Minister's commitment to science as a key driver of national innovation, to CSIRO as a significant national institution and to the Flagships Program itself, evidencing CSIRO's commitment and capability to tackle problems of very significant scale and of the utmost national importance.

The creation of Flagships draws on CSIRO's ability to partner closely and constructively with other research institutions, industry and government agencies, to define and address the nation's most important problems. Indeed, national teamwork, collaboration and partnership are primary ingredients of the Flagships initiative. The Government has confirmed its support for the Flagships Program and its long-term intent by providing us with an additional \$20 million in appropriation for the 2003–04 financial year to supplement its already extensive investment in CSIRO.

The Flagships depend for their success on CSIRO's world-class research platforms, the development of which constitutes the greater part of the ongoing work of CSIRO's research divisions. These platforms will now be enhanced through a targeted investment in a number of emerging science areas, including nanotechnology and bioinformatics, the priority of which reflects science planning within the Organisation, and as part

of the NIS. The selection of individual Flagships, and our platform research directions and priorities, are strongly aligned with the National Research Priorities, announced in December 2002.

Consistent with our charter to encourage or facilitate the application of our research results, the Organisation is investing in an expanded business development and commercialisation function and in raising industry and community awareness of our science. As a result, we are exploring new relationships with commercial, government and community partners, adopting more innovative approaches to technology transfer and being more actively engaged in policy discussions.

Currently, there are five major Government reviews or studies that have the potential to affect CSIRO either directly or indirectly. These are:

- the Mapping of the National Innovation System announced by the Prime Minister in November 2002
- the Research Collaboration Review, whose primary focus is to maximise the efficiency and effectiveness of the NIS through enhanced collaboration between the publicly funded research agencies (such as CSIRO) and the universities
- a taskforce to 'develop a nationally integrated research infrastructure strategy', announced as part of the 2003–04 Budget
- a review of the Cooperative Research Centre (CRC) Program commissioned by the Department of Education, Science and Training (DEST)
- an evaluation of the reforms to the funding of higher education research and research training that flowed from the 1999 White Paper *Knowledge and Innovation*.

We are engaging strongly with these reviews, developing our contributions in the context of CSIRO's role, and towards a more robust NIS.

The Board finalised the Organisation's Strategic Plan for the next four years in June 2003, and the related annual Operational Plan for 2003–04. These Plans, developed after extensive consultation with key stakeholders and management, set out the Organisation's agenda for the coming decade based on the nature of CSIRO's role, as outlined above, and its core beliefs and vision.

The six strategic goals we have set ourselves are:

- focussing our science investment
- delivering world-class science
- partnering for community impact
- serving as a catalyst for industry innovation
- building One-CSIRO capabilities and commitment
- securing a financial foundation for growth.

To ensure the successful delivery of the Organisation's objectives, the Board is working closely with management to further strengthen our Governance framework. We are focussing on roles and responsibilities in terms of the Organisation's primary and enabling processes, coupled with an assessment of strategic risk, in order to foster sound research and commercial choices within a creative and innovative environment.

A key component of Governance in CSIRO is the Performance Management Framework (PMF), originally developed for the Flagships initiative but now being applied more broadly. The PMF allows us to monitor the Flagships, against both science and value creation milestones, thus ensuring simultaneous focus on delivering world-class science *and* the path to value through innovation.

We have also been paying a great deal of attention to Occupational Health, Safety and Environment (OHS&E) in the Organisation: during the year there was a strong improvement in both the safety culture and the supporting measurement systems. CSIRO has already met the research agency benchmark for OHS&E but it is the Board's view that CSIRO should be striving to achieve industry best practice in this very important area.

The Board itself has seen further change over the last twelve months. Mr Don Mercer, Mr Don McDonald and Professor Vicki Sara completed their terms and their contributions, each over five years, are warmly acknowledged. Mr McDonald provided important insights into Australia's agricultural, regional and trade issues, whilst Professor Sara provided a strong science perspective and vital linkages to reforms in the higher education research sector. Mr Mercer served with distinction as Chair of the CSIRO Audit Committee and that role is now filled by Ms Deborah O'Toole who joined us at the April Board meeting. In addition, Dr Peter Shergold changed responsibilities in early 2003, becoming Secretary of the

Department of Prime Minister and Cabinet, and has been replaced by his successor at the Department of Education, Science and Training, Dr Jeff Harmer. Dr Shergold made a strong contribution to the Board in the short time he was with us and we wish him well in his new post. The two new members of the Board, Mr Brian Keane and Professor Alan Robson AM, took up their appointments in August 2003.

Finally, I wish to recognise the extensive contributions and dedication of management, and the responsiveness and adaptability of CSIRO staff, as we have refocussed our research portfolio, embraced the Flagships initiative, pursued new avenues to innovation and improved our commercial practices.

CSIRO is well positioned to continue its contribution to the nation. Building on a rich history of delivering national benefits through outstanding science, we continue to change and adapt to the new challenges, risks and opportunities that we are presented with across this country. Our nation's economy has proved more robust and resilient than most other western economies despite international events and a period of prolonged drought domestically. It will be necessary to continue and indeed enhance our commitment to science as a foundation of innovation if this position is to be maintained. A strong and growing CSIRO will be fundamental to Australia in meeting this challenge.

A handwritten signature in black ink that reads "Catherine B Livingstone". The signature is written in a cursive style and is underlined with a single horizontal line.

Catherine B Livingstone
Chairman of the Board



Chief Executive's foreword



CSIRO's Annual Report for 2002–03 presents a picture of an Organisation whose staff are working tirelessly and enthusiastically, and indeed successfully, to respond to, as well as anticipate, the major challenges and opportunities that we have as a nation. It describes how we are growing our relevance and impact for the future and outlines some of our major successes along the way.

Central to all our activity is a wealth of ongoing scientific developments, a number of which you will find detailed throughout this report. These highlight the incredible talent and diversity of our staff – fundamental to our ongoing success.

CSIRO also continued to provide active advice and scientific leadership at the highest level in a number of policy areas for the nation – including drought, bushfires, land management and the critical water debate.

As the Chairman stated in her Foreword, we were delighted the Prime Minister agreed to launch our Flagships Program in April 2003. After a rigorous investment process conducted by our Flagship Oversight Committee we have agreed to invest in six Programs closely aligned with the National Research Priorities. The performance of these Flagships, and progress towards the major goals set, will be continually reviewed and changes will be made where necessary.

The Treasurer's budget speech for 2003 saw CSIRO receive an additional \$20 million in the 2003–04 financial year, in support of CSIRO's strategic directions and recognising the crucial contribution CSIRO's Flagships Program will make to the nation.

Two other areas which gathered momentum in 2002–03 were the emphasis on science planning and in particular the targeted investment in emerging science areas such as complex systems science and nanotechnology which will provide a well-spring of ideas for the future; and the operational changes and increased investment in the business development and commercialisation domain. This investment is essential if we are to actively support national innovation and maximise Australia's return on its investment in CSIRO R&D.

On the staffing front, late last year we received the results of our second staff *Insight* poll. Overall staff satisfaction is on the increase: ten of the categories identified as priorities for action in the 2001 survey improved markedly and, over the 21 categories measured, there were no declines from the previous year. There is always much more that can be done and we are committed to further improvements in the coming years.

Any proactive and vibrant research organisation has some regular turnover of staff and we will continue to hire staff to work in new areas, and to redeploy staff from current projects to the Flagships and other new opportunities. Over the past twelve months, and for the first time for many years, our net staff numbers have grown by 250, with the vast majority in the science area. Over the year ahead we expect our overall staff numbers to remain relatively constant.

We have made some changes in our management arrangements during the year, as shown in the organisational structure on page 10, reflecting our commitment to implementation against our strategic and operational plans and the focussed management of performance necessary to deliver on our objectives.

Late last year our Sector Advisory mechanisms were reviewed and new Councils formed in order to help us foresee the challenges and opportunities across the seven sectors in which we work. These SACs play a pivotal role in providing input to our planning processes.

On behalf of the senior leadership team, we are most grateful for the active engagement and support provided by our Board during this time of change and we would like to thank the Chairman and her colleagues for their untiring efforts on behalf of CSIRO.

The strong encouragement of many of our senior stakeholders in government, industry and the community at large is also greatly appreciated.

The year, therefore, has been a period of consolidation and implementation around our 'six key messages': a strong outward-looking emphasis; with a 'service from science' culture; greater focus on major scientific challenges and opportunities for Australia; stronger partnerships with universities, other science agencies and industry; a unified 'One-CSIRO', making full use of our collective strengths; and above all, growing our impact and relevance to the nation. These messages remain central to our strategy going forward, and form the basis for our six specific strategic goals for the next four years.

The coming year, in many ways, will be a watershed for Australian science. As mentioned by the Chairman, there are a number of Government reviews currently under way that will set the scene for Australian science in the future.

We believe that the new strategic directions of our Organisation see us well placed to continue to deliver the benefits of our world-class science. For the next decade, we will help take on the biggest and most challenging issues facing the nation. We will help advance the pace of commercialisation. Through vibrant partnerships with effective knowledge transfer to industry and communities, we will help drive business activity, exports, and social benefits. And through unremitting excellence in both science and in the business of doing science, we will remain one of the world's pre-eminent scientific organisations.

Above all, through science and imagination, our people will help create the sort of future for Australia that Australians want: a source of innovative, sustainable solutions, ideas and technologies to the world; booming knowledge exports worth billions of dollars; industrial and environmental innovation and rejuvenation; new jobs, new industries and fresh opportunities.



Geoff G Garrett
Chief Executive





About CSIRO

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About CSIRO

Facts about CSIRO

Research and outputs

- CSIRO ranks in the top one per cent of world scientific institutions in 12 of 22 research fields (based on Institute for Scientific Information data on total citations of publications, as at July 2003). Worldwide, it ranks fourth in agricultural science, sixth in plant and animal science and seventh in environmental science/ecology
- CSIRO transfers know-how through over 3 000 scientific publications, over 10 000 client reports, and around 250 media releases annually, plus secondments, industry workshops, seminars and specialist publications
- CSIRO is the largest single participant in the Cooperative Research Centre (CRC) Program (core participant in 44 of the 62 centres, as at 30 June 2003)
- worldwide, CSIRO is involved in over 900 current or recently completed research activities, working with leading scientific organisations and firms in the United States, Japan and Europe, and with developing countries, especially in Asia
- CSIRO offers more than 50 specialised technical and analytical services. These include analyses for air pollutants and satellite imaging of natural resources through to fire testing of materials and calibration of standards
- CSIRO is Australia's leading patenting enterprise, holding over 3 900 granted or pending patents
- more than 80 spin-off companies are based on CSIRO-generated intellectual property and expertise.

National facilities

- CSIRO hosts four major National Research Facilities (the Australian Animal Health Laboratory, the Australia Telescope, the Oceanographic Research Vessel *Southern Surveyor*, the National Measurement Laboratory (which will form part of the new National Measurement Institute to be established in July 2004)) and over 30 other research facilities such as the Riverside Life Sciences Centre, CSIRO Discovery Centre and the Australian Resources Research Centre
- we manage 11 national reference collections including: the Australian National Fish Collection; the Australian National Insect Collection; the Australian National Herbarium; the Australian National Wildlife Collection; the National Tree Seed Collection; and the Scientific Marine Data Collection.

Our staff

- CSIRO has over 6 600 staff located at 60 sites throughout Australia, and overseas
- sixty per cent of staff hold university degrees, including more than 1 850 doctorates and 440 masters
- in collaboration with university colleagues, our staff supervise or co-supervise more than 500 postgraduate research students annually, over twenty per cent in collaboration with CRCs.

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 2002 to 30 June 2003 the Minister responsible for CSIRO was 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 did not notify the Board of such a general policy in 2002–03.

Organisation chart

Ministers

Education, Science and Training – The Hon Dr Brendan Nelson MP

Science – The Hon Peter McGauran MP

CSIRO Board¹

Ms Catherine Livingstone (Chairman)

Professor Suzanne Cory – Dr Terry Cutler – Mr Peter Duncan

Dr Geoff Garrett – Dr Jeffrey Harmer – Mr Donald McDonald

Ms Deborah O'Toole – Professor Vicki Sara – Dr Ed Tweddell

Executive Team

Dr Geoff Garrett – Mr Mehrdad Baghai – Dr Michael Barber

Dr Ted Cain – Dr Michael Eyles – Dr Rod Hill

Dr Warren King – Dr Steve Morton

Dr Ron Sandland – Mr Mike Whelan

Executive Management Council²

Agribusiness & Health Group

Food Science Australia³ ■

Forestry & Forest Products ■

Health Sciences & Nutrition ■

Livestock Industries ■

Plant Industry ■

Environment &

Natural Resources Group

Atmospheric Research ■

Entomology ■

Land & Water ■

Marine Research ■

Sustainable Ecosystems ■

Sustainable Minerals & Energy Group

Energy Technology ■

Exploration & Mining ■

Minerals ■

Petroleum Resources ■

Information Technology, Manufacturing & Services Group

■ Australia Telescope National Facility

■ Manufacturing & Infrastructure Technology

■ Mathematical & Information Sciences

■ Molecular Science

■ Telecommunications & Industrial Physics

■ Textile & Fibre Technology

Flagship Programs

■ Agrifood Top 5

■ Energy Transformed

■ Healthy Country

■ Light Metals

■ Preventative Health (P-Health)

■ Wealth from Oceans

CSIRO-wide Support

■ Business Development &

Commercialisation

■ Communications

■ Finance

■ Information Technology Services

■ People Development

■ Property

■ Risk Management

■ Science Planning

¹ Board and Executive Team as at 30 June 2003. For details of Board changes during 2002–03 see page 11.

² See page 161 for contact details.

³ Joint venture with the Australian Food Industry Science Centre (Afishc).

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 Hon DSc 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
Managing Director
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 Don McDonald
OBE
Grazier
15 July 1998 – 14 July 2003



Ms Deborah O'Toole
LLB
Director
16 April 2003 – 15 April 2008



Professor Vicki Sara
BA(Hons) PhD DOC FTSE
Chief Executive Officer
Australian Research Council
15 July 1998 – 14 July 2003



Dr Ed Tweddell
BSc MBBS(Hons) FRACGP FAICD
Company Director
26 June 2002 – 25 June 2007

Terms completed during year:

Mr Don Mercer, Dr Peter Shergold (resigned 24 March 2003)

Staff demographics

CSIRO staff are employed under section 32 of the *Science and Industry Research Act 1949*.

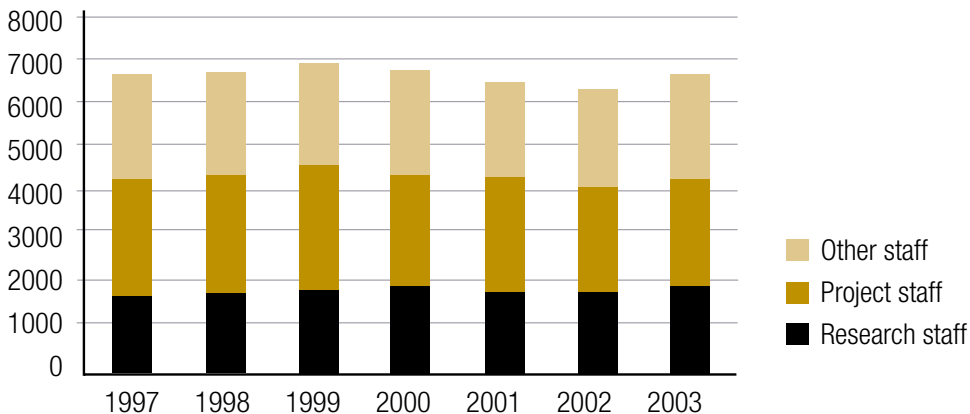
At 30 June 2003 CSIRO had a total staff of 6 636, which has an equivalent full-time (EFT) value of 5 999.

The numbers of staff employed in different job categories as at 30 June 2003 are shown below.

Staff by gender and principal functional area (comparisons with 2001–02)

	Female		Male		Total	
	2002–03	2001–02	2002–03	2001–02	2002–03	2001–02
Research Scientists	284	250	1 322	1 307	1 606	1 557
Research Project staff	1 009	939	1 507	1 476	2 516	2 415
Senior Specialists	9	5	40	37	49	42
Research Management/Consultant	16	11	167	167	183	178
Technical Services	87	89	575	570	662	659
Communication & Information	247	240	135	132	382	372
General Services	68	81	61	62	129	143
Administrative Support	735	702	257	231	992	933
Corporate Management	17	13	100	77	117	90
TOTAL	2 472	2 330	4 164	4 059	6 636	6 389

CSIRO Headcount¹

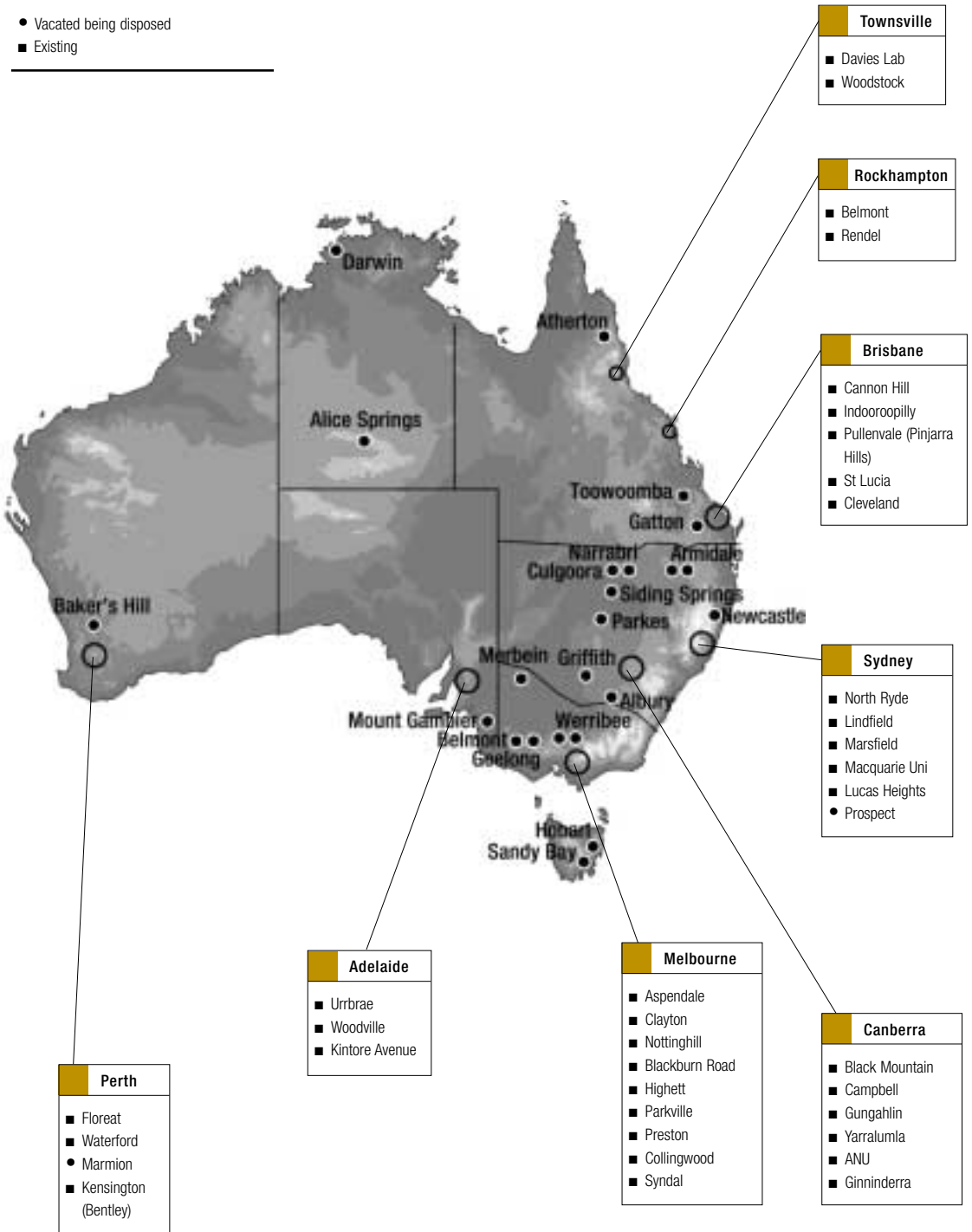


¹ CSIRO Officers only. 1997–2003 figures at 30 June.

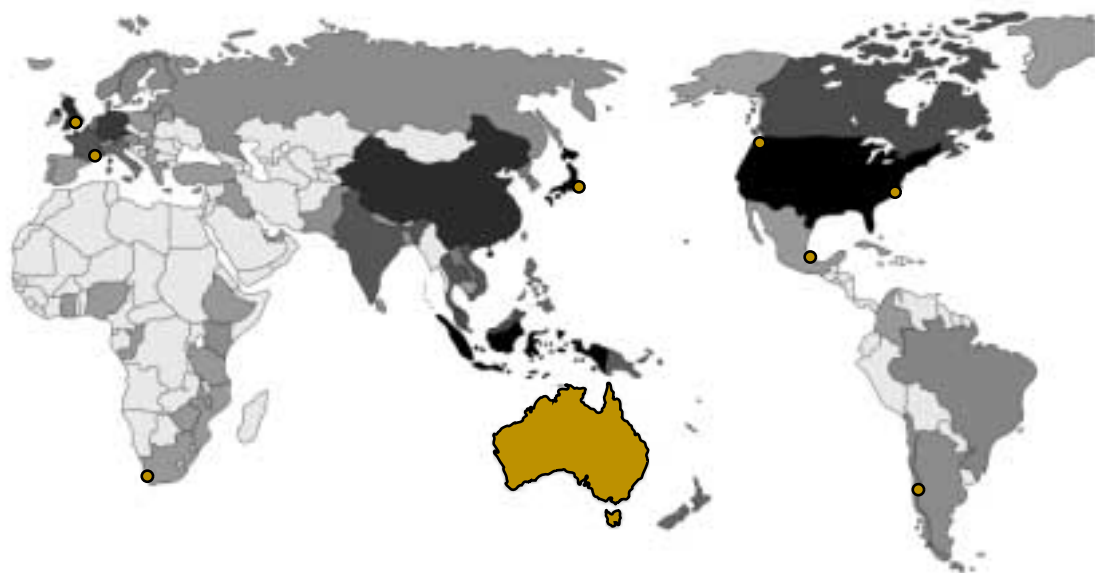
Note that while CSIRO staff numbers have decreased from 6 709 in 1997 to 6 636 in 2003, the number of research staff (Research Scientists and Research Managers) has increased from 1 636 in 1997 to 1 789 in 2003.

CSIRO Locations

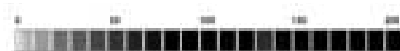
- Vacated being disposed
- Existing



CSIRO International Locations



● Locations of CSIRO Staff



Number of formal international CSIRO activities, current or recent, by country





Performance

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2

Section

Performance



Performance

2

Section

Performance

The year in review – and looking ahead

The year has been one of CSIRO scientists and their support colleagues continuing to deliver world-class science, remarkable developments and creative solutions in the proud tradition of our 77-year history. This 12-month reporting period has also been one characterised by significant planning and positioning of ourselves to take full advantage of CSIRO's scale and scope in addressing the most important issues that face us and the nation.

It has also been a time of consolidation and implementation around our 'six key messages': greater **focus** on major scientific challenges and opportunities for Australia; a strong **outward-looking** emphasis; stronger **partnerships** with universities, other science agencies and industry; with a '**service from science**' culture; a unified '**One-CSIRO**', making full use of our collective strengths; and above all, growing our impact and relevance to the nation. This summary of the year's performance will therefore be based around these key messages – the essence of our Strategic Action Plan for the past year and the key strategic imperatives for organisation development and enhanced contribution over the next decade.

1. FOCUSING OUR RESEARCH

National Research Priorities

In December 2002, the Commonwealth Government announced four broad National Research Priorities (NRPs) for the nation each with a number of more specific priority objectives. CSIRO's submission to the development of the NRPs was very well received by Government and made an important contribution to the policy outcome. As a Commonwealth-funded research agency, CSIRO is required to develop an implementation plan that details how it plans to respond to the Priorities. We have done this, noting that there is already a strong alignment with the National Research Priorities and their goals. Government's response to our submission has been most encouraging.

Over the next four years we will continue to migrate our research portfolio to increase the effectiveness of this alignment particularly through focussing investment into programs with more scale and impact. We have and will continue to do this through a number of mechanisms:

- we are rolling-out a number of Flagship Programs that directly align with the NRP priority goals (these will account for at least 30 per cent of CSIRO's appropriation funding by 2006)
- we are refocussing and better coordinating considerable existing work in a number of key areas into Major Cross Divisional Programs, including climate research and work of relevance to national security (eg work aimed at keeping Australia free of exotic plant and animal diseases)
- we have invested in a focussed and strategic way in five key emerging sciences: complex systems science, socio-economic integration, novel biotechnologies, nanotechnology and innovative information and communications technology
- we have actively commenced the winding down of areas of small investment that lie outside the National Research Priorities, cannot be built up through the roll-out of the Flagship or other Major Cross Divisional Programs, or are well represented in the wider Australian Innovation System (and where CSIRO's contribution is minimal and/or non-critical)
- the proactive development of new collaborative arrangements that remove impediments and foster alliance and partnerships with other government agencies (Commonwealth and State) and the university sector.

This strategy is aimed at increasing the impact of CSIRO's research activities by enhancing focus, increasing scale and achieving synergies that come from developing strong partnerships.

Flagships Program Operational

Flagships are Australia-wide multi-disciplinary partnerships established to tackle ambitious goals in nationally important areas such as the environment, energy, agrifood and preventative health. The Flagship partnerships will make a sustained contribution to Australia's economic and social growth and sustainability over a 25-year period.

CSIRO introduced the Flagships Program during 2001–02 to better focus our effort on issues of national priority. The year 2002–03 saw intensive development of the Flagships initiative, with the highlight being the official launch by the Prime Minister in April 2003. As further evidence of Government support CSIRO received an additional \$20 million in the 2003–04 Federal Budget to directly assist the Flagships Initiative.

A Flagship Oversight Committee, chaired by Dr Ron Sandland, Deputy Chief Executive, was established to assess the quality of the business cases for each Flagship, advise on improvements and allocate resources. The Committee agreed to fund six flagships during 2002–03.

Flagship	Goal
Agrifood Top 5	To transform the international competitiveness and add \$3 billion of value to Australian agrifood.
Energy Transformed	To develop low-emission energy technologies and systems that lead to the widespread use of hydrogen as an energy carrier across the economy.
Healthy Country	A ten times increase in the social, economic and environmental benefits from water use by 2025.
Light Metals	To lead a global revolution in light metals, doubling export income while reducing environmental impact.
Preventative Health	To help Australians live longer, healthier lives through early diagnosis and prevention.
Wealth from Oceans	To generate sustainable wealth from our marine resources, thereby underlining our sovereignty over our large ocean territories.

Directors were appointed to the Light Metals, Energy Transformed and Preventative Health Flagships during the year. In addition, recruitment processes for Agrifood Top 5, Healthy Country and Wealth from Oceans were initiated, and appointments are expected during the first quarter of the next financial year. Research began in all Flagships during 2002–03 except for Wealth from Oceans where activities were focussed on stakeholder consultation and finalisation of the business plan. All Flagships are expected to become fully operational during 2003–04.

2. AN EMPHASIS ON LOOKING OUTWARD

Looking out for the future – Enhancing science excellence

It is critically important for CSIRO and the nation to remain at the cutting edge of science and innovation to ensure the future prosperity of Australia and its people. Over the year we have made a number of significant advances across our entire portfolio of research which you will find detailed throughout this report.

Examples include:

- using enzymes derived from insects to remove pesticide residues from the environment
- the first automated guidance system for underground mine vehicles
- development of a new cancer detection technology and a possible new treatment for prostate cancer
- new design criteria for safer fire trucks
- a DNA test for beef tenderness
- improved and more reliable weather forecasting to enhance competitiveness of climate-dependent industries
- the world's first low-cost magnesium sheet with applications from motor vehicles to mobile phones.

We have also increased the number of post-doctoral fellows – critical to our, and the nation's future success – to over 200 across the Organisation. In addition, the number of postgraduate students sponsored by CSIRO increased by over 20 per cent. Four CSIRO staff were awarded prestigious Federation Fellowships in 2003, recognising their world-leadership in their disciplines. Over 100 CSIRO staff across our entire range of scientific disciplines received Australian or international awards for their outstanding scientific contributions.

Year on year, our scientific publications also grew by 10 per cent to almost 3 300 while at the same time our patents increased by 12 per cent to over 3 900 and the number of reports to clients also grew by 12 per cent, to almost 10 500.

Looking out for our staff and our working environment

We have clearly identified that we have needed to make significant improvements in our Occupational Health, Safety and Environment (OHS&E) performance across the Organisation. Over the last 12 months we have been working very hard in this area and are pleased to report that the majority of Divisions are at, or close to, the targets for improvement set for all OHS&E performance indicators. In respect of the Comcare Workers Compensation Premium, CSIRO remains under the average rate for Commonwealth agencies. Our OH&S key performance indicators demonstrate a consolidated improvement with all our Divisions moving above the unsatisfactory zone and nine Divisions are now in the 'excellent zone' (where in the previous year only two Divisions qualified in this category).

Providing world-class infrastructure is a key to facilitating world-class science. In May 2003, CSIRO was awarded the prestigious Rider Hunt National Award for Excellence in Facilities/Estate Management in recognition of our best practice in infrastructure planning and delivery. The award covered Industry, Government and University sectors.

Looking out for our future – Our Strategic Plan 2003–2007

In late 2002, we began an intensive strategic planning exercise, working closely with the Board, for the 2003–07 Strategic Plan.

We have documented a set of six strategic goals for the next four years (based on our six key messages):

By **focussing our science investment** and prioritising our research efforts we will maximise our impact on the most important issues facing Australia.

By **delivering world-class science** we will also deliver outputs and solutions that create value for our stakeholders and for Australia. We recognise that our people are the key to delivering world-class science.

By **partnering for community impact** we will deliver public good outcomes for Australia. Partnerships allow us to tailor research outcomes specifically to community needs and aspirations and to reach a much broader constituency. We value partnerships and are committed to a 'Team Australia' approach for delivering benefits to the community.

By **servicing as a catalyst for industry innovation** we will deliver commercial impact for Australian industry. By focussing on the current and future needs of our industry customers and stakeholders, we make a real contribution to science and to Australia's economic prospects. We see significant opportunities to add value to small, medium and large corporations and helping boost gross domestic product growth.

By **building One-CSIRO capabilities and commitments** we take fullest advantage of the synergies of CSIRO's scale and expertise. We will continue to build a One-CSIRO culture.

By **securing a financial foundation for growth** we will lay the foundation for the next decade that will increase our investment in our core business of great science.

3. BUILDING STRONGER PARTNERSHIPS

Over the year we have focussed on strengthening existing, and forging new partnerships to deliver against the major challenges that confront us, both now and into the future.

Some highlights

Over the last year CSIRO entered into a number of new partnerships with the University sector, industry and Governments.

The Queensland Biosciences Precinct is a collaborative venture between four CSIRO Divisions, the University of Queensland (UQ), and the Queensland Department of Primary Industries. Co-located in the state-of-the-art facility on the UQ campus this represents the single largest biosciences facility in the Southern Hemisphere covering research from molecules to landscapes. The facility houses over 700 research and support staff and represents a \$110 million investment by CSIRO, the Federal and State governments. To optimise the benefits and outcomes from this alliance, we have, working with UQ, commissioned a study (due for completion by the end of the first quarter of 2003–04) around enhancing collaboration in this Precinct, overcoming barriers and providing incentives for building cooperation.

Other highlights include:

- the establishment of the National Food Industry Centre of Excellence in Functional Foods, jointly with the University of Wollongong and the Victorian Department of Primary Industry
- the establishment of a joint postgraduate teaching and training program in marine science with the University of Tasmania
- a jointly funded Collaborative Research Support Scheme (CRSS) with the University of Melbourne to encourage the development of collaborative research between the two organisations; thirteen awards were granted last year
- the establishment of the Western Australia Energy Research Alliance, a joint venture with the University of Western Australia and the Curtin University of Technology to create a world-leading R&D centre in conjunction with the global oil and gas industry
- Strategic Research Fund for the Marine Environment (SRFME) – a five-year, \$20 million joint venture with the WA Government and involving the four WA universities to encourage collaborative multi-disciplinary research among WA researchers
- the National Biosolids Research Program – a multi-organisational project (involving four State Governments, the Australian Centre for International Agricultural Research (ACIAR) and Curtin University) to assess the risks to environmental and human health of contaminants in waste
- an alliance with the University of Wollongong in the area of electronic textiles
- a partnership with the University of Tasmania to establish a National Centre of Excellence in Food Safety
- working closely with the State Governments, CSIRO entered into collaborative arrangements for two R&D Centres in Victoria (Nanotechnology, and Advanced Manufacturing) and two Centres in Queensland (e-Health, and Clean Energy) that are to be established during 2003–04.

The opportunity for enhancing our people-to-people linkages to help with the delivery and impact of outcomes is very substantial because over 2 600 of CSIRO's 6 600 staff are located either on or adjacent to University campuses. Much work has gone into developing our contribution to the Government's Collaboration Review, mentioned elsewhere, and this is ongoing.

CSIRO also entered into a considerable number of strategic partnerships with industry, some examples of which include:

- a \$20 million joint venture with the Grains Research and Development Corporation (GRDC) to pre-empt a potentially devastating range of pests and diseases infecting the grains industry
- a licensing agreement with Tenix Industries for CSIRO's potential Airborne Hazards Detection Technology worth a minimum royalty of at least US\$750 000 over the next 15 years
- a strategic alliance with AorTech Biomaterials Pty Ltd to research and commercialise CSIRO's polymeric biomaterial for orthopaedic use including a spinal disc implant

- extension of our alliance with Dupont to develop the next generation of polymers that will impact on areas as diverse as microelectronics and automotive paint finishes
- extension of our alliance with Bayer CropScience to develop new cotton varieties that reduce the need for insecticides and have higher, more reliable and better quality yields
- agreement with RCR Tomlinson Ltd, to develop and commercialise CSIRO's Rotary Classifier for continuous processing (replacement technology for large industrial screens) in the field of mineral processing, quarrying rock and sand industries
- a partnership with the Swiss Alinghi Syndicate offering exciting opportunities for new developments in weather derivatives applications with implications across many industry sectors
- a partnership with the global chemical company, Chemetall to develop and market a new anti-corrosion coating technology that is non-toxic and will replace chromate used extensively in zinc coating, aluminium and magnesium alloys
- an agreement with the Grains R&D Corporation (GRDC) and the University of Sydney to establish the Australian Cereal Rust Control Program (ACRCP)
- a partnership with Geosciences Australia and the Department of Defence to develop the 'Sentinel' fire mapping software to assist in fire management
- a research relationship with the Queensland Bureau of Sugar Experimental Stations (BSES) to improve sugarcane production.

CRC Program

In a speech at the Cooperative Research Centre (CRC) Association Awards in May 2003 the Prime Minister gave five examples of CRC success stories "... *the development of contact lenses that don't need to be taken out each night; the first all-Australian satellite in 30 years; new techniques and technologies to improve the productivity of our mining industry; new tests to speed up the detection of toxic blue-green algae and manage outbreaks and new plant breeds that are more disease-resistant and higher yielding...*" – all of which included CSIRO as a participant.

Since the inauguration of the CRC Program in 1990 CSIRO has been involved in 95 of the 123 CRCs established. We are a participant in 17 of the 23 new Round 8 CRCs, including Bushfires and Desert Knowledge, taking our involvement to 53 of the current 75 CRCs. Thirty three universities have worked with CSIRO to date across the CRC Program. This Program will continue to be a critical means for CSIRO to enhance our collaboration with universities and industry.

In early 2003 CSIRO completed a stocktake of its involvement in CRCs to assess and evaluate the value the Organisation had created from them. The stocktake led to a positive assessment of the success of CRCs and identified issues that CSIRO would need to address to maximise the outcomes of its future involvement with CRCs. Among other things, CSIRO intends to improve its process and skills for involvement in CRCs, to enhance communication with them and to establish a CSIRO CRC

Secretariat with a broad charter to ensure we work effectively within the Organisation to achieve the maximum return for all participants.

Providing policy support to Governments

Consistent with our mandate of providing high-level policy advice to Government, CSIRO continued to provide scientific leadership at the highest level in a number of policy areas for the nation. In addition to many briefings and presentations to policy makers in fields as diverse as drought, genetically modified organisms (GMOs), global warming and the business impact of nanotechnology, we also provided formal submissions to the National Research Priorities Review, the Australian Higher Education Review, the Teaching and Teacher Education Review and the AusLINK study on Transport and Infrastructure Policy as well as to Parliamentary Inquiries on Ageing, Business involvement in R&D, the Future Water Supplies for Australia's Rural Industries and Communities and the recent Bushfire Inquiry.

A number of senior CSIRO staff also joined with other leading Australian scientists to form the *Wentworth Group of Concerned Scientists*. Over the year this Group provided three reports to both Federal and State Governments in the area of natural resource management, native vegetation and water reform, and which – notwithstanding the complex and contentious nature of the debate – were very well received and will provide significant input into future Government policy development.

Partnering internationally – the Global Research Alliance

In February 2003, CSIRO became a founder member of the Global Research Alliance (GRA). The group consists of nine CSIRO 'sister' organisations across the world established to harness the scale and scope of these organisations to help tackle some of the major challenges facing the world – providing 'global knowledge for global good'. In the last year CSIRO hosted a GRA workshop in the area of addressing the major problems of access to clean drinking water and basic sanitation. The GRA Water Action Council Group, of which CSIRO is a lead player, is developing a number of multi-million dollar research proposals for major funding agencies such as the World Bank and leading charitable Foundations. Similar working groups are being established around addressing global energy and transport issues.

The Global Mining Research Alliance (GMRA), a collaboration that aims to become the supplier of choice for mining research solutions and knowledge in the international mining and resources industry, was publicly launched in May 2003. The GMRA partners are CANMET-MMSL (Canada), CSIR Miningtek (South Africa), CSIRO Exploration and Mining (Australia), in association with NIOSH (US).

4. SERVICE FROM SCIENCE

CSIRO's mandate is to deliver the benefits of science and innovation to its stakeholders, ie delivering service from science. In the past we have often been seen by our customers as being too complex and somewhat difficult to access. In Section 3 (above)

we outline some of the significant industry partnerships we have entered into over the past year. In addition, over this period we have also developed and implemented a number of new procedures in order to help streamline our interactions and maximise the value we provide to our clients.

Customer Value Survey

In 2001 CSIRO commenced, using an internationally benchmarked Customer Value Survey (CVS), assessing how our customers value their interactions with us. Quarterly returns from an average of 150 of our customers covering a broad spectrum allow us to continually track our progress and identify ways to improve our customer relationships. Results over the last 12 months have generally shown a steady performance with some pleasing improvement in our customers' perception.

Developing our relationships with our clients

CSIRO is transforming its customer relationships including the alignment of our science investment towards the most high-impact and relevant projects of joint interest. This is being achieved through more targeted actions aimed at CSIRO's most attractive customer segments. A number of customer segments have been identified as part of this strategic approach to business development and our value proposition for each was reviewed.

Regional Partnerships – During the year we conducted discussions at the highest levels with four of the Rural R&D Corporations (RDCs) about longer term joint planning of strategic research objectives and multi-year collaborative arrangements.

Corporate Partnerships – CSIRO is entering into major strategic relationships with a number of large (Australian, as well as multinational) corporations, employing a One-CSIRO based, multi-disciplinary approach to companies about their technology requirements. This approach was increasingly employed, with good success, during 2002–03.

Growth Partnerships – Small to medium enterprises (SMEs) are the industry segment with a key role in driving growth in Australia and CSIRO is developing more flexible and compelling approaches for working with them. These arrangements include the opportunity for SMEs to 'spin-through' by co-location within CSIRO for specific periods of time of joint development, using CSIRO facilities and working collaboratively with CSIRO's scientists. CSIRO reached agreement with the Australian Industry Group (AiG) and Australian Information Industry Association (AIIA) during 2002–03 to assist in identifying SMEs that could potentially benefit from access to CSIRO technology.

5. ONE-CSIRO

The Emerging Science Initiative

CSIRO recognises that frontier and developing technologies are vital to Australia's future prosperity and that our scientific capacity must be constantly refreshed to ensure we remain at the forefront of future technology development. The Emerging Science Initiative identifies areas of future strategic importance and supports

research in these areas in an integrated, 'One-CSIRO' way across the Organisation. The emerging science initiative has five themes:

- **Complex Systems Science** – exploring systems whose behaviour cannot be understood or predicted from the characteristics of their individual components. The CSIRO Centre for Complex Systems Science, a 'virtual Centre' has been established with project activity in 12 Divisions. Seventeen science projects and three Australian Research Council (ARC) linkage projects are underway with total project expenditure in 2002–03 of \$2.7 million.
- **Socio-Economic Integration** – bringing together teams who span the spectrum of social and biophysical sciences to address some of the most complex problems facing society. Seven integrated projects involving Universities, industry, government and the wider community were launched in 2002–03.
- **Novel Biotechnologies** – focussing on the development of skills in the frontier sciences of genomics and bioinformatics. The past year has seen the installation and utilisation of significant infrastructure for bioinformatics, robotic handling and x-ray characterisation of proteins, enabling high-throughput screening and analysis.
- **Nanotechnology** – building our skills and capacity to exploit this rapidly growing enabling technology. We are building on our considerable existing scientific strengths, to focus on biomimetics and on interfacial phenomena at the nanoscale through the funding of eight multi-divisional strategic research projects and through collaborative initiatives with all the other major Australian research groups in this scientific discipline.
- **Innovative Information and Communications Technologies** – focussing on grid computing, telecollaboration and 'smart spaces' – systems of embedded communication devices.

Business Improvement – Improving our internal business processes

Unwieldy legal contracts have been an impediment to CSIRO being perceived as a desirable organisation with which to do business. One key business improvement program conducted during 2002–03 was for simplification of the bulk of CSIRO's contracts with its clients, which will deliver a systematic process improvement in the short-term, with long-term benefits. We simplified and are standardising our standard form legal contracts, aligning these with business objectives. The standard agreements that are used in 80 per cent of situations have been rewritten in plain English, simplified and markedly reduced in length. These 'FastTrack' simplified contracts have been piloted in four Divisions, with very positive feedback from our clients, and will be rolled out for use across other CSIRO Divisions during 2003–05.

Program Performance Framework and our Project Management Initiative

We have also developed a new Program Performance Framework (PPF) designed to provide tools that promote robust business planning, good target setting and strong accountability across all our research and support activities. The PPF focusses on the most

critical (and dependent) outputs, uses unambiguous and objective performance measures, emphasises measures that reflect external interactions with 'delivery partners' and links Annual Performance Goals with long-term Missions and Theme Goals. The PPF was implemented for the Flagship Initiative in 2002–03 and is being rolled-out across the balance of the Organisation's activities.

The integration of the PPF with the further development of the Organisation's investment in Project Management Improvement (PMI) will help close the loop between project initiation and the delivery of the planned output. As a core component, effort logging was introduced across the Organisation during the year to enhance our project management capabilities, with the vast majority of our staff now routinely effort logging. The Project Management Guide and consolidated Project Management Policies were released in January 2003, further supporting the progress we are making towards improving project management in CSIRO.

Management Changes

We have simplified and clarified line management responsibilities and made some new senior appointments. Science representation on the Executive Team has been strengthened by the creation of the position of Executive Director, Science Planning and the appointment of Dr Michael Barber to that position, and by the move from part-time to full-time roles for the four Group Chairs (all of whom were reappointed to their positions after a competitive selection process). Two other senior appointments were Mr Mehrdad Baghai as Executive Director, Business Development and Commercialisation, and Mr Mike Whelan as Chief Financial Officer and Executive Director of Corporate Operations.

Our Executive Management Council continues to bring together all members of the Executive Team, Divisional Chiefs, Flagship Directors and General Managers of six of our Corporate Groups to develop and refine our overall directions. The Executive Management Council now works to a cycle of themes for its six meetings per annum: strategic planning; operational planning and budget; people development planning; organisation performance review; customer and client service evaluation; and science planning.

6. GOING FOR GROWTH

Financial Performance

Growth is an important part of CSIRO's strategy but by this we mean growth in our capacity to conduct research, to increase our impact for the nation.

Utilising revenue as a coarse indicator of impact and relevance, we set some 'stretch' targets to challenge ourselves to consider new ways to significantly increase the benefit we deliver to Australia. Despite the complexities in a number of our key market sectors – such as the worst drought in Australia's history (negatively impacting on our \$230 million agricultural research business), and the downturn in the global information technology industry and the manufacturing sector – our external earnings from co-investment,

consulting and services activities still increased by \$12 million (4.8 per cent) over the year, to \$262 million. In addition, following extensive discussions with our key Government stakeholders, we received an overall increase of 6.8 per cent in our appropriation funding for 2003–04.

On the costs side, against a budget deficit of \$56.5 million – planned in concert with the previous year's surplus of \$49 million – we improved this by \$34.5 million to post an operating loss of \$22 million. Overall, therefore, our performance in the last financial year indicates that we are still making good progress towards our overarching and longer term growth objectives.

Commercialisation of CSIRO's intellectual property assets.

CSIRO is working to proactively and systematically manage its patents (a portfolio of over 3 900 patents, from over 780 patent families) which realised a significant increase in revenue streams over the last two years. During the past year we reviewed our patent portfolio in detail, including identifying for appropriate commercialisation 'residual' patents in our portfolio that now fall outside CSIRO's ongoing R&D activities and remain available for exploitation. Revenue from our patent portfolio over the last three years has averaged \$13.7 million per annum, more than doubling in comparison with the approximately \$6.3 million per annum of the previous three years.

Equity Portfolio – CSIRO holds equity in over 45 companies of different kinds. During the year, data on CSIRO's equity portfolio was centralised to enable more systematic management of these. CSIRO is moving to be increasingly proactive and systematic in managing this portfolio for growth and value realisation.

New Value Proposition for Venture Capital – During 2002–03, we explored with venture capital firms new transaction models which would dramatically reduce transaction costs and secure better terms and returns for CSIRO and entered into an agreement with an international venture capital group for an umbrella funding arrangement for up to \$50 million to fund five or more spin-offs in the life science arena.

Pipeline Management and Engagement with Investors – We commenced a process to facilitate the overall commercialisation process and engagement with various investors and collaborators. During 2002–03 more than 80 'pipeline' cases, from nine Divisions, were reviewed and at the end of the financial year there were more than thirty commercialisation cases being worked up in detail.

OUR PEOPLE

CSIRO people are the underpinning force for the significant progress we have made, in the course of the past 12 months, in each of the six areas described above.

To gauge staff views the second staff *Insight* poll was commissioned in September 2002, providing staff the opportunity to comment on CSIRO's progress over the preceding 12 month

period and comparing performance to the benchmark established in 2001 and international benchmarks. (The survey is used by over 40 R&D organisations worldwide, involving more than 62 000 research and support staff.)

Respondents (65 per cent of staff) again rated CSIRO highly overall and signalled improvement in a number of areas, with significant gains in 10 of the 21 categories over the previous year's results, and no declines. This strong historical improvement paints a more favourable picture of CSIRO relative to other R&D organisations and places CSIRO significantly above the International Survey Research (ISR) group global R&D comparisons on 11 of the 21 categories in the *Insight* poll, with only two categories where we rank below the global norm.

Compared to 2001, staff perceptions of leadership and management have improved significantly. Morale is improving and staff remain very proud to be associated with CSIRO. 'One-CSIRO' is better understood, and collaboration and cooperation have improved. More staff now support the new organisational direction and believe CSIRO is capable of achieving the necessary changes. Responses are also more favourable in relation to teamwork being both encouraged and recognised. Staff perceptions of CSIRO's customer focus have improved significantly since 2001, at both the organisational and project level (and compared to other R&D organisations internationally). Whilst surveys of our customers through our regular Customer Value Surveys show significant improvements, CSIRO staff still believe we can do more to improve our interaction with customers.

Despite the significant improvements of the last 12 months, there is still work to do in a number of areas. CSIRO needs to streamline the organisation of work, build on the significant improvements made in collaborating both internally and externally and strengthen organisational leadership and management. These areas are all targeted in action plans developed in consultation with staff at the local level and, at an organisational level, in the Strategic Plan.

In July 2002, CSIRO's latest enterprise agreement was certified, restoring the competitiveness of its salaries. Once again, a highly consultative approach was adopted to engage staff in developing the agreement, which launched a performance culture program, a career management program, enhanced succession planning and aligned reward and recognition schemes with CSIRO's strategic priorities.

CSIRO also plays a critical role in the training of the next generation of scientists to meet the skill needs of the future, not only for CSIRO but for the nation. We have an extensive training and development program operating across the Organisation. Currently over 500 postgraduate students are co-supervised by our staff and over 150 postgraduate students are sponsored by CSIRO. In addition, a new joint Postdoctoral Program between the Australian Research Council and CSIRO started in 2003. This program provides a training opportunity which exposes early career researchers to the strategic research framework within which CSIRO operates, as well as the fundamental research framework of university research. Ten awards were funded in 2003.

In 2003, CSIRO won the coveted Australian Human Resources Institute (AHRI) Award for Excellence in People Management, in the category 'Large Public Sector Organisation'. The Award recognises and rewards organisations that have a coherent and strategic approach to managing people and recognises the contribution of an organisation's staff in achieving organisational objectives for sustainable competitive advantage. The Award is recognition of the importance that CSIRO places around people issues and the efforts and achievements of the People Development Network – the CSIRO-wide cooperation of our human resource professionals, in contributing to CSIRO's continued success.

LOOKING AHEAD

Australia's future remains firmly linked to innovation from which will emerge economic and employment growth.

The National Research Priorities provide CSIRO with strong direction as we focus our research capabilities to address problems of critical importance to the nation. Having put considerable effort into our Strategic Plan for 2003–07, we are focussing in this period on delivery and execution – ensuring the implementation of the Flagship Initiative is a success; pushing the frontiers of science in the Emerging Science Initiative; and ensuring we continue to deliver world-class science in our priority-driven core research platforms. It is only by maintaining the strength of our core research platforms that we are able to undertake mission directed strategic research endeavours like the Flagship Initiative.

The Government's Research Collaboration Review creates a welcome focus on partnerships in the National Innovation System. We will continue to focus and intensify collaboration with universities, CRCs and other agencies. We are improving our partnering skills to become a better, easier to deal with and more committed partner.

We will intensify our engagement with rural R&D corporations to grow regional and new industries. We also intend to reinvent our Information and Communication Technologies (ICT) capabilities by building a world-class ICT R&D Centre to strengthen Australia's knowledge-based industries.

People remain at the heart of CSIRO's creative spirit. We will concentrate our people strategies on developing, attracting, exciting and retaining the talented individuals who have chosen to commit at least part of their careers to CSIRO.

Some scientific achievements



*Bert van Donkelaar, CSIRO Health Sciences and Nutrition, sets a protein crystal in place in order to determine its molecular structure.
Photo: Mark Fergus, CSIRO Manufacturing and Infrastructure Technology*

Cancer drug breakthrough – in triplicate

In a landmark year, CSIRO scientists working in collaboration have determined the three dimensional structures of three cellular proteins whose activity contributes to the development of cancer, and in one case, other diseases such as osteoporosis and rheumatoid arthritis. These research findings have global significance and represent the solution of scientific problems which have teased the best scientific minds for up to 20 years.

The research group used x-ray crystallography which involves growing a crystal from the pure protein and shooting an x-ray beam through it to generate the unique patterns from which the structure is determined. All three projects were the results of collaborative research through the Cooperative Research Centre for Cellular Growth Factors. Mapping the structure of proteins enables researchers to understand their mechanism of action, which in turn provides vital information for the development of new generations of targeted drugs to inhibit or switch off receptor activity. A long road, but many would say the first mile is the toughest.



Climate change will mean that farmers will need to become even more adept at crop, stock and water management. Photo: North Sullivan Photography

Climate change: an agricultural opportunity

Climate change does not have to mean a dark cloud with no silver lining. Australian farmers can lessen the impact of climate change by adopting more resilient and responsive agricultural systems, so that – whilst potentially threatening – climate change may actually bring opportunities, as long as it doesn't become too hot and too dry. Using climatic and agricultural data from across the nation, CSIRO researchers have modelled wheat cropping systems and soil-pasture-livestock systems to investigate the effects of carbon dioxide and temperature increases.

The CSIRO Climate Impacts and Adaptation Working Group notes that increased carbon dioxide is likely to have a beneficial effect on plant growth and hence groundcover, so in the absence of climate change, crop yields should be higher, and animal production will be enhanced.

However, in many parts of Australia, there are projected significant temperature increases and rainfall decreases, particularly across the southern half of Australia. There is also the prospect of even more variable climate. Together with an increase in carbon dioxide this probably means a net negative impact on Australian agriculture. This will mean that farmers will need to become even more adept at crop, stock and water management.

Although there will be the need for adaptation across a range of interrelated industries including transport, communications and market infrastructure, farmers who are ready to look for opportunities may be able to diversify and to increase productivity.



How many people can the Australian continent support? Photo: North Sullivan Photography

Future dilemmas

How many people can the Australian continent support? *Future Dilemmas* is a major report commissioned from CSIRO by the Department of Immigration and Multicultural and Indigenous Affairs that examines a number of different population/immigration scenarios.

The report considers the future effects that three scenarios have on infrastructure, resources and environment to the year 2050:

- zero net migration
- a policy setting of 70 000 immigrants per year
- a rate set at 0.67 per cent of current population per year.

The 'low' rate would see a domestic population of 20 million by 2050, the 'medium' scenario gives 25 million by 2050, and the 'high' rate gives Australia 32 million people by 2050.

Each option carries with it different risks and rewards. A much larger population, at the current rate of per capita resource usage, could bring about serious problems. The report warns of growing shortfalls in domestic stocks of marine fish, petroleum and declining air quality in cities as a consequence of rising population and affluence.

The report concluded that innovation will have to accelerate if material and energy use is to stabilise. Serious account will also need to be taken of the consequences of rising affluence, and the need for increased exports needed to pay for imports and service external debt.



A new DNA test for the 'beef tenderness' gene will improve beef's marketability. Photo: CSIRO Livestock Industries

Tender beef gene test a world-first

A collaborative research effort involving CSIRO, the Cattle and Beef Quality Cooperative Research Centre (CRC) and Meat and Livestock Australia resulted in the development of a DNA test to identify a 'beef tenderness' gene in cattle.

As consumers rate tenderness as a more important 'product-satisfaction' factor than juiciness and flavour, the research team's success represents a major breakthrough for the cattle industry.

Known as GeneSTAR® the new test complements *GeneSTAR Marbling®* – the world's first commercial DNA test for identifying animals with the desirable trait of fat distributed through the muscle.

The Australian-patented technology – which has been exclusively licensed to Brisbane-based Genetic Solutions Pty Ltd – will enable beef producers to breed animals which can more consistently deliver more tender beef.

Since it was launched in November 2002, Genetic Solutions has performed more than 4 000 GeneSTAR® tests for companies in the high-value breeding stock sector.

The test involves laboratory analyses of cattle DNA which can be extracted from a live animal's tail-hair roots or any other tissue.

The tenderness link to the naturally occurring enzyme inhibitor, *calpastatin*, was identified in a major study led by CSIRO and a team from the Beef Quality CRC.

Researchers discovered two variants of the *calpastatin* gene – one associated with increased tenderness and another with increased toughness. Cattle are given a rating – 2-STAR, 1-STAR or 0-STAR – indicating how many copies they have of the tender form of the gene. 2-STAR animals are genetically programmed to produce more tender beef.

A bull and cow, both with 2-STAR ratings, will pass on the desirable traits to 100 per cent of their progeny and selective breeding with 2-STAR bulls will eventually eliminate 0-STAR animals from a herd.

The resulting herd improvements are predicted to more than halve the number of carcasses rated 'unacceptably tough' by consumers.



CSIRO's Bioinformatics facility. Photo: CSIRO Plant Industry

Boost for biotech research

Australia's largest dedicated bioinformatics computer cluster was launched by CSIRO in March 2003.

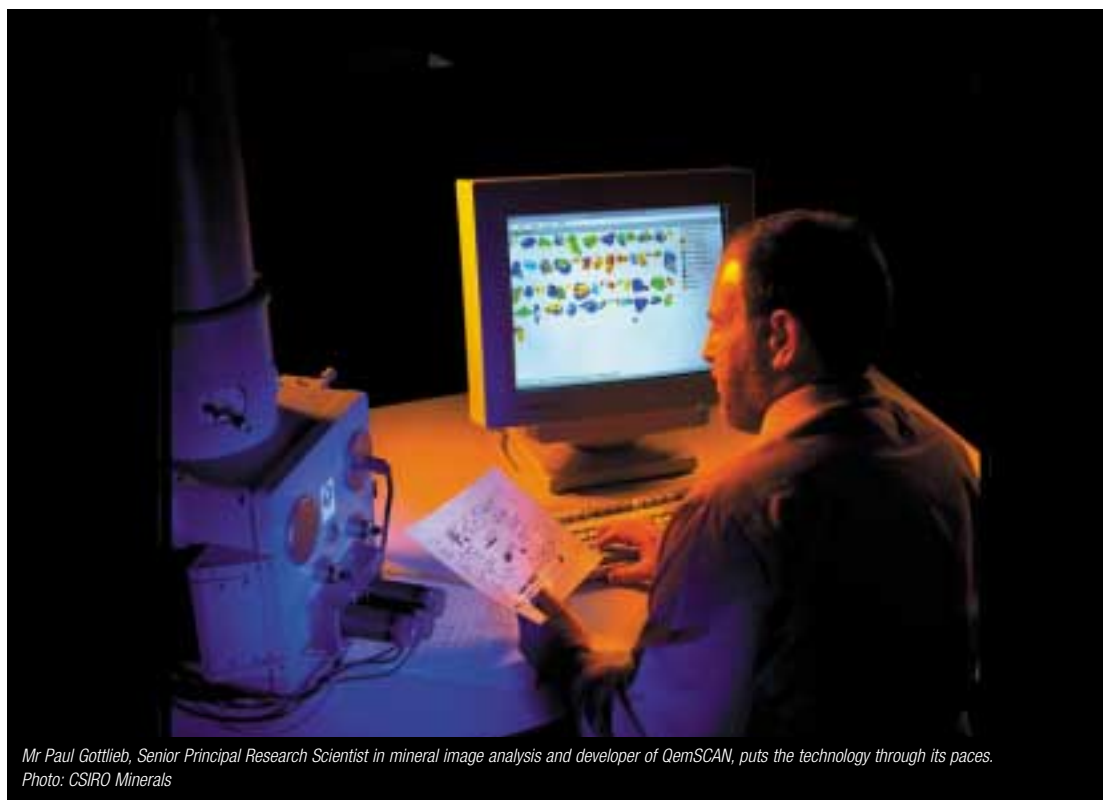
The CSIRO Bioinformatics Facility (CBF) will be used to perform a range of research tasks from screening chemical compounds to identify potential pharmaceutical drugs, through to identifying plant and animal genes to improve sustainable agricultural production.

Bioinformatics – the storage and analysis of biological information – is central to much of CSIRO's biotechnological research capability.

An initiative of 12 CSIRO divisions, the CBF will provide for more efficient management of information about genes and other biological resources, thereby enabling CSIRO researchers across Australia to speed up their analyses of complex problems.

The CBF will facilitate projects to: develop medical diagnosis and prevention strategies using the human genome; identify genes to help with environmentally sound control of pests like rabbits and certain insects; improve production of environmentally safe chemicals; identify genes critical for stress survival in crop plants; and study the genomes of animals.

The Facility is the first computer cluster in Australia to use Dell's new 'blade' or 'mini-server' technology. The system features 66 'blades' networked together in a cluster configuration to deliver a processing capability equivalent to that of more than 130 desktop computers.



*Mr Paul Gottlieb, Senior Principal Research Scientist in mineral image analysis and developer of QemSCAN, puts the technology through its paces.
Photo: CSIRO Minerals*

QemSCAN leads mining revolution

QemSCAN is the world's leading technology for rapid mineral analysis. It is revolutionising the mining industry and is in demand from the world's largest mining companies.

The technology, developed by CSIRO provides rapid identification of minerals and ores, improving the efficiency of mining operations and providing mining companies with a deeper understanding of their ores and refining processes.

QemSCAN involves the automation of a scanning electron microscope. Mineral identification is based largely on chemical composition information obtained from x-ray emissions, which are generated as an electron beam scans over the ore sample.

The technique provides detailed information that was previously not available by any other means.

Sales of QemSCAN have boomed over the last three years with the technology now used by eight of the world's largest resource companies, including BHP Billiton, Rio Tinto, Anglo Platinum, Phelps Dodge, Falconbridge and Brazilian mining giant, CVRD.



*Dr Michael Wendt takes routine measurements during a test run of the CSIRO Liqueatech prototype furnace at Brisbane's Pullenvale facility.
Photo: North Sullivan Photography*

Clean power from coal

CSIRO's Liqueatech hybrid coal and gas turbine is helping in Australia's quest to find cheaper, cleaner energy, by generating clean power from coal mining waste.

The revolutionary technology has the potential to significantly reduce greenhouse gas emissions and bring big savings to coal mining companies.

The system works by burning methane, a gas that would otherwise have polluted the atmosphere, and waste coal in a kiln to produce hot air. This air is then passed through a specially adapted heat exchange unit to drive a gas turbine, which in turn generates electricity.

Australia's underground coal mines produce around 800 000 tonnes of waste coal every year. By recycling this waste and returning it to the generating system as power, the new technology could save the Australian industry millions of dollars annually.

The technology, funded by CSIRO, the Australian Coal Association Research Program the New South Wales Sustainable Energy Development Authority and the Liqueatech Turbine Company, is part of a project targeting a 75 per cent reduction in greenhouse gas emissions from coal mines over the next 20 years.



FedSat, Australia's first satellite in over thirty years, launched by H-IIA rocket from Tanegashima Space Centre, 14 December 2002. Photo: National Space Development Agency of Japan

CSIRO hits new heights

"Ju, ku, hachi, nana, rokyu, go, yon, san, ni, ichi, zero!"

Those who can count backwards in Japanese will recognise the classic rocket countdown. This was the sound track at Tanegashima Space Centre in southern Japan on 14 December 2002, when the fourth flight of the H-IIA launch vehicle lifted Australia's *FedSat* science and engineering test satellite into orbit at 800 km altitude, with three Japanese satellites.

The *FedSat* project was announced by Science Minister the Hon Peter McGauran MP in August 1996. At that time he asked CSIRO to lead the project and to form a team, including universities and industry, to carry it out. That task was accomplished by the Cooperative Research Centre for Satellite Systems, with CSIRO as its managing agent and one of the largest of twelve participants.

CSIRO designed the highly efficient Ka-band radio system that enabled *FedSat* to become the first microsatellite to operate at that frequency. The satellite carries four other scientific and engineering payloads:

- advanced messaging and data acquisition
- 'self-healing' computing systems
- magnetic field sensors
- global positioning system.

FedSat, is the first satellite built in Australia for over 35 years and is already the longest-operating Australian space mission. It is thought to be the first satellite to demonstrate that computing systems can 'repair' themselves in orbit after suffering from the impact of high energy charged particles.

The collaborative research agreement under which the National Space Development Agency of Japan supplied *FedSat*'s launch was signed by CSIRO Chief Executive, Dr Geoff Garrett, on 12 September 2002. The Organisation also arranged for the Overseas Launch Certificate from the Commonwealth Space Licensing and Safety Office, and obtained the satellite's Global Positioning System payload under a 1999 research agreement with US space agency NASA.



CSIRO has designed a smarter way to ensure the privacy of personal information for people accessing services on the web.
 Photomontage: Peter Saunders, CSIRO Mathematical and Information Sciences

Information security for online service users

CSIRO has designed a smarter way to ensure the privacy of personal information for people accessing services on the web. The privacy model allows the privacy conditions that apply to personal information to be set by the customer rather than the service provider.

Web Services are software applications, connected over the Internet, that may be hosted by different service suppliers such as businesses or government departments. Using a web browser, the user interacts with one application which then shares the user's information over the Internet with other applications in the network in order to carry out the service.

Web Services will play an increasing role in the provision of business and government services, but concern for the privacy of personal and other sensitive information is a significant barrier to people using these services. This is particularly true in the areas of healthcare and financial services.

Using a Web Service can involve personal information being shared among a complicated network of different service suppliers. For example, buying building supplies over the web could involve a user's information being sent to several different material suppliers, a bank, a credit card processor and a shipping company.

In CSIRO's model, secure transfer protocols ensure the user's privacy conditions are immediately and automatically applied across all applications involved in providing the service.

The user can even set privacy conditions that vary within the Web Service network allowing, for example, their name and email address only to be given to government agencies.

A prototype system, developed for the Commonwealth Department of Health and Ageing, has demonstrated the practical application of the CSIRO approach.



In a world-first, NSW Rural Fire Service and the Country Fire Authority of Victoria, working with CSIRO researchers, have developed and proved a new fire truck protection system which will help fire fighters survive being caught in a bush fire. Photo: Nathan White. CSIRO Manufacturing and Infrastructure Technology

Fire research

Hundred of thousands of hectares of farm and bushland, and hundreds of houses and farm buildings were lost to bushfires in the past year. Ongoing research projects have been intensified, and CSIRO is now a major player in the newly-established Cooperative Research Centre for Bushfire Research, announced in December 2002.

Research into fire truck design and crew safety took place at a specially designed Rural Fire Service facility at Mogo, New South Wales (NSW) which showed promising results.

A unique gas-fired artificial fire-front was developed by CSIRO, for the NSW Rural Fire Service and the Country Fire Authority of Victoria. This can realistically simulate different intensities of full-scale bushfire fronts, and led to a number of recommendations for the improved safety of fire brigade vehicles,

giving crews a good chance of survival if caught in a bushfire 'burnover'. These recommendations also included re-designed vehicles and spray systems.

A computerised mapping system, known as Sentinel Hotspots, developed by CSIRO, Geoscience Australia and the Defence Imagery and Geospatial Organisation allows forest managers and fire control officers, and anyone with web access, to see online satellite-derived images of possible fire outbreaks across Australia. The images are updated up to four times a day, and the information is placed on the Sentinel website [www.sentinel.csiro.au] within one hour of the satellite reception in Alice Springs.

Other research projects are investigating the urban/bush interface, urban planning and building design, fire behaviour and prescribed burning and forest management.



The new \$105 million Queensland Bioscience Precinct on the University of Queensland's St Lucia campus. Photo: University of Queensland

Queensland Bioscience Precinct up and running

The research efforts of the Brisbane-based operations of four CSIRO divisions received a major boost in May with the launch of the \$105 million Queensland Bioscience Precinct (QBP) on the University of Queensland's St Lucia campus.

CSIRO's initial \$50 million investment in the facility is designed to facilitate closer collaboration between scientists from the Divisions of Plant Industry, Livestock Industries, Sustainable Ecosystems, and Mathematical and Information Sciences, and the University of Queensland's Institute of Molecular Bioscience.

The Precinct – Australia's largest research facility dedicated to human, animal and plant biotechnological research – houses a total of 700 scientists around 300 of whom were previously located at CSIRO's nearby research facilities in Long Pocket.

It features state-of-the-art laboratories, equipment and administrative and conference facilities contained in four buildings on a 1.6 hectare site.

At the QBP's official launch on 21 May, CSIRO's Chief Executive, Dr Geoff Garrett, said the Organisation's investment was testimony to its commitment to fostering commercial research partnerships which bridge traditional institutional and disciplinary boundaries. The research undertaken by such partnerships will provide solutions to the major problems facing the nation and the world.

Funding for the project was contributed by: CSIRO (\$50 million); the University of Queensland (\$15 million); the Queensland Government (\$15 million); the Commonwealth's Federation Fund (\$15 million); and Atlantic Philanthropies (\$10 million).



Australian scientists at CSIRO have developed an industrial-scale pilot plant, which is now producing near-net-shape, or close to product thickness, low-cost magnesium sheet. Photo: Mark Fergus, CSIRO Manufacturing and Infrastructure Technology

Australia takes the lead in magnesium manufacture

CSIRO's Elaborately Transformed Metals group have developed a low-cost, thin, near production ready magnesium sheet.

Magnesium is attractive for its strength, light-weight and recyclability, and the race has been on for more than a decade to be the first to develop new low-cost technologies to make magnesium manufacturing friendly.

Magnesium alloys have excellent, shielding capability against electromagnetic interference, environmental stability, and effective heat dissipation. Most of these properties make magnesium sheet the material of first choice for the communications equipment market and increasingly so for automotive applications.

CSIRO has built an industrial-scale pilot plant to produce its low-cost magnesium sheet. The process used is suitable for both continuous (large) and batch (small and medium) production, while producing good quality magnesium alloy sheet from a large range of conventional and new magnesium alloys.

The unique expertise of the casting team at CSIRO, which distinguishes its operations from others around the world, is its know-how in casting of non-ferrous alloys with large freezing ranges, which solves the surface and internal defects as well as edge cracking problems for magnesium casting.

CSIRO's Outcomes, Outputs and Key Performance Indicators

This section describes CSIRO's performance in accordance with the Government's outcome-output performance reporting framework and the performance indicators in the Government's Triennial Funding Agreement with CSIRO for 2000–01 to 2002–03.

Outcomes and Outputs

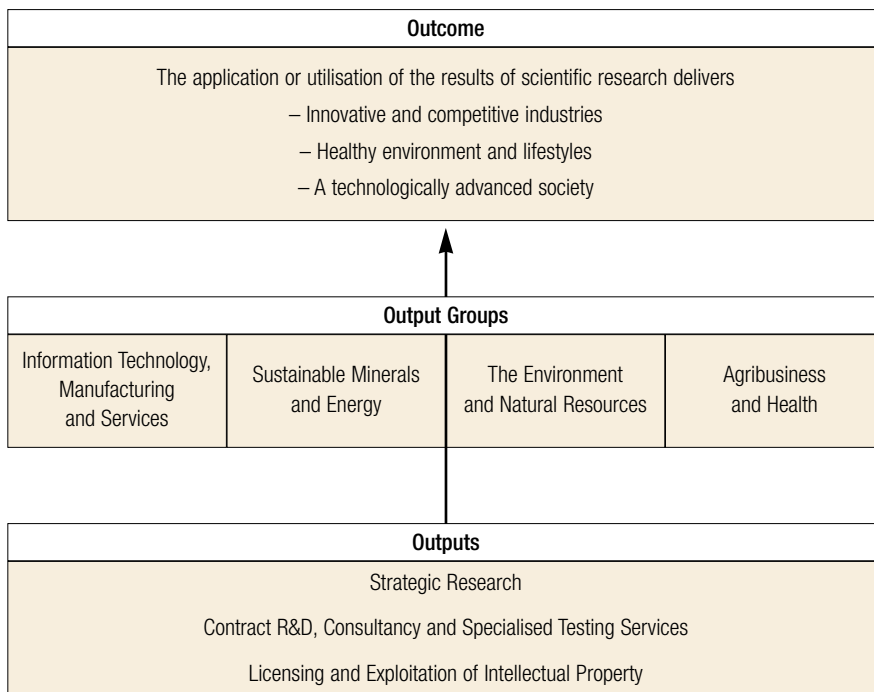
CSIRO's Outcome-Output Framework is illustrated in Figure 1. CSIRO's activities are based on the firm belief and expectation that the application of the results of high-quality scientific research will make a substantial contribution to the welfare of all Australians by assisting the growth of innovative and competitive industries, promoting sound environmental management and healthy lifestyles, and developing a technologically advanced society.

In seeking to maximise its contribution, CSIRO conducts three main 'business streams' that have differing types of outputs: strategic research; contract R&D, consultancy and specialised testing services; and licensing and exploitation of intellectual property. The four Output Groups reflect four broad areas of related industries or other interests that benefit from CSIRO's outputs. CSIRO's 20 research Divisions are now organised and managed in four groups aligned with these Output Groups.¹

Selected outcomes and outputs are described on pages 47-64.

There are six key performance indicators incorporated in the current Triennium Funding Agreement between CSIRO and the Commonwealth Government for the period July 2000 to June 2003. This agreement has now been extended for a further year. The reporting below reflects the ongoing review and enhancement by CSIRO of its performance measurement framework.

Figure 1: CSIRO's Outcome-Output Framework



¹ The Outputs and Output Groups are shown here as they appear in the Portfolio Budget Statement, 2003–04. This reflects a slight change in wording, but not in substance, compared with the Portfolio Budget Statement 2002–03.

Indicator 1: Allocation of Resources in line with Priorities

This indicator reflects CSIRO's shifting of resources in line with changing priorities determined in consultation with government, Sector Advisory Councils and CSIRO customers in the public and private sectors.

Planning of CSIRO's research portfolio is undertaken to ensure that the core competence of CSIRO – its science base – will achieve focus, impact and scale, and is capable of meeting the requirements of its customers and stakeholders. Inputs to the process include:

- the Government's National Research Priorities (NRPs)
- the Organisation's strategic plan
- feedback from Sector Advisory Councils (SACs)
- developments in emerging and breakthrough science
- market analysis
- opportunities for collaborative research.

The CSIRO Science Forum, which is designed to foster our commitment to science excellence and the sharing of better practice, also provides a mechanism for gaining input from scientists into strategic direction. The Forum has members drawn from all Divisions and levels of the Organisation.

During 2002–03, the 22 Sector Advisory Committees (SACs) that played a key role in advising CSIRO on priorities at the beginning of the triennium were replaced with seven new Sector Advisory Councils. The new arrangements enable the constructive interactions that were a feature of the SAC system to take place at a higher, more strategic, level. With the announcement for the first time of National Research Priorities, and this reorganisation of advisory processes, the 22 Sectors no longer represent the organising principle by which CSIRO's research priorities are determined and articulated.

CSIRO was an active contributor to the process which led, in December 2002, to the announcement of the Government's NRPs. The Flagship Program is the key plank of CSIRO's response to the NRPs. While the concept of the Flagship Program predates the announcement of the Priorities, CSIRO and its partners have reviewed the objectives and planned roll-out of the Flagship Program to ensure optimal alignment with the NRPs.

In addition to their individual outcomes relevant to the NRPs, the Flagship Programs are closely interrelated and have a very intimate connection to other critical Government policies and initiatives. During 2002–03, CSIRO established a rigorous process for selecting and monitoring the performance of Flagship Programs. Six programs have now been approved by the Flagship Oversight Committee and are at different stages of development. Further information on Flagships can be found on page 18.

CSIRO is also responding to NRP goals by refocussing existing Divisional investments in a number of key areas into Major Cross Divisional Programs. The intent is to review, integrate and refocus current activities and make (limited) new investment in priority goal areas to achieve impact through scale and enhanced collaboration. CSIRO has entered discussions with other agencies who are required to develop National Research Priority implementation plans to identify factors and/or practices that inhibit cooperation; and to identify opportunities for future collaboration that would further the Government's intent.

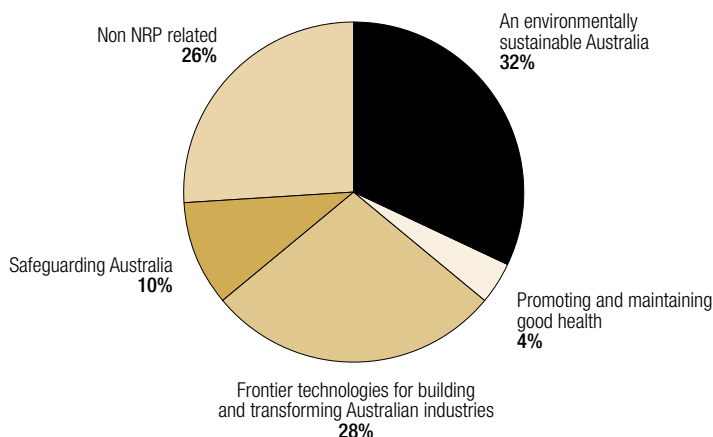
Figure 2 summarises the alignment of CSIRO's current research portfolio with the NRPs and their goals. This assessment shows that approximately 74 per cent of CSIRO's total investment in 2002–03 was targeted at research activities with potential outcomes relevant to the goals associated with NRPs. The work directed at the NRPs amounted to \$595 million in 2002–03, with \$370 million (62 per cent) of this coming from CSIRO's budget appropriation and \$225 million (38 per cent) from external funding sources.

That there is already a significant alignment between the NRPs and CSIRO's current research portfolio is consistent with CSIRO's mandate and the Organisation's historical focus on performing research to benefit Australia.

Because the assessment took place at the Priority Goal level, the research defined as 'not relating to the NRPs' (currently 26 per cent of CSIRO's total effort) falls into four broad categories:

- research of relevance to the NRPs but not reasonably connected to any Priority Goal (for example, work in climate change)
- research which does not reasonably align with either the NRPs or their associated Priority Goals but which addresses important issues for Australia (for example, research targeted at the discovery of bioactive molecules for application in human health (such as, pharmaceuticals, animal health or crop protection)
- a limited amount of fundamental research that it is not reasonable to include as breakthrough science in the context of building frontier technologies. (Given CSIRO's strong industry/end-user focus most of its more fundamental work, for example, in nanotechnology or information and communication technology, is designed ultimately to lead to frontier technologies of relevance to Australian industry. The most significant exception is basic research in radio astronomy)
- consulting services, compliance testing and work carried out for international clients.

Figure 2: Alignment of CSIRO's total R&D expenditure with National Research Priorities



Indicator 2: External Earnings

This indicator (measured as the amount of external earnings for research and related services from various sources) reflects the demand for CSIRO's research and related services.

The trend in CSIRO's external earnings by source is shown in Figure 3. External earnings (Sale of goods and services) grew in 2002–03 by 3.1 per cent over the previous year. The strongest contributor was a \$9.2 million (13 per cent) increase in earnings from the Australian Private Sector. Revenue from Intellectual Property continued to grow (recognising a significant one-off receipt in 2001–02).

Figure 3: External Earnings by Source

Source		1997–98	1998–99	1999–00	2000–01	2001–02	2002–03
Australian Private Sector	\$m	74.5	64.9	67.9	68.6	68.6	77.8
Commonwealth, State & Local Govt	\$m	52.3	63.1	68.6	66.8	75.6	76.8
Rural Industry R&D Corporations	\$m	40.3	40.8	40.7	40.8	41.6	42.6
Cooperative Research Centres	\$m	32.5	31.3	30.0	27.6	26.7	32.0
Overseas Entities	\$m	13.1	19.9	20.5	31.0	35.3	34.3
Other Revenue not classified by source	\$m	8.1	4.1	4.9	5.2	0.2	0.0
Intellectual Property – Royalty and Licence Revenues	\$m	5.3	6.5	8.3	9.3	16.9	13.8
Net adjustment – work in progress and deferred revenue	\$m	10.7	-9.3	-0.1	-7.0	2.1	-1.9
External Earnings (Sale of goods and services)	\$m	236.8	221.3	240.8	242.3	267.0	275.4
External Earnings Ratio*	%	32.6	32.7	33.3	32.3	34.7	34.1

* The external earnings ratio, as defined in CSIRO's Triennium Funding Agreement, includes adjustments to revenue for items unrelated to the provision of research and technology services, (for example, interest on investments) and for the capital use charge. Following a review by the Chief Scientist, Dr Robin Batterham, CSIRO's external earnings target ratio of 30 per cent was removed by the Government in September 2002.

Indicator 3: CSIRO Publications, Reports and Patents

This indicator (measured as the number of patents, reports and other publications annually, with quality assessed through citation analysis on a five-yearly basis) reflects CSIRO's contribution to, and hence ability to access, the world's knowledge base.

Trend data for CSIRO's publication and patenting activity are shown in Figures 4 and 5. The latest year-on-year results show an increase in all but one category. In addition, as at 30 June 2003, CSIRO held 62 Australian and 12 foreign Plant Breeders Rights (registered and pending applications), 287 Australian and 93 foreign Trade Marks, and five Australian and 17 foreign Registered Designs.

CSIRO is a significant contributor to the international scientific literature. July 2003 data from the Institute for Scientific Information (ISI) show that, based on the number of times an agency's scientific papers have been cited by other researchers over the last decade, CSIRO is the fourth most influential research agency in the world in agricultural science, sixth most influential in plant and animal science, and seventh most influential in environmental science/ecology. Overall, based on total citations, CSIRO ranks in the top one per cent of scientific institutions in the world in 12 out of the 22 scientific disciplines as categorised by ISI.

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

	1997	1998	1999	2000	2001	2002
Journal Articles	1 682	1 472	1 535	1 619	1 631	1 686
Conference Papers	1 278	1 183	1 280	1 035	1 096	1 142
Technical Reports	318	194	229	175	153	240
Books & Chapters	207	123	236	178	128	223
Total	3 485	2 972	3 280	3 007	3 008	3 291
Client reports	7 075	8 099	7 339	8 936	9 324	10 486

Figure 5: CSIRO Patents (number as at 30 June each year)

	1998	1999	2000	2001	2002	2003
Inventions (patent families)	723	735	705	751	733	779
New Inventions	96	74	79	93	80	92
Current PCT* applications	83	84	63	82	104	90
Granted patents			1 749	1 774	1 801	2 002
Live patent cases	3 182	3 371	3 436	3 475	3 537	3 695

*Patent Cooperation Treaty

Indicator 4: Research Training

This indicator (measured as the number of research students supervised or co-supervised by CSIRO staff) reflects CSIRO's contribution to developing the skills base of Australia and its own staff.

In 2003, CSIRO jointly supervised a total of 535 postgraduate research students. The number of students sponsored by CSIRO in 2003 rose to 194. Figure 6 shows the trend in student supervision and sponsorship numbers over recent years including the breakdown by PhD, Masters and Honours students and the number of full and partial scholarships. CSIRO's contribution to the training and development of Australia's researchers and science-based professionals is being further enhanced as CSIRO pursues its goal to increase the number of postdoctoral appointments to 300 by 2006. In line with this goal the number of postdoctoral staff increased from 183 at 30 June 2002 to 207 at 30 June 2003.

A new CSIRO Postdoctoral Program, established in October 2001, has granted 55 awards to date. The program will support 25 Postdoctoral Fellowships every year with emphasis on new areas of science and collaborative proposals. A new joint Postdoctoral Program between the Australian Research Council (ARC) and CSIRO began in 2003 and awarded ten fellowships. A CSIRO-wide PhD Program was initiated at the end of 2001 to augment Divisional investments. The program has awarded 120 scholarships to date and will build to a steady state of 180 PhD students per annum.

CSIRO staff contribute to student lectures and seminars, undergraduate and TAFE courses, short courses, summer schools, apprenticeship training and vacation student programs. CSIRO Education (see also page 65) continues to provide a range of highly regarded science-oriented programs for primary and secondary school aged students (and their teachers).

Figure 6: Number of Students Sponsored and Supervised (jointly) by CSIRO

Supervision	1997-98	1998-99	1999-00	2000-01	2001-02 ^r	2002-03
PhD	585	579	379	475	433	425
Masters				57	53	48
Honours	158	176	143	77	71	62
Total	743	755	522	609	557	535
With CRCs*	26%	30%	30%	23%	26%	21%
Sponsorship	1997-98	1998-99	1999-00	2000-01	2001-02 ^r	2002-03
Full	34	30	32	42	49	52
Partial	98	97	69	86	112	143
PhD	114	103	91	110	144	179
Masters				8	9	4
Honours	18	24	10	10	8	11
Total	132	127	101	128	161	194

* Cooperative Research Centres

^r 2001-02 figures have been revised to correct an error in collation of the data.

Indicator 5: Customer Satisfaction

This indicator, measured with CSIRO's customer value survey, reflects CSIRO's responsiveness to the needs of customers with whom the Organisation has a contractual arrangement.

CSIRO's Customer Value Survey (CVS) is based on an internationally proven technique of comparative value analysis. The survey uses a questionnaire that explores several levels of 'attributes' that test the overall question of whether the results of the interaction of a particular customer with CSIRO were 'of value'. The survey instrument is based on a comparative analysis (asking our customers to rate us as well as our competitors). Taking corrective actions in response to the survey results and advising our customers of what we have done, is a vital aspect of the process.

Any comparative score above 100 rates the Organisation above alternative providers to the surveyed customers and, based on a large body of international experience, a customer rating for overall value of 8/10 (or higher), combined with a comparative value score of 110 (or higher), is indicative of 'world-class' performance.

CSIRO's results for the period since the survey was introduced in July 2001 are shown in Figure 7. These results are based on response from approximately 150 customers each quarter. They indicate generally steady performance with some pleasing improvement in our customers' ratings of the way that CSIRO people interact with them in the course of the relationship.

Figure 7: Customer Value Survey Results*

Period Ending ...	CSIRO's Score		Comparative Value Score	
	Mar 02	Mar 03	March 02	March 03
Rating of CSIRO overall on value	7.0	7.0	108	108
Rating overall on products/services	7.3	7.3	111	111
Rating overall on process/people	7.0	7.1	105	109

* Results for the period July 2001 to March 2002 and April 2002 to March 2003. Comparative value scores are calculated as CSIRO's score (on a ten point scale) divided by our competitors' score times 100. For example, $7.81 / 7.65 * 100 = 102$.

Indicator 6: Adoption and Impact

This indicator reflects the economic, social and environmental significance of CSIRO's work by reporting examples of CSIRO **outputs** adopted by users in industry, government and the community and the **outcomes** associated with their use.

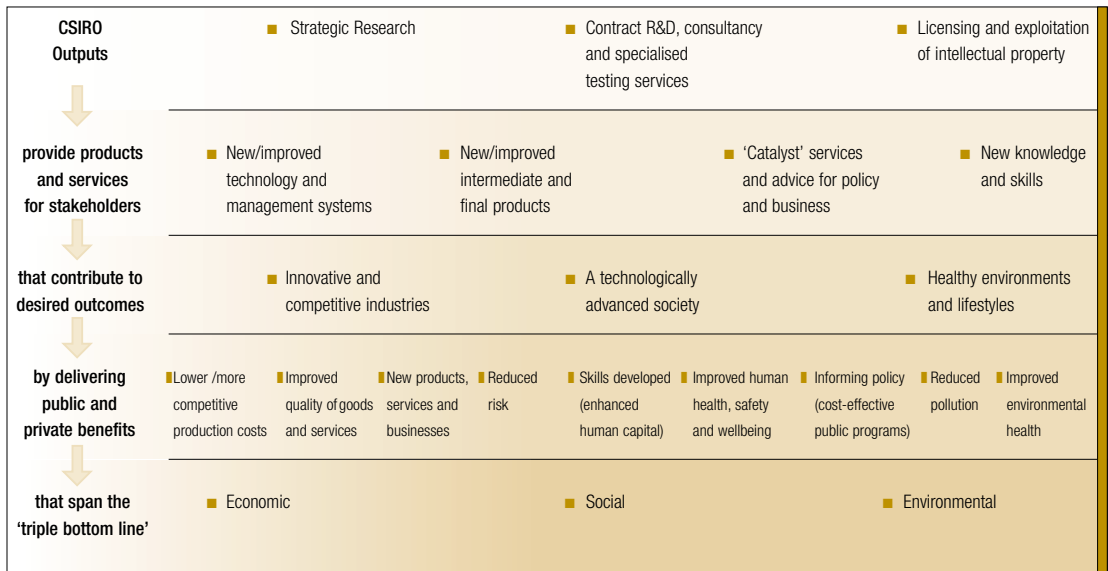
There are four major 'types' of research products and services (outputs) that CSIRO delivers to stakeholders:

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

Furthermore, as illustrated in Figure 8, these four types of outputs contribute to 'triple bottom line' economic, social and environmental benefits in a variety of different ways, specifically through:

- lower/more competitive production costs
- improved quality of goods and services
- new products, services and businesses
- reduced risk (economic, environmental or social)
- development of skills (enhanced human capital)
- improved human health, safety and wellbeing
- informing policy (cost-effective public programs)
- reduced pollution
- improved environmental health.

Figure 8: CSIRO's Pathway to the Triple Bottom Line



The following selection of recent achievements illustrates the enormous variety of ways in which CSIRO contributes to economic, social and environmental benefits for Australia. The achievements are arranged under headings for each of CSIRO's four Output Groups (Information Technology, Manufacturing and Services; Sustainable Minerals and Energy; Environment and Natural Resources; Agribusiness and Health). The following charts illustrate the distribution of outputs and outcomes in each Output Group, using the classification of outputs and outcomes described above.

It should be noted that the labels on the charts have been abbreviated and that, for the purpose of these illustrations, each achievement has been allocated to a maximum of two output categories and a maximum of three outcome categories. Given the nature and breadth of some of the achievements there is necessarily an element of subjective judgement in allocating the achievements between the output and outcome categories.

While 'Chart 1' provides a summary across all the achievements described in the text, 'Charts 2 to 5' illustrate how the nature of outputs and outcomes varies between the four output groups. For example – looking at outcomes – the largest category 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 'lower/more competitive production costs'. In the Environment and Natural Resources Group the single most significant means of delivering benefit to Australia was through 'informing policy (cost-effective public programs)'.

Some of the achievements described in this report represent further milestones in achievements that have been reported in previous years. This reflects the cumulative nature of knowledge, the timeframes over which innovations are adopted, and CSIRO building ongoing research and commercial partnerships. CSIRO acknowledges that many achievements result from successful partnerships with clients and collaborators, both private and public. Space prevents specific acknowledgement of all partners who have contributed to the achievements reported here.

Chart 1: Summary of Selected CSIRO Achievements 2002–03
Distribution of Outputs and Outcomes from all Output Groups

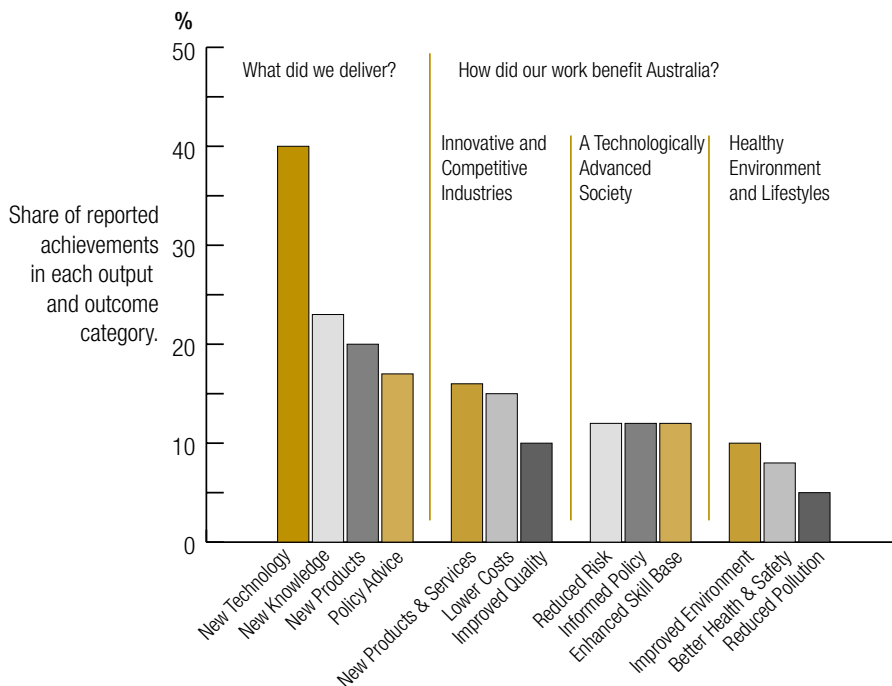


Chart 2: Information Technology, Manufacturing and Services
Distribution of Outputs and Outcomes, 2002–03

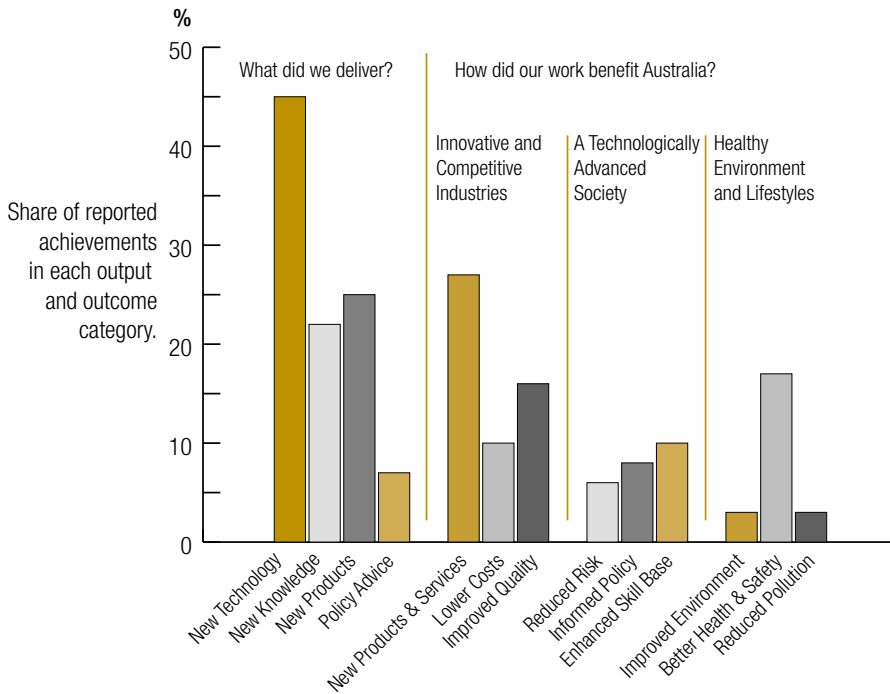


Chart 3: Sustainable Minerals and Energy
Distribution of Outputs and Outcomes, 2002–03

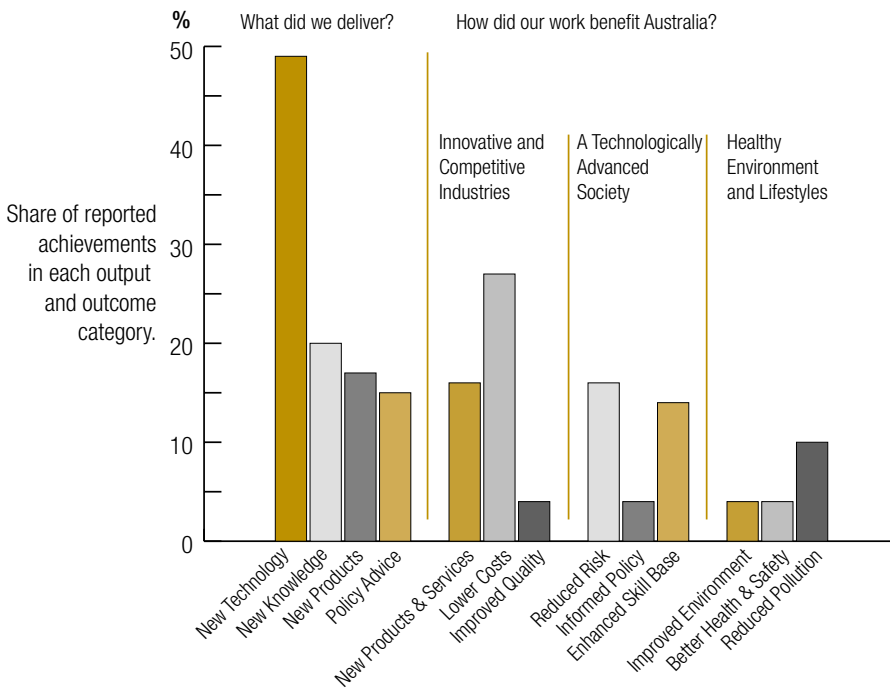


Chart 4: Environment and Natural Resources
Distribution of Outputs and Outcomes, 2002–03

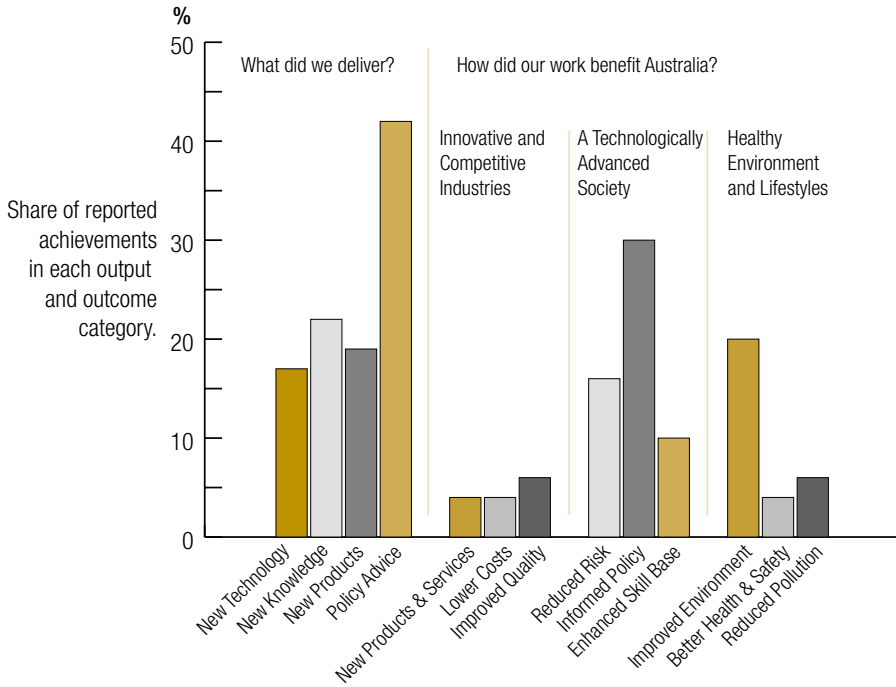
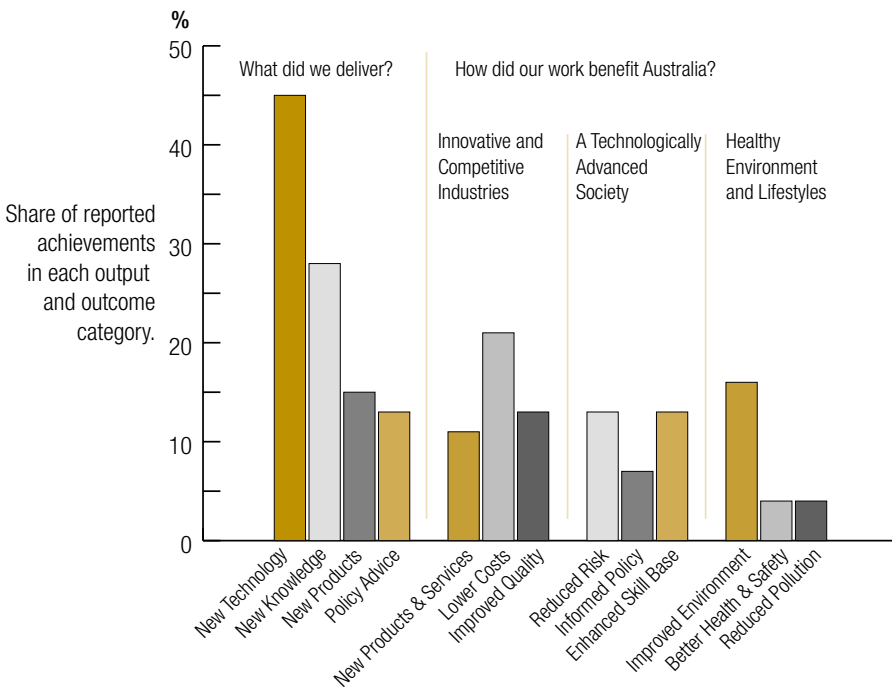


Chart 5: Agribusiness and Health
Distribution of Outputs and Outcomes, 2002–03



Outputs and Outcomes

Information Technology, Manufacturing, and Services

Low-Cost Magnesium Sheet Technology

Outputs:

Low-cost magnesium sheet casting technology that is a world-first. The technology successfully overcomes the tendency of magnesium melt to oxidise and catch fire and prevents it freezing faster than aluminium wrought alloys.

Outcomes:

An industrial scale pilot plant has demonstrated large savings on the capital cost of conventional production, and is producing low-cost castings suitable for a wide range of everyday products from motor vehicle parts to mobile phones. Magnesium alloy is easier to recycle than the plastics it replaces. (more information see page 36)

New Magnesium Alloy for Motor Vehicle Engines

Outputs:

A patented new lightweight heat-treatable magnesium alloy has been designed for motor vehicle engines.

Outcomes:

A prototype 14 kilogram diesel engine block is currently being road tested. Magnesium engines are much lighter than cast iron engines and offer high shock and dent resistance, improved dampening of noise and vibration, improved fuel economy and reduced carbon dioxide emissions.

New Non-toxic Corrosion Prevention

Outputs:

A new anti-corrosion coating technology to replace Chromium VI (chromate). Chromate is highly toxic and is used extensively in zinc coating, aluminium and magnesium alloys. The technology is protected by five patents world-wide.

Outcomes:

The health risk associated with exposure of workers to chromate in the workplace is virtually eliminated by the CSIRO process. A new product was released onto the market in Germany in 2003 and is expected to become available more generally in Europe and North America in 2004.

New Industrial Sorting Technology

Outputs:

CSIRO's Rotary Classifier is a new sorting technology with applications in a number of industries such as construction, recycling and mining. It offers high throughput, low-wear, no 'blinding' (jamming of material), reduced energy use and various extraction options.

Outcomes:

The new technology reduces operating costs for maintenance, downtime and replacement. A patent application has been filed and rights to develop and commercialise the Rotary Classifier for continuous processing in the field of mineral processing, quarrying rock and sand industries has been taken up by RCR Tomlinson Ltd of Perth.



Drs Guy Metcalfe and Kurt Liffman with the laboratory scale model Rotary Classifier. Photo credit: Lawrence Cheung, CSIRO Manufacturing and Infrastructure Technology

New Generation Lightweight Cellular Material

Outputs:

HySILL is a revolutionary light-weight cellular materials technology used to develop a class-leading product for wall panel applications in the commercial and residential construction industries. Further potential exists for use in critical infrastructure applications.

Outcomes:

HySILL provides superior load bearing, weight savings, thermal, fire, acoustic, moisture transmission and impact properties. This can significantly improve occupant comfort and productivity. HySILL uses fewer materials and is completely recyclable. The technology is estimated to be 5–10 times cheaper than competing technologies.

New Generation Low-Cost High Speed Computing

Outputs:

CSIRO's Hybrid Modular Processor (HYMOD) is a flexible, real-time, high-speed, broad bandwidth computing engine that can be readily configured by software for intense data processing applications such as machine vision, signal processing, gene sequencing and like applications.

Outcomes:

HYMOD systems can be configured to achieve superior processing capability at workstation prices. Applications programming time is reduced from months to days. HYMOD is now in use at Sydney airport and being installed in the Safe-T-Cam vehicle-monitoring network throughout New South Wales.

Energy Efficient Sustainable Housing

Outputs:

Life Cycle House Energy Evaluation (LICHEE) is a new computer assisted design-based tool that consists of a series of sophisticated intercommunicating programs that work together to produce a detailed report on the lifetime energy profile for particular detached housing designs.

Outcomes:

Housing designers can produce an assessment of the life-cycle energy impact of a design in two minutes compared with 24 hours using current systems. LICHEE facilitates decisions on the best materials and design for lifetime energy efficiency. LICHEE may also inform the setting of policy targets on energy consumption.

Acoustic Non-Destructive Inspection Tool for Aeroplanes

Outputs:

BaNDIcoot is a compact and easy to use acoustic non-destructive inspection system that delivers real-time assessment of the severity of damage to aeroplanes from corrosion or impacts during service.

Outcomes:

BaNDIcoot enables easier and more effective testing of panels on modern aircraft, reduced costs of unnecessary removal of aeroplanes from service, and safer air travel. The research team is now, with the help of Boeing Commercial Airplane Group, preparing for United States Federal Aviation Administration certification trials preparatory to inclusion into the aeroplane repair manuals.

High Resolution Sub-surface Radar

Outputs:

A novel, light weight, hand-held sub-surface radar unit designed to detect small, discrete objects buried close to the surface of walls and floors. The unit is fully software configurable, includes a user-friendly interface and connects to any computer.

Outcomes:

Significant sales have been achieved on a world-wide basis.

New Earth Station Antenna for the Department of Defence

Outputs:

A new Ka-band feed antenna for the Defence Science and Technology Organisation.

Outcomes:

The feed antenna is compact in size and makes possible both transmission and reception to the new Optus-C and *FedSat* satellites. At Ka-band frequencies higher data rates can be achieved with smaller sized antennas than with currently used frequency bands.

High-Voltage Measurement Services

Outputs:

A precision multi-ratio high voltage national reference divider that has increased the accuracy of direct current (DC) high voltage measurement over conventional techniques by a factor of three, thereby meeting the most demanding specifications for DC high voltage measurement.

Outcomes:

Australia is now one of only two countries that can provide DC high voltage measurement services with the highest accuracy, facilitating developments in areas such as DC power transmission, semiconductor processing, scientific instrumentation, aviation and defence facilities.

Launch of *FedSat*

Outputs:

The first Australian built satellite in more than 30 years was launched in December 2002. Built by the CRC for Satellite Systems, the satellite has on board a world-leading Ka-band transponder developed by CSIRO. The transponder uses CSIRO designed and fabricated monolithic microwave integrated circuits.

Outcomes:

FedSat is delivering world-class scientific outputs from its experiments, feeding into international and national programs. The transponder will investigate the propagation and communication characteristics of the Ka-band which may provide solutions for rural and remote area digital access on future more powerful satellites. (more information see page 32)

Advanced Microwave Receiver and Transmitter Modules

Outputs:

Novel millimetre-wave integrated circuit-based transmitter and receiver modules. Millimetre-waves are radio signals with ultra-short wavelengths, in this case around 3 millimetres, corresponding to a frequency of 100 gigahertz (GHz).

Outcomes:

The modules provide previously unavailable levels of performance and functional integration. They have been used to demonstrate a fully functional millimetre-wave radio system operating at a frequency of 90 GHz, highlighting the wide bandwidth that is available and essential for gigabit rate data communications. These modules incorporate indium phosphide and gallium arsenide chips designed by the CSIRO and fabricated by Northrup Grumman Space Technology under a Strategic Alliance agreement.

Prototype Lens for the Square Kilometre Array

Outputs:

Design and production of a prototype Luneburg lens which is a key element in an Australian proposal for the Square Kilometre Array – a major international project to develop the world's biggest radio telescope.

Outcomes:

The new lens embodies significant advances in the development of very low-loss dielectric materials for major antenna applications. Use of these materials will give power losses through the lens up to two orders of magnitude lower than is currently available.

Ultrasound Cardiac Output Monitor

Outputs:

A prototype ultrasound cardiac output monitor suitable for use in surgery, intensive care and other critical medical environments has been developed using CSIRO's specialist expertise in diagnostic ultrasound. This has kick-started product development for USCOM, a start-up company with a patented concept but little technical expertise.

Outcomes:

The product has been approved by the Therapeutic Goods Administration and is undergoing Australian and international trials prior to commercial release later in 2003. It has the potential to replace present hazardous and invasive cardiac monitoring methods and to generate a substantial export market.

Synchronising National Time Scales

Outputs:

A portable system for the intercomparison and calibration of timing receivers at the nanosecond level. This requires accurate timing measurements as well as the ability to determine the position on the earth's surface with centimetre level accuracy.

Outcomes:

The system has been purchased from the National Measurement Laboratory and will be used on behalf of the Asia-Pacific Metrology Program (APMP) by APMP affiliated national laboratories to synchronise national timescales with Coordinated Universal Time.

New Analgesic for Trauma Situations

Outputs:

An alternative chemical synthesis process for the production of a novel analgesic agent for use in trauma situations, primarily in the paramedical ambulance service.

Outcomes:

The process has been licensed to an Australian pharmaceutical small-to-medium enterprise. A new manufacturing facility has been constructed and is operating in Australia, replacing overseas sources of the product and enhancing the company's manufacturing skills and expertise.

New Cancer Detection Technology

Outputs:

New technology for cancer diagnosis through the detection of specific changes in cancer cell DNA. The technology allows detection of as little as one cancer cell in 10 000 normal cells and can be applied to both body tissue and body fluid samples.

Outcomes:

The technology has been licensed to Epigenomics Inc who are using the technology to develop new diagnostic assays for the detection of cancers at an early stage while the cancer could still be cured.

New Treatment for Prostate Cancer

Outputs:

Following the completion of contract research for Mayne Pharma to test a new treatment for incurable prostate cancer in animal models, CSIRO has provided documentation to support the regulatory submission for the product.

Outcomes:

A new product is now being developed to test against prostate cancer in humans. The technology has been transferred to a contract manufacturer in the United Kingdom. Phase One clinical trials are scheduled for 2004.

Sydney Olympic Park Site Remediation

Outputs:

Using toxicity tests with microalgae developed by CSIRO, the monitoring of contaminants in leachates from waste landfill mounds, together with the monitoring of surface waters and sediments, found that there was an overall trend of decreasing contamination in leachates over a two-year period, as the mounds age.

Outcomes:

This research has confirmed the effectiveness Sydney Olympic Park Authority's (SOPA) ongoing remediation strategy; increased understanding of the seasonal variation in leachate composition and toxicity; identified the major cause of the toxicity; and enabled selection of the most sensitive tests for long-term monitoring.

Cellular Image Analysis for Drug Screening

Outputs:

Advanced image analysis software for the rapid screening of high information content cell images for drug discovery.

Outcomes:

The software is incorporated in Axon Instruments' Automated Cellular Imaging and Analysis System, Image Express™, used by pharmaceutical companies to make more accurate choices about promising candidate compounds, which will enable them to create better drugs cheaper and faster.

New Generation Unmanned Helicopter

Outputs:

A relatively low-cost autonomous flight system for a small scale unmanned helicopter incorporating novel research in stereo-vision systems, sensor fusion, and artificial neural network and fuzzy control.

Outcomes:

Previously life threatening high-risk activities such as low-level surveillance and tracking, search and rescue, security surveillance and fire front monitoring can be carried out by a fully equipped, low-cost robotic helicopter. This product is now ready for commercialisation.



The world's first low-cost smart autonomous helicopter for civil applications – the CSIRO Mantis. Photo: CSIRO Manufacturing and Infrastructure Technology

Protecting Personal Health Care Information

Outputs:

New technology that enables the capture, storage and application of individuals' expressed wishes concerning access, transfer and use of their personal health information. Novel transfer protocols ensure the continuous, automatic association of each individual's access conditions with their health information.

Outcomes:

The outputs of the Electronic Consent Research and Development Project are informing concurrent investigations of consent in the test phase of the Federal Government's HealthConnect agenda, and the national plan of action for information management in the health sector, called 'Health Online'. (more information see page 33)

Vehicle Scheduling System

Outputs:

The Dynamic Vehicle Allocation and Scheduling System (D-VASS) is software that sits at the heart of a fleet vehicle reservation system, maintaining an efficient vehicle schedule and answering vehicle availability questions on-line.

Outcomes:

Tourism Holdings Ltd operate the system with a fleet of around 8 000 recreational vehicles and up to 20 000 bookings at any one time. The cost of relocating vehicles between cities to cover bookings has been reduced by at least five per cent. Vehicle utilisation rates have increased and fewer vehicle 'substitutions' are required.

Water Pipeline Risk Management

Outputs:

PARMS-PLANNING is software for predicting customer service levels and the long-term costs of water pipeline system failures. Such failures cost the nation more than \$250 million annually. PARMS-PLANNING can be used to predict pipe failures and to determine likely future costs for a variety of management and operational strategies.

Outcomes:

The results are assisting Australian water utilities to manage their assets more efficiently by identifying water mains needing replacement under different strategies. This allows them to determine the level of expenditure required to maintain customer service, prevent unscheduled interruptions to supply and reduce property damage due to pipe failure.

World Coordinate Systems

Outputs:

New mathematical and software standards for describing the location of objects in the sky have been developed in collaboration between CSIRO and the National Radio Astronomy Observatory in the United States.

Outcomes:

In 2002, following international acceptance, the software and standards have been published, providing astronomers with precise and accurate systems for mathematically describing astronomical coordinates.

Tracking Mars Probes

Outputs:

The Parkes radiotelescope has been equipped with a new radio receiver and improvements to enhance the accuracy of the main reflecting surface.

Outcomes:

The large number of space missions to Mars in 2004 exceed the normal capacity of the National Aeronautic Space Administration's (NASAs) Deep Space Network. CSIRO will provide tracking facilities to NASA using the new receiver and improved reflecting surface.

Key Insights into the Twinkling of 'Radio Stars'

Outputs:

Careful observations over several years have resulted in clear signatures of 'radio twinkling', addressing a theoretical problem associated with the variability of certain cosmic radio sources.

Outcomes:

This research has led to a greater understanding of the material in interstellar space in our Galaxy.

High Sensitivity Survey of Radio Sky

Outputs:

A new type of signal processor developed using integrated circuits with analog rather than digital multiplication and operating at speeds approaching 10 billion operations per second has been installed on the Australia Telescope Compact Array.

Outcomes:

At shorter wavelengths the patch of sky, which can be seen at once, gets so small that a survey of a significant part of the whole sky would take decades of continuous observations. This new equipment improves the sensitivity in this waveband enough to do such a survey in a few weeks. This will contribute important new knowledge of the radio sky at short wavelengths.

New Antenna Configuration for the Australia Telescope Compact Array

Outputs:

A new antenna configuration, incorporating construction of the new 'North Spur' rail track, will enable the Australia Telescope Compact Array (Narrabri, NSW) to operate at short radio wavelengths.

Outcomes:

Effective radio images can now be made at shorter wavelengths than previously possible.

New Wavelength Band Available on the Australia Telescope

Outputs:

The six antennas of the Australia Telescope Compact Array have been equipped with radio receiving systems covering a wavelength band from 11.5 to 18.8 millimetres, based on amplifiers designed by CSIRO.

Outcomes:

The new instrument capabilities are available to all National Facility users and a new piece of the radio spectrum is available for Southern Hemisphere astronomy. The systems address the need to measure the southern sky over a wide range of wavelengths in order to obtain more complete astrophysical information about the Universe.

New Measurements of our Galactic Neighbourhood

Outputs:

Data from the HI Parkes All-Sky Survey on the Parkes telescope have been used to make a new high-resolution image of the Magellanic Stream. This is a stream of gas pulled out from the Magellanic Clouds by their mutual gravitational interaction with the Milky Way.

Outcomes:

The new data show that the Magellanic Clouds have been bound for at least two orbits, allowing a better understanding of the history and assembly of our local system.

Weight Loss Diets with Health Benefits

Outputs:

Credible scientific evidence from clinical trials demonstrating that a higher protein/low-fat diet is more effective for weight loss than a high carbohydrate/low-fat diet. Health benefits of a higher protein/low-fat diet in relation to the moderation of risk factors for cardiovascular disease and diabetes were also demonstrated.

Outcomes:

The availability of scientifically valid weight loss guidelines for 'at risk' groups may contribute to a reduction in the incidence of significant diseases such as diabetes and cardiovascular disease, which are currently on the rise in Australia.

Meal Replacements for Weight Loss

Outputs:

Credible scientific evidence has been produced which demonstrates that meal replacements are effective in weight loss diets and easier for many people to sustain, compared to other forms of diet.

Outcomes:

This information may assist a greater number of Australians to lose weight successfully, contributing to a reduction in the incidence of significant diseases such as diabetes and cardiovascular disease, and may encourage the food industry to develop further innovative meal replacement products with health benefits.

Important Information for New Cancer Therapies

Outputs:

The three-dimensional structure of the ErbB2 receptor, a protein known to be involved in several types of cancer including about 30 per cent of all breast cancers, has been revealed. Understanding how such proteins activate the uncontrolled growth of cells is the key to developing new cancer therapies.

Outcomes:

Researchers can now consider ways to block this action and stop the signal for cell growth. The ultimate objective is to design precisely targeted drugs which sabotage the operation of this receptor family. This has potential benefit for the pharmaceutical industry and significant long-term benefits for human health.

Towards Drugs that 'Switch off' Disease

Outputs:

Researchers have drawn a three-dimensional map of a protein known as the Interleukin-6 Receptor, which is thought to be involved in diseases such as cancer, osteoporosis, rheumatoid arthritis and some autoimmune diseases. A theoretical model of how the receptor interacts with the Interleukin-6 hormone to initiate biochemical changes in cells has been developed.

Outcomes:

This knowledge creates the potential to design a host of therapeutic agents to interfere with or augment the biological activity of Interleukin-6. This has potential benefit for the pharmaceutical industry and enormous longer term potential benefit to community health, following the development of new drugs which contribute to 'switching off' major diseases.

Landmark Discovery for Rational Drug Design

Outputs:

The three dimensional structure of an important protein called the epidermal growth factor receptor, which exists on cancer cells. These molecules communicate in different and more subtle ways than had been thought, contributing to the kind of abnormal cell activity associated with diseases such as cancer and psoriasis.

Outcomes:

The findings pave the way for the discovery of a new class of anti-cancer drugs based on rational drug design. This has potential benefit for the pharmaceutical industry and, in the longer term, the ready availability of new therapy options will have a significant human health benefit.

Supporting Bushfire Control

Outputs:

Sentinel is an end-to-end satellite data reception, processing and web delivery system that provides synoptic coverage of Australia's likely fire situation and direct access to vital information on approaching fires in remote and regional Australia. It locates satellite-detected 'hotspots' up to four times every 24 hours.

Outcomes:

Sentinel mapping provides improved speed of delivery of information, supporting bushfire strategic control, informing fire-fighting resource allocations and operational planning, leading to improved safety. It represents a world-first in delivery of satellite derived information.

Machine Washable Wool Blend Suits

Outputs:

A machine washable 60 per cent wool, 40 per cent polyester suit with particular appeal for younger consumers has been developed.

Outcomes:

This opens a completely new market segment for a range of structured wool rich, machine washable garments with improved wear performance. Increased demand for Australian wool should result.

Output Group: Sustainable Minerals and Energy

Sensitive Detectors for Mineral Exploration

Outputs:

LANDTEM is the world's first commercial high temperature superconducting quantum interference device (SQUID) for use in detecting highly conducting ore bodies such as nickel, gold and silver to depths of one metre.

Outcomes:

LANDTEM has been licensed to an Australian small-to-medium enterprise, Outer-Rim Exploration Services, and has successfully detected nickel ore bodies in Australia and China that would have been otherwise missed. An early system assisted with the delineation of the BHP-Billiton Cannington Silver Mine worth \$2 billion.

Mapping Iron Ore Dust on Mangroves

Outputs:

A method for quantitatively mapping the distribution of iron ore dust on mangroves around the iron ore handling facilities at Port Hedland has been developed. The method makes it possible to operationally obtain spatially comprehensive dust measurements from airborne imaging spectrometers for routine environmental management.

Outcomes:

The method allows non-invasive, accurate and cost-effective monitoring of dust levels around mining facilities, reducing the risk of environmental damage to sensitive mangroves.

Managing Power Station Emissions

Outputs:

Advice was provided on the frequency and magnitude of power station contributions to photochemical smog in the greater Sydney region. Improved detailed chemistry models and meteorological models (coupled models) were developed.

Outcomes:

This project enabled the power industry to quantify the impacts of interregional transport of emissions and this is now being considered by the NSW Environment Protection Agency in the formulation of their policy on a NOx trading scheme.

Hybrid Coal and Gas Turbine System

Outputs:

A device for burning low-concentration methane ventilation air from underground coal mines has been produced. The system incorporates a proof-of-technology prototype rotating kiln, heat exchanger and 240 kilowatt output gas turbine. New 10 and 100 megawatt gas turbine systems have also been developed.

Outcomes:

The ventilation air, which is not suitable for direct use as fuel, is mixed with waste coal to produce heat for a gas turbine powered electrical energy generator. The system produces on site power, reduces the cost of managing waste coal and has significant potential to reduce Australia's greenhouse gas emissions. (more information see page 31)

Improving Mine Safety in the Bowen Basin

Outputs:

A three-dimensional model of 2 500 square kilometres along the western side of the coal-rich Bowen Basin has been constructed. The results have been widely presented and freely distributed on CD. Additional confidential reports, maps and computer models have been provided to mines operating in the project area.

Outcomes:

The model is used for geological and structural hazard identification ahead of mining. New knowledge of regional and local patterns in structure, geology and gas distribution reduces overall costs and improves mine safety.



CSIRO Exploration and Mining scientists Dr Renate Silwa (left) and Dr Joan Esterle examine data used to construct the Bowen Basin supermodel. Photo: CSIRO Exploration and Mining

Determining the Thermal History of the Earth's Crust

Outputs:

A new method of determining the thermal history of the Earth's crust has been developed. It incorporates improved and automated hardware, expanding the range of minerals that can be studied, and an expanded database that allows investigation of cooling histories over a wider temperature range than before.

Outcomes:

The method provides increased analytical precision and lower-cost exploration. Solutions have been provided to previously unaddressed problems such as the timing of mineralisation or exhumation of an ore deposit, the origin of archaeological artefacts and the timing of the most recent fluid circulation through a proposed nuclear repository site.

Rapid, Automatic Mapping of Minerals in Drill Core

Outputs:

A new spectrometer/core handling/imaging system supported by automated interpretation software has been developed. The system provides quantitative information to improve ore grade prediction, guide metallurgical processing, enhance understanding of ore controls and avoid environmental hazards, for selected deposit types.

Outcomes:

The system reduces the cost and time to gain relevant ore grade and metallurgical information and increases the objectivity and repeatability of core logging. Early recognition of deleterious minerals reduces both the economic risk of poor recovery of ore and potential environmental or health risks.

A Hybrid Solar and Natural Gas Demonstration Facility

Outputs:

A concept for embodying solar energy in the form of gas, so that it is storable, transportable and able to be used in a wide range of energy applications has been demonstrated successfully.

Outcomes:

The facility won the 2002 Engineering Excellence Award in the Environmental category from the Australian Institution of Engineers, Sydney Division. The heart of the system, the chemical reactor, is much simpler and costs less than alternatives under development overseas. All emissions associated with conventional electricity generation are avoided.

Mineral Bioprocessing

Outputs:

Novel leaching microbes that leach copper from chalcopyrite at high temperatures and methods to monitor microbes in leach heaps. New assays for detection and quantification of leaching bacteria. Improved understanding of leaching chemistry.

Outcomes:

World-class centre of excellence in mineral bioprocessing established in CSIRO.

Hornsby Library Project

Outputs:

New technology that uses the waste heat from a gas-powered electrical generator to dehumidify and cool the ventilation air supply, demonstrating the potential for dehumidification technology to assume a prominent role in low-energy air-conditioning applications.

Outcomes:

The system is being implemented for the Hornsby municipal library in NSW. The cogeneration plant will serve most of the power and air conditioning needs of the library and approximately halve the building's present greenhouse emissions.

CSIRO Energy Centre Newcastle

Outputs:

CSIRO has completed the construction of its new Energy Centre in Newcastle, NSW. It is a facility for demonstrating significant energy reduction in areas of widespread application in new and existing buildings and a facility for the research, development and demonstration of new technology in low-emissions electricity.

Outcomes:

The Centre enables a wide variety of businesses and the public to get involved in the push for greater energy efficiency and cleaner electricity generation in an environment where the technology can be taken from concept through to demonstration.

Laser Micropyrolysis Facility

Outputs:

CSIRO's enhanced laser micropyrolysis facility is capable of analysing individual solid bitumens in petroleum reservoir rocks. It provides a unique micro-chemical analytical service to the petroleum industry that bridges the gap between microscopy and bulk analysis techniques.

Outcomes:

The oil exploration risk for a major multi-national oil company has been reduced due to the new understanding of oil migration events and the relationship between macro and micro-solid bitumens.

Petroleum Reservoir Seals

Outputs:

New approaches have been developed to identify, quantify and mitigate risks associated with the integrity of the rocks and structures that provide the seals to naturally occurring oil and gas reservoirs. Outputs include new methods for evaluating stress history and have made a major contribution to the Australian Seals Atlas.

Outcomes:

Partners in the consortium funding this work under the auspices of the Australian Petroleum CRC have adopted the tools and approaches to lower risk and increase exploration success.

Improving Petroleum Prospectivity

Outputs:

A new analytical facility provides more accurate evaluation than previously available of the low temperature cooling histories and hence the petroleum prospectivity of a number of Australian sedimentary basins.

Outcomes:

The basin evolution models that underpin petroleum exploration are being refined with this more accurate information on the thermal histories of the basins, leading to a reduction in exploration risk for petroleum exploration and production companies.

Timor Sea Database

Outputs:

An internally consistent, quality controlled, searchable database of fluid inclusion datasets from more than 70 Timor Sea exploration wells has been incorporated within a custom built geographic information system. It provides improved data delivery and visualisation capability, with better ability to compare results against conventional datasets.

Outcomes:

The data are routinely used by oil and gas companies to lower risks associated with migration and retention of hydrocarbons, leading to an increase in exploration success.

Seismic Inversion Software

Outputs:

New open-source software has been developed to refine estimates of petroleum reservoir structure and properties using seismic data.

Outcomes:

The software provides improved estimates of the structure and properties of potential petroleum reservoirs prior to drilling. It has been used successfully to evaluate prospects and known reserves in Gulf of Mexico fields operated by BHP-Billiton.



The team at the Queensland Centre for Advanced Technologies have developed the automation controls for this underground ore carrier from Northparkes Mine. Photo: Northparkes Mine

Automated Guidance System for Underground Vehicles

Outputs:

CSIRO has collaborated to produce a design of the first commercial guidance system for automated underground vehicles and provided specialised consulting, risk analysis and training for transfer of the technology and its application during production trials at Olympic Dam Operations and Northparkes Mine.

Outcomes:

The new system, MINEGEM, was launched in April by Dynamic Automation Systems – a new high technology company established in Australia with the support of Caterpillar for export. It reduces human exposure to diesel and dust particles and the risk of injury or death. It also provides a 40 per cent improvement in the productive time of the underground loader.

QemSCAN sale to Brazil

Outputs:

CSIRO's QemSCAN technology allows rapid identification of minerals. It has recently been installed at Brazil's largest mining company, CVRD, for use primarily in the areas of ore characterisation and process optimisation in the base and precious metals areas of the business. The installation was completed in record time.

Outcomes:

QemSCAN is now owned by each of the world's four largest mining companies. The technology is expected to recoup the million dollar plus investment by CVRD in less than 18 months by providing the company with a deeper understanding of their ores and refining processes. (more information see page 30)

Low Frequency Microwave (LFM) Moisture Analyser

Outputs:

The LFM moisture analyser is suitable for a wide range of applications that are out of the reach of conventional analyses – including thick coal beds, iron ore, mineral concentrates, and materials with high moisture levels.

Outcomes:

Results of on-line moisture measurement trials of the LFM moisture analyser by BHP-Billiton's Iron Ore operation are very promising. Accurate measurement of moisture content is vital for bulk ship loading operations that handle millions of tonnes of coal and iron ore per annum.

New Process to Revitalise Ilmenite Resources

Outputs:

A new ilmenite upgrading process, known as the NewGenSR process, can produce synthetic rutile products exceeding 94 per cent titanium dioxide, irrespective of the ilmenite grade.

Outcomes:

The technology has been successfully tested and is being adopted by Iluka Resources, the world's largest producer of synthetic rutile by the Becher SR process. It will mean increased utilisation of Australia's ilmenite resources, and will allow the processing of different ilmenite grades with the one technology.

Benefits from Parker Centre Research

Outputs:

An assessment of 62 individual projects undertaken for the international minerals industry by the AJ Parker CRC for Hydrometallurgy was conducted recently. The Centre includes CSIRO Minerals, Curtin University of Technology (including the WA School of Mines), Department of Industry and Resources (WA), Murdoch University, and the University of Queensland.

Outcomes:

Respondents provided dollar benefit estimates for 30 projects. Combined operating and capital savings produced a realised benefit of \$34 million from direct research costs to clients of about \$3 million. The estimated benefits for R&D not yet implemented were estimated at \$174 million.

Capturing Fugitive Emissions at Source

Outputs:

A computational fluid dynamics (CFD) model that accurately models the behaviour of the zinc slag fumer at Pasminco's Port Pirie smelter.

Outcomes:

The model allows the testing of modifications without the expense of repeated cycles of shutdown, modification and trial. A new hood design is now operating successfully, allowing the fume to be captured at source. Emissions from the smelter have been cut by 65 per cent over the past year.

Windscape® – Windlab Systems

Outputs:

WindScape® is a large-area, high-resolution wind resource mapping system used for pre-planning and policy development at state and local government levels. Windscape® fills a gap in the knowledge of wind resources suitable for commercial wind energy that has hampered development potential worldwide.

Outcomes:

Windscape® shortens the time from prospecting to construction of a wind farm by 18 months and reduces development costs by up to 20 per cent. Windlab Systems was created to take Windscape® to a global market. Several businesses and the Sustainable Energy Authority of Victoria have adopted WindScape® as an integral part of their services.

Output Group: Environment and Natural Resources

Regional Sources and Sinks of Pollutants and Greenhouse Gases

Outputs:

CSIRO's Greenhouse Gas Modelling Team has developed the regional inversion technique, using innovative mathematics to estimate pollutant emissions at regional scale from atmospheric measurements at a few locations.

Outcomes:

The technique provides a methodology for verifying greenhouse gas emission inventories for policy application in greenhouse gas accounting and regulation of pollutant emissions.

Recent and Long-term Greenhouse Gas Records

Outputs:

CSIRO has interpreted a decade of global atmospheric greenhouse gas measurements and is extending high-resolution records of atmospheric composition to 11 000 years before the present using Antarctic ice cores.

Outcomes:

Informing policy through knowledge of the natural and anthropogenic causes of variations in climate-changing and ozone-depleting gases. For example, carbon dioxide growth rate maxima in the 1990s were traced to significant releases from biomass burning events rather than from natural variations as previously thought.

Better Global Climate Modelling

Outputs:

The Mark 3 Global Climate Model has been developed incorporating the atmosphere, oceans, cryosphere and biosphere. The model has improved horizontal resolution, more vertical levels through the atmosphere, more sophisticated cloud simulations and improved descriptions of ocean and sea ice physics.

Outcomes:

The model provides improved assessments of how Australia's climate may change over 100 years due to rising greenhouse gas concentrations, and more accurate regional forecasts of seasonal changes over several months.

Climate Change Impact Assessments

Outputs:

Assessments of future changes in temperature, extremes (heat stress, incidence of frost, duration of snow cover) have been provided on a regional basis, and likely increases of extreme precipitation events have been identified.

Outcomes:

The results have been used to underpin climate change policy responses by Commonwealth, State and Territory Governments, and decisions by local Councils and industry associations. New adaptation methods, identification of thresholds and cost-benefit analyses have been developed through stakeholder consultations.

Lifecycle Analysis of Vehicle Emissions

Outputs:

Emissions have been quantified over the full lifecycle of a vehicle – including production, transportation to distribution centres, and in-vehicle combustion – for fuels such as ethanol and other biofuels that are the major alternatives to diesel for heavy vehicles in Australia.

Outcomes:

The results provide decision support for the Diesel Alternative Fuel Grants Scheme. The techniques are also applicable to fuels for light vehicles, informing policy and planning in relation to national issues including air quality and Australia's greenhouse gas emissions.

Tailored Weather Forecasts

Outputs:

New weather forecasting software delivers user-friendly displays of meteorological observations and model forecast data, and provides tailored weather forecasting at small geographic scales for specific purposes.

Outcomes:

Faster and more detailed forecasts provide an improved basis for making decisions influenced by the weather. This was exemplified

by the use of the system under contract to the America's Cup winning crew, *Alinghi*. The technology is also being applied to other sectors, such as determining energy demand.

Identifying Sites for Marine Protected Areas

Outputs:

A suite of information that interprets the physical and biological features of the South East marine region has been provided for regulators, industry, conservation organisations and other stakeholders. It is in a form useful for identifying representative areas for conservation and testing the implementation of Australia's Oceans Policy.

Outcomes:

The information enables candidate sites for marine protected areas to be identified on the basis of credible scientific information and assessment. There is now greatly increased understanding amongst many groups, which will flow into more effective processes to identify conservation areas for other marine regions.

Monitoring Ozone-Depleting Gases

Outputs:

Measurements of chlorofluorocarbons (CFCs), methyl bromide and other ozone-depleting chemicals have been taken from clean air at the Cape Grim Baseline Station, operated by the Bureau of Meteorology in a joint program with CSIRO. CSIRO observations from Antarctic ice samples show that CFC concentrations increased continuously for 50 years before peaking in 2000.

Outcomes:

The measurements confirm the effectiveness of global adherence to the Montreal Protocol. With the consequent decrease in CFCs, ozone levels over southern Australia and New Zealand have stopped declining and UV levels have stopped increasing.



Dr Paul Frazer decants a sample of air taken from the Cape Grim outpost on the southern tip of Tasmania as part of an international project to monitor CFCs in the atmosphere and the Ozone layer.

Photo: North Sullivan Photography

Seasonal Climate Predictions

Outputs:

CSIRO in partnership with the Bureau of Meteorology has developed a Predictive Ocean Atmosphere Model that provides improved seasonal climate predictions, based on coupled model forecasts of equatorial Pacific ocean temperatures. CSIRO developed and validated the ocean component of the coupled system, based on a state-of-the-art model with enhancements by Australian researchers (Australian Community Ocean Model).

Outcomes:

Experimental forecasts are now published on the Bureau of Meteorology web site. More reliable and longer lead-time climate forecasts enhance the competitiveness and profitability of climate-dependant industries, and enhance the ability of Australian industry and government to respond to climate events such as drought.

Bathing Frogs for Conservation

Outputs:

A special 'bath' and a range of tests that can detect the *chytrid* fungus on frogs have been developed. This fungus is believed to have been a major contributing factor in the extinction of eight species of frogs and has been detected on over 100 species.

Outcomes:

The technology has been transferred to the University of California (Berkeley, US) and other international research centres, providing researchers and conservationists around the world with a new tool to help better respond to the threat posed by the *chytrid* fungus.



A Great Barred frog takes a bath to detect the *chytrid* fungus.
Photo: Frank Filippi, CSIRO Livestock Industries

Australia's Contribution to the World Ocean Circulation Experiment

Outputs:

Australian scientists played leading roles in the World Ocean Circulation Experiment (WOCE) which concluded in 2002. It provided the first global 'snapshot' of the ocean circulation and its variability, and fundamental understanding of its role in Australian and global climate, providing the foundation for the next generation of improved climate models.

Outcomes:

The 12-year long study has revolutionised our understanding of ocean circulation and its role in the climate system. Australia's participation provided the primary material for reports of the Intergovernmental Panel on Climate Change, ensuring that Australian and international policy on climate was informed by high quality science.

Sustainable Harvest Strategies for Wild Fisheries

Outputs:

A Management Strategy Evaluation modelling framework for South West Pacific swordfish populations has been provided to the Australian Fisheries Management Authority (AFMA). The model predicts the performance of the fishery under different management strategies.

Outcomes:

The model was used by the AFMA as a critical input into decisions on the Total Allowable Effort for the East Coast Tuna and Billfish Fishery which has an annual value of \$86 million.

Bushland on Life Support

Outputs:

Scientists can now identify the minimum number of plants required in plant populations to avoid problems associated with inbreeding, and make recommendations on which tree species to grow with which specific naturally occurring soil bacteria to provide the maximum benefit for reestablishment of new areas of native vegetation.

Outcomes:

This knowledge can help landholders achieve greater success in their tree planting projects, which in turn will help reduce the problems brought about by land clearing in the first place and contribute to restoring the genetic viability of native plant populations.

Understanding the Climate of Australia's South-West

Outputs:

New approaches to analysing climate data were developed using emerging ideas in climate and statistical science. These have provided greater understanding of influences on water supply and agriculture for long-term policy making, together with in-depth knowledge of factors influencing the drying trend in south-west Western Australia.

Outcomes:

Western Australia's new water strategy is now underpinned by a substantial body of research focussed on the State's most populous region, the south-west, enhancing the security of water supplies and strengthening strategies to protect Perth's groundwater system.

Carbon Dioxide Sequestration

Outputs:

Significant advances have been made in understanding the behaviour of carbon dioxide (CO₂) in deep saline formations. In particular, it is now understood that containment of buoyant CO₂ is only necessary until it dissolves, which may be only a few thousand years. This is highly significant because it greatly increases estimates of the capacity and availability of suitable storage sites in Australia.

Outcomes:

Increased confidence in the identification of possible sites for long-term geological storage of CO₂ to mitigate the greenhouse effect.

Assessing the Health of the Murray River

Outputs:

A new decision support system – the Murray Flow Assessment Tool (MFAT) – provides scientifically robust, comparable, repeatable and transparent ecological assessments in support of the Murray-Darling Basin Commission's Living Murray initiative to investigate multiple river flow scenarios.

Outcomes:

Assessments of river health made using MFAT form the basis of scientific advice to the Murray-Darling Basin Commission and the Murray Darling Basin Ministerial Council. Council will consider this advice in October 2003 when they deliberate upon how to achieve the best balance between river health and consumptive water use.

Dam Ea\$y Software

Outputs:

Dam Ea\$y is a software package to help support decision making regarding the costs and benefits of incorporating on-farm water storages into existing sugarcane farm enterprises in the Bundaberg catchment.

Outcomes:

'Accredited' users help irrigators make better decisions about whether to invest in an on-farm water storage, and if they do, what size storage would best meet their specific needs, risk profile and goals. Nitrate leaching (and hence groundwater pollution) is reduced through better management of water and nitrogen.

Framework for Specification of Water Entitlements, Allocations and Conditions of Water Management

Outputs:

A new framework for assessing the appropriateness of water reforms and the most cost-effective way to sequence them has been developed. This framework delivers an understanding at the Commonwealth, State and industry level that it is possible to establish a robust way to define water property rights and a simpler water management system.

Outcomes:

The ideas and concepts have been widely adopted in debates on water rights issues around Australia, and key concepts incorporated in government policy documents. Opportunities to reduce transaction costs associated with water trading have been identified and risks associated with current systems identified.

Indian Ocean Climate Initiative

Outputs:

The Indian Ocean Climate Initiative provides improved understanding and definition of interseasonal to interdecadal climate variability, and develops seasonal outlooks relevant to south-west Western Australia. The initiative was formed in November 1997 and begins its second stage in July 2003.

Outcomes:

Improved understanding of our climate helps ensure that water service providers can confidently develop and manage water sources to meet requirements in the face of climatic variability, minimising the potential costs of water restrictions and contributing to improved management of environmental and social outcomes.

Global Reference Status for the Lower Murrumbidgee

Outputs:

A range of innovative hydrologic, integrated hydrologic-economic and community education tools have been developed and are helping to promote policy development and dialogue between regulators, irrigation companies and farmers. The tools employ a new approach in which hydrologists, water resources managers and water law/policy experts work together.

Outcomes:

Recognising the unique problem-driven and the client-responsive nature of this work, the United Nations Educational Scientific and Cultural Organisation (UNESCO) and the World Meteorological Organisation have designated it and the Lower Murrumbidgee catchment as the first global reference in its existing network of catchments under the Hydrology for Environment, Life and Policy (HELP) program.

Community Ecology Training Manual

Outputs:

The first comprehensive manual has been produced that sets a benchmark for studies of rodents across Southeast Asia and the Pacific. It describes the significance of pest and non-pest rodents, methods for studying biology, taxonomy, ecology, breeding, capture-mark-release, assessment of damage, parasites and diseases and a review of the main pest species in Southeast Asia and the Pacific.

Outcomes:

The manual fills an important gap in knowledge, building the capacity of students (undergraduate and postgraduate) and government staff to undertake safe and effective research including studies of the impact of rodent diseases on humans.

Output Group: Agribusiness and Health

Surviving the Drought

Outputs:

GrazFeed is a user-friendly decision support package for interpreting the Australian Feed Standards for grazing livestock. It has been modified to incorporate early weaning as a drought-management strategy. Examples of how to calculate the levels of nitrogen and phosphorous available for post-drought crops, and formulae for individual farms are provided.

Outcomes:

GrazFeed assists graziers to minimise drought debt due to feed costs, improve budgeting of options if breeding stock are retained during drought, and avoid underestimating nitrogen levels which can lead to growers sowing an inappropriate crop – a potentially critical mistake for farms recovering from drought.

Bayer CropScience Alliance

Outputs:

CSIRO's alliance with Bayer CropScience was first established in 1998 and has already seen significant scientific advances including innovations in the control of insect pests, cotton fibre development and the mechanisms that control seed development.

Outcomes:

The success of the Alliance saw it extended in March 2003 in an agreement that will grow Australia's R&D capabilities and deliver further benefits to cotton growers – including new cotton varieties that reduce the need for insecticides, have higher and more reliable yields, and produce a higher quality product.

Strong Payoff from Plant Industry Research

Outputs:

In the second half of 2002, CSIRO commissioned four analyses of plant industry related research from the Centre for International Economics: research in plant breeding and pest management for cotton; decision support for the nutritional management of grazing livestock; using canola in crop rotation; and mechanical pruning of grapevines.

Outcomes:

All analyses demonstrated that industry has benefited substantially with benefit-cost ratios ranging from 26:1 to 70:1 and net present values of benefits from \$247 million to \$5.2 billion in the case of the cotton industry. Benefits were primarily due to improved yields and the adoption of more efficient, less risky management strategies.

Release of Gene Silencing Tools

Outputs:

CSIRO has released molecular tools for identifying the function of thousands of genes quickly and accurately to promote major advances in biotechnology and agriculture. The tools – called gene-silencing vectors – are available free-of-charge to not-for-profit organisations for research use.

Outcomes:

The tools allow high-throughput and highly efficient gene silencing – a technique used internationally to study whole genomes by ‘switching off’ selected genes. This enables the effect of a gene in an organism to be determined confidently, and once its function is known, decisions on how to use this information.

Resisting Rust in Cereal Plants

Outputs:

The first cloning of a rust avirulence gene has been achieved. This is a gene that allows a plant to mount a resistance response against rust. Rusts are the most important fungal pathogens of cereals and crops such as flax.

Outcomes:

This achievement creates new and exciting opportunities to design novel methods of preventing pathogen growth and to confer a more robust resistance to rust disease in plants.

Field Test for Beef Tenderness and Feedlot Performance

Outputs:

A quick, simple, objective, electronic measurement that breeders and feedlotters can use early in an animal's life to identify animals that will perform well in a feedlot or to breed for improved beef quality has been developed. Animals no longer need to be slaughtered and their beef sampled to identify animals carrying superior genes for beef tenderness.

Outcomes:

The test has been commercialised by Ruddweigh Australasia Pty Ltd. It is being delivered to industry via Australia's beef genetic evaluation scheme BREEDPLAN. Use of the measurement enables breeders to target markets that require a guarantee of the eating quality of beef.

DNA Test for Beef Tenderness

Outputs:

A DNA test for genetic variation in beef tenderness has been developed. Tenderness is one of the most important aspects of meat quality for consumers yet the grading of beef deals with surrogates to try to predict meat tenderness.

Outcomes:

The technology has been licensed to Genetic Solutions – an Australian startup company that is now entering international markets. More than four thousand tests have been performed for the high value breedstock industry since the launch in November 2002. (more information see page 28)

A Test for Infectious Bursal Disease Virus in Poultry

Outputs:

A new diagnostic test that is able to quickly identify and differentiate very virulent forms of infectious bursal disease virus from other types is now available. These very virulent forms cause significant economic losses to poultry industries around the world but are exotic to Australia.

Outcomes:

A test to easily differentiate very virulent forms of the virus was previously not available. Such a test would be highly beneficial in case of an exotic incursion and in control measures introduced to curtail its spread and minimise economic impacts on the sustainability of the local poultry industry.

Rapid Diagnosis of Newcastle Disease in Poultry

Outputs:

Improved molecular diagnostic capabilities and techniques for the rapid diagnosis of Newcastle disease have been developed along with improved understanding of the origin of virulent strains of the virus causing the disease in Australia.

Outcomes:

The poultry industry and Australian Government used CSIRO advice to design a national vaccination campaign, launched in 2002, which will help to minimise the risk of future outbreaks of disease, and the need for strict local control measures including the destruction of large numbers of birds.

Commercialising Livestock Vaccines and Therapeutics

Outputs:

Viral vector systems to deliver bioactive molecules to production animals have been developed, along with therapeutics and vaccines to control disease and promote the health of chickens and pigs housed under production conditions.

Outcomes:

A spin-off company, VectoGen, has established commercialisation agreements with major veterinary pharmaceutical companies. The use of improved therapeutics results in increased production and decreases the need to use antibiotics as growth enhancers in intensive production species.

Identifying Trees with Remote Sensing

Outputs:

Tree Identification Methodology Based on Remote Sensing (TIMBRS) is a commercially available software package designed to undertake the automated identification and delineation of individual tree crowns. It provides whole-of-estate assessment at the individual tree scale from aerial digital imagery.

Outcomes:

TIMBRS optimises ground based forest inventories and increases the objectivity and efficiency of remote forest resource assessment, facilitating improved forest management decision-making across a range of management levels.

Greenhouse Resource Kit for Private Forest Growers

Outputs:

A new resource kit with critical information and links to further sources of information to assist private growers and their advisers with decisions on tree plantings for positive greenhouse impacts is now available as a printed compendium, a CD or online.

Outcomes:

The kit will assist growers to achieve profitable tree farming with positive environmental services, through the development of effective carbon sinks on private land, enhancement of biodiversity outcomes, and amelioration of salinity.

Making Farm Forestry Species Selection Easier

Outputs:

A book including descriptions of climatic requirements of 27 tree species and maps showing broad regions of Australia where particular species may perform well based on climate factors is now available in hard copy or downloadable from the internet.

Outcomes:

Improved matching of species to sites assists the establishment of successful farm forestry systems, particularly in lower rainfall areas and other challenging sites around Australia, with flow-on benefits associated with carbon sequestration, biodiversity conservation, salinity mitigation and water quality management.

Domestication of Prawns for the Aquaculture industry

Outputs:

Protocols for health-screening wild prawn stock captured in the Gulf of Carpentaria and for screening the progeny have been developed. Molecular screening and histology has provided new insights to the variation in the occurrence of different viruses among wild stocks of *Penaeus monodon* captured from different geographical regions.

Outcomes:

This nationally co-coordinated approach to improving the quality of prawn seed stock, with collaboration between the Fisheries Research and Development Corporation, CSIRO, the Australian Institute of Marine Science, Queensland Department of Primary Industries, the Australian Prawn Farmers Association and industry partners, will ensure that the benefits of the research flow on to the whole of the Australian prawn farming industry.



CSIRO Livestock Industries scientist Dr Jeff Cowley examining a high-health giant tiger prawn from the Gulf of Carpentaria. Photo: University of Queensland

Conserving Genetic Diversity in Regenerated Native Eucalypt Forests

Outputs:

Research into the impacts of harvesting and regeneration in a mixed eucalypt forest has confirmed that minor species representation may decline unless a minimum number of seed trees are retained. It has been established that the number of seed trees of minor species per standard size logging coupe is an effective indicator of the genetic sustainability of forest regeneration practices.

Outcomes:

This knowledge will help prevent the loss of genetic diversity, tree decline and inbreeding among minor species in mixed eucalypt forest after harvesting and regeneration.

Design Criteria for Safer Fire Trucks

Outputs:

Recent research has provided crucial information about the effectiveness of water spray systems, that is required to develop a thoroughly tested fire truck protection system, involving water sprays, radiation shields and cabin sealing. Reports have been delivered to clients on specific systems or components tested under simulated bushfire conditions.

Outcomes:

The rapid cycle of test and development possible with the bushfire simulator has resulted in much improved performance of prototype systems. State fire management organisations are better positioned to specify fire truck protection systems for improved fire fighter safety and, over time, to incorporate these improvements in their fleets. (more information see page 34)

Assessing Carbon Storage in New Plantations

Outputs:

The software model, FullCAM, is used to assess net carbon uptake by both forests and agricultural systems. For forestry applications it links four sub-models and incorporates new knowledge of how carbon levels will change in litter and soil.

Outcomes:

The model was developed for the National Carbon Accounting System section of the Australian Greenhouse Office and is being used to inform the implementation of emission trading and offset schemes designed to reduce global greenhouse gas emissions. Credible estimates of carbon uptake are essential for this purpose.

Controlling the Shoot Borer in the Forests of the Asia-Pacific

Outputs:

Techniques have been developed for reducing the impact of the shoot borer, *Hypsipyla robusta*, an insect pest feeding on species of *Meliaceae* in the Asia-Pacific region. Superior seed lots have been identified. New understanding of mechanisms of resistance has been achieved and will form the basis of improvements in the forestry of tree species affected by the shoot borer.

Outcomes:

Improvements in entomology and data handling skills of foresters in developing countries are apparent in workshops conducted over a three year period. The risk of plantation failure will be reduced as practitioners adopt the strategies suggested by research outcomes in a major report delivered in January 2003.

Eliminating Pesticide Residues

Outputs:

CSIRO, in conjunction with Orica Australia Pty Ltd and Horticulture Australia Ltd, is developing an enzyme bioremediation technology for the clean-up of pesticide residues in the environment. Two enzymes that hydrolyse organophosphate insecticides have now been identified. The enzymes are sourced from soil bacteria and insecticide resistant insects.

Outcomes:

The two enzymes have been successfully trialled in the field and transferred to our licensee for commercial development of technology that will be available for use by farmers, dip operators, crop dusting pilots and fruit and vegetable packers, for degrading organophosphate insecticide residues.

Insect Management Strategies in Cotton

Outputs:

The effects of some commonly used farm management practices on the abundance of beneficial invertebrates, such as parasites and predators which attack insect pests of cotton, have been demonstrated. The importance of Area Wide Management (AWM) of insects in cotton crops has also been demonstrated. AWM is the coordination of management strategies of pests and beneficial species across farms on a catchment scale.

Outcomes:

This research is having significant impact on the adoption of Integrated Pest Management (IPM) strategies. Utilising the potential for natural enemies to control cotton pests is reducing on-farm costs, reducing the overall quantity of pesticide use on-farm and reducing the use of 'hard' pesticides.

Recovering High Value Lactose from Whey

Outputs:

An integrated food process that minimises waste, reduces costs and maximises the use of by-product has been developed. The process produces a commercially viable and high value product from whey produced by the cheese industry. A complementary patented process for crystallising lactose into a unique form suitable for high value pharmaceutical applications has also been achieved.

Outcomes:

The process contributes to improved profitability and sustainability of the dairy industry by reducing the costs of disposal of wastes produced in cheese-making, increasing the yield of lactose crystals from whey from 60–75 per cent to 90 per cent, and recovering and recycling 25 per cent more water than the process requires.

National Survey for Prevalence of *E. coli* and *Salmonella* in Cattle

Outputs:

Results from a national survey of the prevalence of *E. coli* 0157 and *Salmonella* in cattle at slaughter have been provided to industry and government in response to United States meat import requirements.

Outcomes:

The meat industry has been able to react quickly and provide up-to-date information in response to export market requirements and recent changes by the US Food Safety and Inspection Services, reducing the risk of problems with market access.

Options for Alternative Sugarcane Supply Arrangements

Outputs:

A unique modelling framework and decision support tools have been developed to promote the improved supply of sugarcane to sugar mills. The modelling framework uses operations research to integrate optimisation models, and the decision tools are based on a participatory research approach that takes a negotiated approach to outcomes, due to multiple stakeholders and competing objectives.

Outcomes:

Several growers reported increases in profit with Maryborough Sugar Factory noting gains of \$34 000 for mill-owned crops. Mackay Sugar reports substantial savings from optimised harvester and siding rosters. Estimated potential gains in 2003 from new operational management practices implemented in the Mourilyan region total \$700 000.

Improving Profitability of Commercial Baking Systems

Outputs:

A mathematical model for optimising the baking process in an industrial oven has been developed. The model uses computational fluid dynamics to describe the relationships between processing conditions and bread quality.

Outcomes:

A major Australian baking company has achieved significant cost savings in operating costs by optimising their ovens using this model. It also contributes to consistency in product quality and efficiencies in energy consumption.

Education and Outreach

CSIRO Education continued to raise awareness of the value of scientific research and to encourage students to take up science careers. Activities involved over 300 000 students, parents and teachers during 2002–03, as well as many more through a weekly national TV program.

An external review of the group's operations was undertaken during the year, with the final report being highly complimentary of the strategic mix of programs, noting the large financial leverage of the group, which earns 75 per cent of its budget externally.

CSIRO Education initiated and undertook the National Kilowatt Count, in conjunction with the Australian Greenhouse Office. The project aimed to raise awareness of energy use by households, and to encourage the community to reduce its use of fossil fuels. Over 10 000 households fully completed the survey and over 2 000 schools requested the school's kit, enabling activities to be undertaken in the classroom and at home. The project was supported by Alcoa World Alumina Australia, Energy Australia and Transgrid.

In December 2002, parts of Australia experienced a total eclipse. CSIRO Education undertook a webcast of the event. The webcast generated great interest with many thousands of people logging on to witness the event. The webcast was supported by Telstra Country Wide.

CSIRO Science Education Centres (CSIROSECs) are located in every capital city plus Townsville. In 2002–03, these Centres catered for over 210 000 students attending workshops, both in the Centres, and through each Centre's 'Lab on Legs' travelling program. CSIROSECs are supported by State and Territory Education Departments as well as a number of universities and corporate sponsors.

CSIRO's Double Helix Science Club offers two magazines, *The Helix* (circulation 13 000) and *Scientrific* (circulation 12 000). Each CSIROSEC provides events and activities for members and their families. *Scientrific* is supported by the Bureau of Meteorology and Alcoa World Alumina Australia.

CSIRO continues to jointly produce a top-rating national science TV program (*Totally Wild*, Tuesdays 4pm, Network Ten). This half-hour program features scientists explaining their research in an entertaining but clear manner, together with activities to try at home. The program reaches over 330 000 people each week.

The CREativity in Science and Technology (CREST) project encourages and supports school students to undertake their own scientific research or technology-based project. Over 6 000 students completed CREST projects this year. The project is supported by Alcoa World Alumina Australia and the National Innovation Awareness Strategy of the federal government.

CSIRO's Student Research Scheme is providing over 450 places for students in 2003. The Scheme places senior secondary students with research scientists and provides a powerful experience that encourages many students to continue or take up further science studies. It is 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.

Science by Email continued its operations with subscriptions now at over 4 500, almost double the number at the same time last year. This weekly science e-newsletter is funded by the Members and Education Credit Union (**mecu**).

CSIRO Education operates a number of other projects including the BHP Billiton Science Awards, providing prestigious prizes for students undertaking research projects and for outstanding science teachers.

The CSIRO Discovery centre has led the way in promoting the 'one-CSIRO' message. It offers visitors an engaging, hands-on experience that provides a snapshot of the achievements and capacity of the entire organisation. Visitors during the year included school children from every state and territory in Australia, with the school programs offered by the centre being extremely well received with educators. Discovery has been increasingly utilised as the means of introducing CSIRO to high-profile overseas visitors and Embassy staff, the general public, business and industry groups. Working with communications, the Discovery staff have also taken on the role of corporate events coordinators for CSIRO.

The CSIRO Media unit actively promoted science and technology stories throughout metropolitan and regional Australia concentrating on print, radio, and television. Around 250 media releases were issued throughout Australia and around the world.

The Media unit is currently undertaking a review into new media opportunities and technologies that will further assist the external promotion of CSIRO. A media evaluation company has been contracted to undertake media analysis for 2002 and then every quarter for the next three years.

CSIRO Publishing produced over 1 500 research papers through 18 peer-reviewed journals and published 50 new book and CD products for global markets working with the Australian Academy of Science and research community.

CSIRO Enquiries Contact Centre is the national interactive communication point supporting all mediums of interaction for the general public, existing customers, and new clients with CSIRO. The centre connects, informs, sources, and delivers information in all connecting areas of science, research, industry, education, publications and much more. The 1300 363 400 number lets you connect everyday with the exciting world of science, and it responds to 40 000 plus calls per annum.

2

Section

Performance

Awards and Honours

In 2002–03, CSIRO scientists won international and national acclaim for the excellence of their work. These awards are further demonstration of our effectiveness in research and its application in industry and the community.

Australian Honours

Order of Australia

Officer (AO)

Dr Judy West (Plant Industry) for service to the advancement of botanical science and research, particularly in the field of plant systematics, to science administration and policy development, and to the establishment of Australia's Virtual Herbarium.

Member (AM)

Dr Jim Davidson (Plant Industry retired) for service to the wheat industry through the development of new winter wheat varieties suitable for cultivation in the higher rainfall and colder regions of Australia.

Dr Edward Hillis (Forestry and Forest Products) for services to the development of wood science and forest products technology, and to the sustainable use of forest resources.

Mr James Woodcock (Minerals) for service to the mining and minerals industries of Australia through research and development work, as an author and editor of technical publications and as a lecturer and mentor.

Public Service Medal (PSM)

Dr Joanne Daly (Entomology) for outstanding public service through the development of Australia's national research priorities, and to science and its application.

Dr Catherine Foley (Telecommunications and Industrial Physics) for outstanding public service for research in physics, as a communicator and promoter of science within the community, and as a role model for women in science.

Australian Awards

Dr Mike Austin (Sustainable Ecosystems) was one of seven Australians named by the Institute for Science Information in the *top 250 researchers* in ecology and environmental science.

Dr Keith Ayotte, Dr Peter Coppin and Dr Nathan Steggel (Land and Water) received the *NSW Energy Smart Green Globe Award* for the best new technology or application in 2002. The Windscape™ team was recognised for its major Australian achievements in renewable energy through the development of a world-leading wind resource mapping system.

The Australian National Insect Collection volunteers (Entomology) received a *National Australia Bank Community Link Volunteer Award* in the Environment, Conservation and Heritage Category for support to the maintenance of the Australian National Insect Collection.

Dr Michael Bange, Mr Darren Linsley and Mr Stewart Whiteside (Plant Industry) won the *Asian Pacific Information-Communication-Technology (ICT) Award* in the Natural Resource Management category 2003 for Cotton LOGIC for Palm OS. This major award recognises innovation in Australian ICT that contributes to the preservation or enhancement of the Australian environment.

Dr Bill Barendse (Livestock Industries) and **Dr Heather Burrow** (CRC for Cattle and Beef Quality) won an award for *Excellence in Innovation* that acknowledged the four innovative technologies that have contributed to guaranteeing beef tenderness.

Dr Myriam Bormans (Land and Water) was one of three winners of the *Biennial Medal 2003* awarded by the Modelling and Simulation Society of Australia and New Zealand in recognition of her outstanding research in in-stream algal and nutrient dynamics. Other award winners included **Dr John Gallant** and **Dr Hua Lu** (Land and Water); **Dr Grace Mitchell** (Manufacturing and Infrastructure Technology); and **Dr Andre Zenger** (Sustainable Ecosystems) who won an award in the category of *(Early Career) Research Excellence* which honours some of the best young and emerging quantitative earth system scientists.

Dr Rob Bramley (Land and Water) was awarded the *Doug Reuter Travel Award* by the Australasian Soil and Plant Analysis Council.

Dr Phil Brown (Mathematical and Information Sciences) as co-author of the paper titled *Wavelet-Based Nonparametric Modelling of Hierarchical Function in Colon Carcinogenesis* won the *Mitchell Prize 2003*. The prize is awarded in recognition of an outstanding paper that describes how a Bayesian analysis has solved an important applied problem.

Mr Ian Brooker, Mr John Connors, Ms Siobhan Duffy and Mr Andrew Slee (Plant Industry and Forestry and Forest Products) won the *2003 Award for Excellence in Educational Publishing* presented by the The Australian and Australian Publishers Association for their interactive CD-ROM, *EUCLID: Eucalypts of Southern Australia*, published by CSIRO Publishing.

Centenary Medals were awarded to:

Dr Norm Adams (Livestock Industries) for service to Australian Society in rural science and technology;

Dr Sukhvinder Badwal (Manufacturing and Infrastructure Technology) for service to Australian society in research and development and energy technology and engineering;

Dr Michael Barber (Corporate, Science Planning) for service to Australian society through university administration and scientific research;

Dr Ray Binns (Exploration and Mining) for services to Australian society in geology and mineral resources;

Dr Trevor Bird (Telecommunications and Industrial Physics) for service to Australian Society in telecommunications;

Dr Brian Bolto (Manufacturing and Infrastructure Technology) for service to Australian Society in environmental science and technology;

Dr Nan Bray (Marine Research) for service to Australian society in marine science;

Mr Alan Brown (Forestry and Forest Products) for service to Australian society in rural science and technology;

Dr Jeremy Burdon (Plant Industry) for service to Australian society in ecology and conservation;

Dr Greg Constable (Plant Industry) for service to Australian society in cotton research;

Dr Liz Dennis (Plant Industry) for a lifetime of excellence in science, in particular for the discovery of the flowering switch gene;

Dr Tom Denmead (Land and Water) for service to Australian society in environmental science and technology;

Dr Ron Ekers (Australia Telescope National Facility) for service to Australian society and science in astronomy and cosmology;

Dr Michael Eyles (Food Science Australia) for service to Australian society in food science and technology;

Dr Andy Green (Exploration and Mining) for services to Australian society in geophysics;

Dr Gary Fitt (Entomology) for service to Australian society in rural science and technology;

Dr Richard Hannink (Manufacturing and Infrastructure Technology) for service to Australian society in materials science and engineering;

Dr Graham Harris (Flagship Programs) for service to Australian society in environmental science and technology;

Dr Elizabeth Heij (Sustainability Network) for sustainable development and science education;

Dr Alan Head (Manufacturing and Infrastructure Technology) for service to Australian society in materials science and technology;

Dr Thomas J Higgins (Plant Industry) for service to Australian society in plant biotechnology;

Dr Rod Hill (Minerals) for service to Australian society in applied mineralogy;

Dr Bruce Hobbs (Exploration and Mining) for services to Australian society and science;

Dr Jon Huntington (Exploration and Mining) for services to Australian society in remote sensing and mineral resources;

Dr Shirley Jeffrey (Marine Research) for service to Australian society and science in algal physiology and ecology;

Dr Raymond Jones (Sustainable Ecosystems) for service to Australian society in plant and animal production and processing;

Ms Yvonne Latham (Land and Water) for service to the community, particularly through research;

Ms Catherine Livingstone (CSIRO Chairman) for service to Australian society in business leadership;

Dr Danny Llewellyn (Plant Industry) for service to Australian society in biotechnology;

Dr Peter Manins (Atmospheric Research) for service to Australian society in meteorology;

Dr Albert Mau (Molecular Science) for services to Australian society in applied chemistry;

Mr Don McDonald (CSIRO Board member) for a substantial contribution to Australia's trade expansion and interests in the trading system;

Dr Trevor McDougall (Marine Research) for service to Australian society and science through marine science;

Dr Laszlo Nemes (Manufacturing and Infrastructure Technology) for service to Australian society in production engineering;

Professor John O'Callaghan (Mathematical and Information Sciences) for service to Australian society in computer science and technology;

Dr John Passioura (Plant Industry) for service to Australian society and science in environmental biology;

Dr Jim Peacock (Plant Industry) for pioneering research on plant development especially the discovery of the flowering switch gene;

Dr Graeme Pearman (Atmospheric Research) for service to Australian society and science in atmospheric research;

Dr John Pitt (Food Science Australia) for service to Australian society in food science and technology;

Mr Mick Poole (Plant Industry) for service to Australian society in plant production and processing;

Dr David Rand (Energy Technology) for service to Australian society through applied chemistry;

Dr John Raison (Forestry and Forest Products) for research on forest ecology;

Dr Subramania Ramakrishnan (Manufacturing and Infrastructure Technology) for service to Australian society in electrical engineering;

Dr Mike Rickard (Livestock Industries) for service to Australian society in animal production and processing;

Dr Ezio Rizzardo (Molecular Science) for service to Australian society and polymer science;

Professor Beverley Ronalds (Petroleum Resources) for service to Australian society in civil engineering;

Dr Ron Sandland (Corporate) for service to Australian society in research and development;

Dr Ian Sare (Corporate) for service to Australian society in metallurgical science and engineering;

Dr Nigel Scott (Plant Industry) for service to Australian society in horticulture;

Dr Ray Smith (Exploration and Mining) for services to Australian society in geology;

Dr Tony Smith (Marine Research) for dedicated commitment to Australian and international fisheries science over many years;

Dr Brian Sowerby (Minerals) for service to Australian society in applied physics;

Dr David Smiles (Land and Water) for service to Australian society in environmental science and technology;

Dr Brian Spies (Exploration and Mining) for services to Australian society in exploration geophysics;

Professor David Trimm (Petroleum Resources) for service to Australian society in chemical engineering;

Dr Neil Turner (Plant Industry) for service to Australian society in environment science and technology;

Dr Brian Walker (Sustainable Ecosystems) for service to Australian society in ecology;

Dr Colin Ward (Health Sciences and Nutrition) for service to Australian society in molecular biology and medical technology;

Dr Rob Woolaston (Livestock Industries) for service to science;

Professor Mike Young (Land and Water) for outstanding service through environmental economics.

A number of former CSIRO staff received Centenary Medals for services to science and current CSIRO staff received medals for other activities.

CSIRO's **Corporate Property** was awarded the 2003 *Rider Hunt National Award for Excellence in Facility Management* from the Facility Management Association of Australia. The award acknowledges the innovative and successful management of CSIRO's real property assets through development and implementation in a series of programs over a ten year period.

Dr James Chen and team (Food Science Australia) received an *achievement award* from the CRC for International Food Manufacture and Packaging Science for their work on advanced modelling of food processes within the process optimisation and sensing technologies program.

CSIRO won the *2003 Australian Human Resources Institute Award for Excellence in People Management*. The award recognises and rewards organisations that have a defined and strategic approach to managing people.

CSIRO Publishing won the technology showcase category at the *Australian Awards for Excellence in Educational Publishing* for the book titled *Euclid: Eucalypts of Southern Australia*.

Dr Greg Duffy and team (Energy Technology) won the *Institution of Engineers, Australia, Engineering Excellence Award 2002* for demonstrating solar-thermal technology as a commercial option for large-scale energy delivery in Australia.

Dr Calum Drummond (Molecular Science) won the *2002 David Syme Research Prize* for best original research work in chemistry during the preceding two years. Dr Drummond also received the *2002 Royal Australian Chemical Institute Applied Research Award* for research activities conducted in the ten year period (1992–2002) at CSIRO Chemicals and Polymers and CSIRO Molecular Science.

Dr John Farrow (Minerals) was awarded the *Australasian Institute of Mining and Metallurgy Mineral Industry Operating Technique Award* for services to the minerals industry through revolutionising the development and implementation of new thickener technology for mineral processing.

Dr Gary Fitt (Entomology) received the *Mackerras Medal 2002* for demonstrated excellence in entomology.

Food Science Australia – Werribee won the Agribusiness category of the *2003 Wyndham Business Awards* for active involvement in the promotion of the Werribee Technology Precinct and the local City.

Dr Neale Fulton (Mathematical and Information Sciences) won the *Royal Aeronautical Society Canberra's Graduate Medal for Aeronautical Sciences at the Australian Defence Force Academy* and an *Aviation Safety Foundation Australia Certificate of Air Safety* for his extensive study, revolutionising the understanding of aircraft proximity warning in airspace design to enhance air safety.

Dr Bronwyn Harch and **Mr Peter Toscas** (Mathematical and Information Sciences), as part of a research team with the CRC for Coastal Zone, Estuary and Waterway Management, received the *Coastal Cooperative Research Centre Science Award* at the Healthy Waterways Awards. The team developed a sampling design to ascertain the spatial extent and temporal persistence of specific water quality parameters, particularly those reflecting public and ecosystem health.

Dr Alex Held and the **Environmental Remote Sensing Group** (Land and Water) together with postgraduate students and staff from the University of Queensland, received the *CRC for Coastal Zone, Estuary and Waterway Management Excellence in Science Award* and the *Coastal CRC Shield* for the use of new remote sensing techniques to map and monitor coastal waters in south-east Queensland.

A collaborative team, led by **Dr Andrew Higgins** (Sustainable Ecosystems) won a *Business and Higher Education Round Table* award for a project examining supplying sugarcane to a mill. The team comprised the Mackay Sugar Cooperative Association Ltd, CANEGROWERS, Mossman Agricultural Services, CSR Sugar Ltd, Maryborough Sugar Factory Ltd, Sugar Research and Development Corporation, and the CRC for Sustainable Sugar Production.

Dr Rod Hill (Minerals) had a mineral *Hillite* named after him. This is the highest honour that mineralogists can receive. The name *Hillite* has been approved by the International Mineralogical Association Commission on New Minerals and Mineral Names.

Dr Ailsa Hocking and **team** (Food Science Australia) received three *CRC for International Food Manufacture and Packaging Science Achievement Awards* for their contributions to the fresh cut guidelines, food safety and modified atmosphere packaging, and mould boundary mapping.

Professor Peter Hoj (Australian Wine Research Institute, AWRI) and **Dr Nigel Scott**, (Plant Industry), received the *South Australian Great Science Award* on behalf of the National Wine Industry Research Cluster. The award was an acknowledgement of the contribution of the cluster partners – AWRI, CSIRO and the South Australian Research and Development Institute for science in that state.

Dr Peter Hurley (Atmospheric Research) won the *2002 Clean Air Society of Australia and New Zealand Individual Achievement Award* for the development of the Air Pollution Model.

Dr Brian Keating (Sustainable Ecosystems) was awarded the *Sugar Industry Research/Extension Award 2003* for research over the last five years, for fostering collaboration across agencies and for training younger scientists.

Ms Estelle Lifran and **Dr Robert Sleight** (Food Science Australia) and the Centre for Advanced Food at the University of Western Sydney won the *Environmental Science Technology Sector Award for Excellence* at the Knowledge Commercialisation Australasia Awards.

Dr Brian Loveys (Plant Industry) received an *Excellence in Natural Resource Management Science Award* from the Board of Land and Water Australia for his groundbreaking research into partial rootzone drying, a quantum leap in sustainability and improved water management for the Australian irrigation industry. Nominated amongst Australia's top 100 innovations in the last century.

CSIRO's **Manufacturing and Infrastructure Technology Adelaide Laboratory** won the *Welding Technology Institute of Australia Company of the Year Award 2002* for major achievements in welding technology over the years, and its ongoing commitment to the advancement of Australian industry in welding technologies.

Mr Richard Merry and **team** (Land and Water) was awarded the *Top 100 Natural Resource Management Innovation Award* by Land and Water Australia for the best and most promising innovations in natural resource R&D over the past ten years for their research on mid infra-red spectroscopy for rapid prediction of soil properties.

A team led by **Dr Mike McLaughlin** and **Dr Daryl Stevens** (Land and Water), along with collaborators from South Australia Water and United Water, won the *Australian Water Association R&D award for South Australia* for providing the scientific framework for beneficial agricultural re-use of biosolids in South Australia.

CSIRO **Molecular Science** as a participant of the CRC for Eye Research and Technology was awarded the *Outstanding Achievement in International Collaborative R&D Award* by the Business and Higher Education Round Table for their work in the development of the Focus Night and Day extended wear contact lens.

Miss Jodi Neal (Plant Industry) was awarded the *Mayo Price Award* for the most outstanding talk at the Genetics Society of Australia 49th Annual Conference 2002.

Dr John Passioura (Plant Industry) received the *Grains Research Development Corporation 2003 Seed of Light Award* for excellence in research communication.

Mr Christopher Relf (Telecommunications and Industrial Physics) the first Software Engineer in the Southern Hemisphere to be officially recognised by National Instruments for his individual expertise and skills gained from wide experience.

Dr Steve Rintoul (Marine Research) was awarded the *M R Banks Medal* by The Royal Society of Tasmania for research excellence by a scientist in mid-career.

Dr Peter Roupas (Food Science Australia) was awarded the *Australian Journal of Dairy Technology Award* for the best paper titled *On-farm practices and post farmgate processing parameters affecting composition of milk for cheesemaking*.

Ms Nichole Schick (Plant Industry) won the *Cotton Research Development Corporation Science Innovation Award for Young People* in 2003.

Dr Shouyi Sun and team (Minerals) were acknowledged for their major contribution to the development of the Alcoa spent pot lining process that won the *Victorian Premier's Business Sustainability Award* and the *Banksia Award* in the Infrastructure and Services section.

Dr Nai Tran-Dinh (Food Science Australia) won the *John Christian Young Food Microbiologist Award for 2003* for his presentation on 'Population genetics of the aflatoxigenic species, *Aspergillus flavus* and *Aspergillus parasiticus*'.

Dr Michael Treeby (Plant Industry) won the *2003 Riverlink Staff Award* for his assistance over the past decade to the citrus, dried grape and table grape industries.

Dr Kees Versteeg (Food Science Australia) was awarded the *Loftus Hills Silver Medal* for his published articles, which have made a significant contribution to dairy science and technology.

Professor Rob Vertessy and team (Land and Water) in the Integrated Catchment Management Directorate/CRC for Catchment Hydrology received an award for innovation and research at the *Stormwater Industry Association of Queensland 2002 Awards for Excellence*.

Dr Jason Wan and team (Food Science Australia) received three *CRC for International Food Manufacture and Packaging Science Achievement Awards* for their contributions to the produce sanitation, fresh cut guidelines and rapid microbial methods projects.

Dr Peter Whetton and members of the **Climate Impacts Group** (Atmospheric Research) won the *2002 Award for Planning Excellence (Occasional Special Award)* and the *2003 National Award for Planning Excellence* (Certificate of Merit) from the Planning Institute of Australia (Victorian Division).

Dr Andrew Young (Plant Industry) won the *Fenner Medal 2003* from the Australian Academy of Science in recognition of distinguished research in biology.

International Awards

Dr Roger Arnold (Forestry and Forest Products) won one of two *Hunan Province International Science and Technology Cooperation Awards 2002*, for collaborative research and development of cold tolerant eucalypts in China. The project aims to establish fast growing, high yielding hardwood plantations in the Hunan province.

Dr Vittorio Brando (Land and Water) was awarded the *Junior Environmental Prize* of the *Premio Sapio per la Ricerca Italiana* (SAPIO award for Italian Research 2002).

Dr Jeremy Burdon (Plant Industry) received the *E C Stakman Award* from the University of Minnesota, United States for outstanding achievements to Plant Pathology in the area of research.

Professor Suzanne Cory (Board member) won the *Royal Medal of Britain's Royal Society* in recognition of lifelong achievement in immunology and the research of cancer.

Dr Robert Evans (Forestry and Forest Products) received the highest honour from the International Academy of Wood Science, the *Academy Lecture*, in recognition of his outstanding contribution to wood science. Dr Evans also received the *2002 Burgess-Lane Memorial Lectureship in Forestry* from the University of British Columbia, Vancouver, Canada.

Dr Narelle Fegan (Food Science Australia) and team (University of Nebraska) won the *Best Poster prize* in the Food Chain category at the 5th International Symposium on Shiga toxin-producing *E.coli* infections. Their poster was titled *Pen Test Devices for Detection of E. coli 0157 and Salmonella in Cattle*.

Dr Greg Foliente (Manufacturing and Infrastructure Technology) and **Professor Ian Smith** (University of New Brunswick) won the American Society of Civil Engineers (ASCE) 2003 *James Croes Medal* for their paper titled *Loan and Resistance Factor Design of Timber Joints: International Practice and Future Direction*, which was published in the ASCE Journal of Structural Engineering.

Dr Neale Fulton (Mathematical and Information Sciences) won an *International Prize* from the *Captain A G Vette Flight Safety Research Trust* for his extensive study, revolutionising the understanding of aircraft proximity warning in airspace design to enhance air safety.

Dr Richard Hannink (Manufacturing and Infrastructure Technology) received the *Australasian Ceramic Award 2002* for contributing in an outstanding way to the profession and practice of ceramics in Australasia.

Dr David Harris (Energy Technology), **Dr Liming Lu** and **Professor Veena Sahajwalla** (University of New South Wales) were awarded the *United States Iron and Steel Society's 2003 Josef Kapitan Award* for their paper titled *Novel Equations to Establish the Influence of Char Structure on Reactivity during Pulverised Coal Injection in a blast furnace*.

Dr Jack Katzfey and members of the **weather and climate applications team** (Atmospheric Research) as a meteorologist for the Swiss *Alinghi* yachting syndicate's weather team, contributed to the syndicate's win of the *2003 Louis Vuitton Cup* and the *2003 America's Cup*.

Mr Colin MacRae and **Mr Nick Wilson** (Minerals) received the *Microbeam Analysis Society Birks of America Award* for the best contributed paper at the previous annual meeting. The paper was titled *Holistic Mapping in an Electron Microprobe*.

Dr Keith Millington (Textile and Fibre Technology) and Professor Louis Kirschenbaum (University of Rhode Island) won the annual gold *Research Medal for 2002* from the Worshipful Company of Dyers in London. The award was made for their paper studying photochemistry which causes the yellowing of textiles exposed to sunlight.

Mr Geoff Morrison (Information Technology Services) won a *CSIRO-LIPI (Indonesian Institute of Sciences) 2002 Award* for his work in strengthening scientific relations between LIPI and CSIRO.

Dr Sadanandan Nambiar (Forestry and Forest Products) was awarded the *Sergei A Wilde Distinguished Lectureship on Forest Soils*. Dr Nambiar was the first non-US scientist to be given this award.

Dr Alison Ord and **team** (Exploration and Mining) won the prestigious *Otto Trustedt Medal* for their contributions to understanding the Outokumpu mineralising system in Finland. The medal is named after mining engineer Otto Trustedt, whose persistence is credited with having discovered the Outokumpu mineral deposits in 1910.

Dr Martin Palmer and the **Microencapsulation team** (Food Science Australia and Clover Corporation) were awarded the *American Oil Chemists Society's International Corporate Achievement Award 2003* for recognition of the technological, commercial and public health impact of their joint research in oil microencapsulation technology.

Dr David Tanner (Food Science Australia) won the *James Harrison International Institute of Refrigeration Young Researchers Award* for his work on mathematical modelling for design of horticultural packaging.

Ms Jayanthi Weerasinghe (Food Science Australia) was presented an *Innovation in Science and Technology Award* by the Sri Lankan Study Centre for the Advancement of Technology & Social Welfare for her achievements in food product development.

CSIRO Awards

The Chairman's Medal

The *2002 Chairman's Medal* was presented by Ms Catherine Livingstone, Chairman and the *CSIRO Medals* were presented by The Hon Dr Brendan Nelson, Minister for Education, Science and Training, and the Hon Peter McGauran, Minister for Science on 10 December 2002.

The Seabed Ore Systems team won the *2002 Chairman's Medal* for their investigations to a better understanding of how ore bodies were created in the geological past, and have improved the capability of industry to find new mineral resources on land. The team have achieved world leadership in the discovery of sites where valuable minerals are forming today on the ocean floor.

The winners of the *Chairman's Medal* were: **Dr Ray Binns** (team leader), **Ms Lesley Dotter**, **Dr Tim McConachy**, **Dr Brent McInnes**, **Dr Joanna Parr** and **Dr Chris Yeats**.



From left to right: Dr Geoff Garrett (Chief Executive), Dr Chris Yeats, Dr Joanna Parr, Dr Brent McInnes, Ms Lesley Dotter, Dr Tim McConachy, Dr Ray Binns, Ms Catherine Livingstone (Chairman).
Photo: Hilary Wardhaugh Photography

CSIRO Medals

The *CSIRO Medals* for 2002 for CSIRO staff were awarded for:

- the development of cost-effective new production methods for nanoparticles by **Dr Terry Turney** (team leader), **Dr Anne Ammala**, **Mr Daniel Bell**, **Ms Sasha Boskovic**, **Mr Phil Casey**, **Mr Richard Harris**, **Dr Anita Hill**, **Dr Olga Koulaeva**, **Ms Kelly Lawrence**, **Mrs Tracey Markley**, **Dr Pavla Meakin** and **Mr Merchant Yousuff**
- the development of advanced Indium Phosphide Monolithic Microwave Integrated Circuits by **Dr John Archer** (team leader), **Mr Russell Gough**, **Mr Paul Roberts**, **Ms Oya Sevimli** and **Mr Malcolm Sinclair**
- the development and commercialisation of a new health product for commercial poultry by **Dr John Lowenthal** and **Dr Mike Johnson** (team leaders), **Dr Andrew Bean**, **Dr Matthew Digby**, **Dr Kevin Fahey**, **Dr Adrian Hodgson**, **Mrs Terri O'Neil**, **Ms Cate Pooley**, **Dr David Strom** and **Dr Jennifer York**.



From left to right: Ms Catherine Livingstone (Chairman), Dr Mike Johnson, Dr John Lowenthal, The Hon Peter McGauran, Dr John Archer, Dr Terry Turney and Dr Geoff Garrett (Chief Executive).
Photo: Hilary Wardhaugh Photography

Business Excellence Medal

The *Business Excellence Medal* was awarded to the Focus Night and Day Lens Technology Platform team, **Dr Jack Steele** (team leader), **Dr Hans Griesser**, **Mr Bryan Loft**, **Dr Gordon Meijs** and **Ms Elisabeth Opie**. The award recognises the exemplary model of relationship management and partnering provided by the CSIRO team in the development of a breakthrough product – the Focus ‘Night and Day’ contact lens – recently introduced to the global market.

This year we have inaugurated a suite of new awards that recognise lifetime achievement, fostering of growth, excellence in partnering, Occupational Health and Safety, care of our environment, and One-CSIRO collaboration.

Lifetime Achievement Medals

Mr John Brooks (Australia Telescope National Facility) and **Dr Barrie Hunt** (Atmospheric Research) were awarded a *Lifetime Achievement Medal*. As Project Manager of the Australia Telescope Compact Array, Mr Brooks’ technical leadership kept the facility at the forefront of its field, and he has been a key person in achieving the Australia Telescope’s outstanding reputation. Dr Hunt was recognised for his contributions to atmospheric science and the CSIRO Climate Model developed by a team under his leadership.

Go for Growth Award

The *Go for Growth Award* was awarded to the Iron Ore Processing team (Minerals) for outstanding growth through the establishment of strategic alliances and excellence in service delivery. The winners were: **Dr Ralph Holmes** (team leader), **Mr Jonathan Campbell**, **Mr Simon Campbell-Hardwick**, **Dr John Clout**, **Dr Mark Dell’Amico**, **Mr Jeff Douglas**, **Ms Angela Drabble**, **Mr Trevor Dunne**, **Mr Alex Edenton**, **Dr Andrew Firth**, **Mr John Garden**, **Mr Jasbir Khosa**, **Mr James Manuel**, **Mr Andre Metzeler**, **Mr Rod Nicholson**, **Mr Paul Nielsen**, **Ms Maureen O’Connor**, **Ms Anne Porter**, **Mr Ross Price**, **Ms Thressa Rowlands**, **Mr Rod Smyth**, **Mr John Theaker**, **Dr Alfonso Trudu**, **Mr Keith Vining**, **Ms Natalie Ware**, **Mr Jason Young** and **Dr Rui Zhu**.

Partnership Excellence Award

The *Partnership Excellence Award* was awarded to the Rodent Research team (Sustainable Ecosystems) in recognition of the team’s highly effective partnerships with the Australian Centre for International Agricultural Research and the International Rice Research Institute. The team provided international leadership, scientific expertise and training in ecologically based management of rodent pests in Australia and Asia. The winners were: **Dr Grant Singleton** (team leader), **Dr Ken Aplin**, **Mr Peter Brown**, **Mr Micah Davies**, **Dr Lynette Hinds**, **Dr Jens Jacob**, **Mr Dean Jones**, **Ms Katrina Leslie** and **Dr Roger Pech**.

Occupational Health and Safety Achievement Award

The *Occupational Health and Safety Award* was awarded to the Field Safety Initiative team for developing standard operating procedures, acknowledged as current industry best practice, providing a safety net and reducing the risks to staff engaged in fieldwork. Team members were: **Mr Steve Fraser**, **Mr Melvyn Lintern** and **Dr Ian Robertson**.

Environmental Achievement Award

The *CSIRO Environmental Award* was awarded to the Farm Creek Revegetation Project team. The project, undertaken voluntarily by staff located at the Queensland Centre for Advanced Technologies site, sought to preserve and enhance a small, neglected watercourse on site and assist endemic species to re-establish themselves. While a large number of staff from the Divisions of Exploration and Mining, Minerals, Manufacturing and Infrastructure Technology and Energy Technology were involved the award recognises the key contributions of: **Mr Stephen Peck**, **Mr Norm O'Neill**, **Mr Alan Scott** and **Mr Andrew Taylor**.

One-CSIRO Award

The *One-CSIRO Award* was awarded to the **Mineral Processing Biotechnology** team for their ability to assemble a multi-disciplinary team to tackle highly complex problems facing Australia and industry. The winners were: **Dr Helen Watling** (coordinator and team leader), **Dr Martin Houchin** (initial co-ordinator), **Ms Melissa Climo**, **Dr Craig Klauber**, **Mr Patrick Merrigan**, **Ms Renee Outram**, **Dr Matthew Stott**, **Ms Rachel Tiller-Jeffery** (Minerals); **Dr Peter Nichols** (team leader), **Dr John Gibson**, **Mr Mark Rayner**, (Marine Research); **Dr Philip Hendry** (team leader), **Dr Chun-Qiang Liu**, **Dr Haiyan Lan**, **Dr Meredith Wilkes** (Molecular Science); **Dr Peter Franzmann** (team leader), **Dr Jason Plumb**, **Dr Wendy Robertson**, **Ms Rebecca Hawkes** and **Mr Luke Zappia** (Land and Water).

Fellowships and International Societies

Mr John Blackwell (Land and Water) was elected a Fellow of the *Institution of Agricultural Engineers*.

Dr Phil Brown (Mathematical and Information Sciences) was elected a Fellow of the *American Statistical Association*, San Francisco, US.

Dr Jock Churchman (Land and Water) was awarded a Fellowship of the *New Zealand Society of Soil Science*.

Dr Martin Cole (Food Science Australia) was elected as a Fellow of *Food Standards Australia New Zealand*.

Dr Tapas Das (Manufacturing and Infrastructure Technology) has been awarded a Fellowship under the *International Cold Forging Group's Training Program* offered by Nichidai Corporation, Japan.

Dr John Donnelly (Plant Industry); **Mr Ian Galbally** (Atmospheric Research); **Dr Ian Grey** (Minerals); **Professor Peter Hudson** (Health Sciences and Nutrition); **Ms Catherine Livingstone** (CSIRO Chairman); **Dr James Ridsdill-Smith** (Entomology); **Dr David Topping** (Health Sciences and Nutrition); **Dr Terry Turney** (Manufacturing and Infrastructure Technology); and **Dr John Wright** (Energy Technology), were elected as Fellows to the *Australian Academy of Technological Sciences and Engineering*.

Dr Calum Drummond (Molecular Science) and **Dr Dick Manchester** (Australia Telescope National Facility) were awarded *Federation Fellowships* by the Commonwealth Government. **Dr Roger Francey** (Atmospheric Research) was offered a *Federation Fellowship*. *Federation Fellows* **Professor Bruce Kemp** of St Vincents Institute of Medical Research, Melbourne, will join CSIRO in August 2003, and **Professor Andrew Holmes** of the University of Cambridge will work jointly with CSIRO Molecular Science to form a world-class research team focussing on polymer electronics.

Dr Barbara Etschmann (Exploration and Mining) was awarded a three-year *Fellowship* to carry out synchrotron studies relevant to the Australian mining industry.

Dr John Griffiths (Manufacturing and Infrastructure Technology) was elected President of the *Australian Fracture Group*.

Dr Steven Loffler (Forestry and Forest Products) was awarded a *Gottstein Fellowship* for 2003 by the J W Gottstein Memorial Trust.

Dr Barry Inglis (Telecommunications and Industrial Physics) was elected Vice-President of the *International Committee of Weights and Measures*, one of the highest accolades in metrology.

Dr Anna Koltunow (Plant Industry) was elected President of the *International Association for Plant Reproduction Research*.

Mr Ian Madsen (Minerals) was elected a member of the *Commission on Powder Diffraction of the International Union of Crystallography*.

Mr Mick Poole (Plant Industry) was elected as Fellow of the *Australian Institute of Agricultural Science and Technology*.

Dr Neil Turner (Plant Industry) was made a Fellow of the *Indian National Science Academy*.

Dr Long Yu (Manufacturing and Infrastructure Technology) was elected as Fellow of the *Royal Australian Chemical Institute*.





Corporate Governance

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Section

Corporate Governance



Corporate Governance

Corporate Governance

The CSIRO corporate governance framework covers the roles 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.

Role of the CSIRO Board

The functions of the Board of CSIRO are contained in the *Science and Industry Research Act 1949* (SIR Act) and the *Commonwealth Authorities and Companies Act 1997* (CAC Act). The SIR Act requires the Board to, amongst other duties:

- ensure the proper and efficient performance of the functions of the Organisation
- determine the policy of the Organisation with respect to any matter
- give directions to the Chief Executive.

The CAC Act requires the Board to comply with certain accountability and corporate governance principles, including:

- the maintenance of the Audit Committee
- specific financial and reporting provisions
- disclosure of Board Member's personal interests
- provision of indemnities and indemnity insurance in certain circumstances.

All CAC Act requirements are currently being met.

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.

The Board has a formal agenda for each meeting. It receives regular papers from management on its science activity, financial and business performance, and specific issues relevant to Organisational performance and conformance.

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.

The Audit Committee and Commercial Committee operate under written terms of reference. 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.

Board membership

Under the SIR Act, the CSIRO Board comprises the full-time Chief Executive, a part-time Chairman and up to eight other part-time members. 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 2002–03 Board members, including qualifications and terms of appointment, are shown on page 11. The Financial Statements contain details of remuneration of Board members and their attendance at Board, Audit Committee and Commercial Committee meetings.

All new Board members receive a formal induction to inform them of their responsibilities and rights. The performance of the Board is documented through a periodic self-assessment process.

Disclosure of interests

Sections 10E and 10F of the SIR Act require written disclosure to the Minister of all direct or indirect pecuniary interests in any business or in any body corporate carrying on a business. Section 27F of the CAC Act provides for the disclosure of material personal interests in a matter that is being considered by the Board and prohibits participation, deliberation and decision making by any member on such matters, unless so resolved by the Board or entitled by the Minister: see section 27J(3) CAC Act.

All of these requirements are currently being met.

Board and Board Committee members' remuneration

The Remuneration Tribunal determines part-time Board members' remuneration and allowances.

Audit Committee

The Audit Committee, a formal sub-committee of the Board, meets at least four times a year. As at 30 June 2003, the Audit Committee comprised Ms D O'Toole (Chairman), Dr T Cutler, Dr E Tweddell and Ms E Alexander (external advisor). Mr D P Mercer chaired the Committee until March 2003 when his term as a member of the CSIRO Board was completed.

The Chairman of the Board, Ms C Livingstone, is an *ex officio* member of the Audit Committee. The Chief Executive, Corporate Secretary and the Chief Finance Officer, together with the General Manager of CSIRO's Risk Assessment and Audit (RA&A) Unit, and representatives of the Australian National Audit Office (ANAO), attend meetings at the invitation of the Audit Committee Chairman.

The Audit Committee's purpose as detailed in the Committee's Charter is:

To assist Board members to fulfil their governance responsibilities by:

- reviewing the risk management framework and internal control processes relating to the high and significant risks of CSIRO
- monitoring internal controls in relation to financial and commercial activities, legislative and regulatory conformance and asset protection
- ensuring the preparation and presentation of annual financial statements show a true and fair view and comply with all relevant accounting standards, Finance Minister's Orders and statutory requirements
- facilitating open communication between the CSIRO Board, Audit Committee, Senior Management and the Internal and External Auditors
- determining the adequacy of CSIRO's administrative, operating, project and accounting systems
- complying with obligations under section 32 of the CAC Act
- ensure the independence and objectivity of Internal Audit (RA&A) and External Audit (ANAO) activities.

The Committee has unlimited access to both the internal and external auditors and to senior management.

Commercial Committee

The Board Commercial Committee (BCC) meets at least four times per year and as at 30 June 2003 comprised Ms C Livingstone (Chairman), Mr P Duncan, Dr E Tweddell, and Dr G Garrett.

The Executive Director Business Development and Commercialisation, the Corporate Secretary and the General Counsel attend meetings at the invitation of the BCC Chairman.

The functions of the BCC as detailed in the Committee's Terms of Reference are:

- to review CSIRO's commercial policies and strategies and where appropriate to propose improvements in these to the CSIRO Board and CSIRO management
- to ensure that CSIRO has appropriate people and processes involved in the conduct of its commercial activities
- to determine, in consultation with the Board and CSIRO management, appropriate performance criteria for CSIRO's commercial activities, and monitor CSIRO's performance against those criteria
- to review CSIRO's equity shareholdings
- to maintain a watching and consultative/advisory brief over the 'pipeline' of projects which would eventually come to the BCC and Board arena for decision
- to consider and approve individual commercial project proposals
- to consider and make recommendations to the full Board on transactions
- to specify the composition, frequency and formats of reports and recommendations to the Committee on commercial activities from CSIRO management
- to report on its activities to the CSIRO Board at each meeting.

The BCC is supported by the Executive Management Commercial Committee – ComEx – which provides advice on internal management processes and oversees commercial activities. During 2002–03, the composition of ComEx changed and now comprises two part-time external commercial advisors together with senior management personnel. During 2002–03 ComEx met 14 times and considered more than 50 transactions. The respective roles and responsibilities of ComEx, the BCC and the Board in considering commercialisation transactions were systematised during 2002–03 with the objective of accelerating the pace of review, increasing the transparency of governance objectives and assisting divisional staff to navigate these processes. In the light of the review of the performance of the ComEx committee system during the year, increased financial delegations for the approval of transactions were agreed for implementation by ComEx in 2003–04.

Other committees

Other sub-committees are established from time to time to address specific issues but are not permanent committees.

Executive team

The Chief Executive, who is a member of the Board, is responsible for the Organisation's activities. In the reporting year – as shown in the Organisation Chart on page 10 – an Executive Team (ET) and an Executive Management Council (EMC) supported the Chief Executive in this role. The ET meets about once a month and comprises the Chief Executive, Deputy Chief Executive, Group Chairs, Executive Directors and Corporate Secretary. The EMC comprises ET members, Chiefs of Divisions, Flagship Directors and a number of other senior managers.

Risk management program

The Board has responsibility for ensuring an appropriate risk management framework is in place to identify and manage high and significant risks to the Organisation.

To this extent, CSIRO undertakes a systematic program of organisation-wide and divisional contract and project specific risk assessments. These are designed to identify, evaluate and prioritise risks and develop risk mitigation strategies. The Risk Assessment and Audit Unit facilitates this process utilising a methodology consistent with the Australian Risk Management Standard AS/NZS-4360.

An organisational risk profile is completed semi-annually and reported to the Audit Committee. The Executive Team is responsible for the implementation of mitigation strategies.

The Audit Committee reviews the organisational high and significant risks and management's risk-mitigation strategies through regular reports from the Risk Assessment and Audit Unit.

A risk management policy and associated guidelines were issued in July 1997.

It is the responsibility of the operational management of CSIRO to develop and implement risk-mitigation strategies. In appropriate circumstances, insurance is used as a method to transfer the financial impact of risk.

Internal control

The Board is responsible for ensuring an appropriate internal control framework is in place and operating. Through the Audit Committee it reviews management's policies, procedures framework and internal compliance.

External audit

Under the CAC Act the Auditor General is the external auditor for CSIRO. The Audit Committee reviews the Australian National Audit Office audit plan and meets with the external auditor prior to recommending financial statements to be signed by the Board.

Internal audit

The Risk Assessment and Audit Unit provides an independent review function in accordance with a formal charter endorsed by the Audit Committee.

The Audit Committee reviews the annual Risk Assessment and Internal Audit Plan and receives regular reports on progress against that Plan.

Ethical standards

In September 1994, the CSIRO Board endorsed a Code of Conduct that applies to the Organisation's Board, management and staff. The Code provides a benchmark against which conduct can be assessed to ensure that the highest ethical standards are met.

Fraud control

CSIRO has conducted fraud risk assessments and has in place fraud control plans that comply with the Commonwealth Fraud Control Guidelines. CSIRO has in place appropriate fraud prevention, detection, investigation, and reporting procedures and processes. Annual fraud data has been collected and reported in compliance with the Commonwealth Fraud Control Guidelines. CSIRO has a Fraud Control Officer who reports on an as required basis to the Audit Committee of the Board.

Independent professional advice

In the pursuit of their duties, Board members may seek independent professional advice at the Organisation's expense. However, the Chairman's prior approval is required in all instances.

Other corporate governance

In response to government, industry and community expectations, the Board has initiated a dialogue with management on CSIRO's corporate governance framework. Policies and practices, risk management and reporting arrangements and related roles and responsibilities will be examined and where necessary clarified and improved over the next year to support the delivery of CSIRO objectives and to build and strengthen the Organisation's corporate governance culture.

In this context, a Performance Measurement Framework will be implemented in 2003–04, which includes four primary groups of measures:

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

Annual performance goals will focus on research and the delivery of research.

Developments since 30 June 2003

The *Commonwealth Authorities and Companies Act 1997* 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.

Since 30 June 2003 no developments have arisen that have significantly affected or may significantly affect CSIRO's operations or state of affairs.

CSIRO Policies

The Organisation is improving the clarity and accessibility of operational policies, procedures and guidelines, as part of its overall governance framework.

Occupational Health and Safety and Project Management continue to be priority areas, with the emphasis on the implementation of related support systems and management arrangements.

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

Operational area	New/updated Policies
Occupational health and safety	<ul style="list-style-type: none"> ■ The Measuring Occupational Health, Safety and Environmental (OHS&E) Performance procedure was updated. ■ A new Environmental Policy was developed. ■ The Control of Hazardous Substances procedure was updated. ■ The Management of Underground Storage Tanks procedure was updated. ■ The Radiation Safety Manual was updated. ■ The Radiation Safety Policy was updated. ■ The Occupational Health and Safety Policy was updated. ■ The Health, Safety and Environment Assessment and Control of Work Policy was updated. ■ The Health, Safety and Environment Assessment and Control of Work Procedure was updated. ■ A new OHS&E Hazard Reporting procedure was developed. ■ The OHS&E Incidence Reporting, Recording and Investigation procedure was updated.
Research management	<ul style="list-style-type: none"> ■ The Project Management policy was updated. ■ Project Management Guide released containing policy, procedures and guidelines.
Financial procedures	<ul style="list-style-type: none"> ■ The Financial Directions Policy on procurement of goods and services was updated.
General administrative procedures	<ul style="list-style-type: none"> ■ A new CSIRO Animal Welfare Policy was developed. ■ A new Effort Logging Policy was developed.

Administrative Law

Freedom of information

The *Freedom of Information Act 1982* ('the Act') provides the public with a general right of access to documents held by CSIRO and Commonwealth Agencies. This general right is limited only by exceptions needed to protect essential public interests or the privacy and business affairs of those who give information to the Commonwealth.

In the year to 30 June 2003, CSIRO received 16 requests under the Act.

Section 8 Statement

Section 8 of the Act requires agencies to publish certain information concerning their functions and documents.

The following information is presented by CSIRO in accordance with the requirements of that section.

Consultative procedures

Valuable input from industry and other users and stakeholders into the identification of strategic research needs and the formulation of policy and administration is obtained through formal advisory and consultative committees as well as through receipt of representations from industry, scientific and employee groups.

Categories of documents

CSIRO holds the following categories of documents:

- (1) **Corporate records:** containing information of corporate and residual value such as financial management and administration, buildings and property, personnel and industrial relations and scientific and industrial research.
- (2) **Work group records:** these are records generated within a work group such as research records and materials created in the course of scientific and technical investigations including:
 - raw data
 - project databases
 - observational and experimental data
 - field and laboratory notebooks.
- (3) **Personal records.**

The following CSIRO documents are customarily made available to the public free of charge: policy circulars; information circulars; staff circulars; *CoResearch* (staff newspaper); film catalogues; lists of saleable publications; information service leaflets issued by Divisions on a wide range of technical subjects attracting frequent inquiries from the general public; conditions of CSIRO postdoctoral awards; press releases; information on careers in CSIRO; and school project material.

The following CSIRO documents are available for purchase by the public by contacting CSIRO, Limestone Avenue, Campbell, ACT 2602 or CSIRO Publishing, 150 Oxford Street, Collingwood, VIC 3066: scientific and technical publications including magazines, journals and books as well as CSIRO administrative manuals. CSIRO Publishing material is listed at www.publish.csiro.au. A list of administrative manuals is available from the Freedom of Information (FOI) Coordinator.

Archives and disposal arrangements for documents

CSIRO maintains an archives collection in Canberra that has records dating from the establishment in 1926 of the Council for Science and Industrial Research, the original predecessor of CSIRO. Certain Australian Archives Regional Offices also hold quantities of CSIRO records. The 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.

Facilities for access

Arrangements can be made for documents that are the subject of FOI requests to be made available for inspection at the CSIRO office nearest to the address of the applicant.

FOI procedures and initial contact points

A central Freedom of Information (FOI) Coordinator is responsible for the receipt of requests, identification of relevant CSIRO documents, consultation with CSIRO authors and officers, determining access to the documents and arranging internal review. Initial enquiries should be made to:

FOI Coordinator
CSIRO
Limestone Avenue
CAMPBELL ACT 2601
PO Box 225
DICKSON ACT 2602
Tel (02) 6276 6123
Fax (02) 6276 6437
Email rosemary.caldwell@csiro.au

In accordance with the *Freedom of Information Act 1982*, formal requests to CSIRO should be addressed to the Chief Executive of CSIRO.

Privacy

The *Privacy Act 1988* came into operation on 1 January 1989. The Act applies to both the Commonwealth and ACT Governments and requires Departments and Agencies to comply with certain Information Privacy Principles (IPPs). They govern:

- methods used to collect personal information
- storage and security of personal information
- notice of the existence of record systems
- access by individuals to their own information
- use of personal information and its disclosure to third parties.

The Act allows the Privacy Commissioner to investigate, and report on, an act or practice that may be an interference with the privacy of an individual.

During 2002–03, the Privacy Commissioner did not undertake any investigations under section 36 of the *Privacy Act 1988* in relation to CSIRO.

Privacy Procedures and Initial Contact Points

A central Privacy Coordinator manages CSIRO's privacy responsibilities.

Initial enquiries should be made to:

Privacy Coordinator
CSIRO
Limestone Avenue
CAMPBELL ACT 2601
PO Box 225
DICKSON ACT 2602
Tel (02) 6276 6123
Fax (02) 6276 6437
Email rosemary.caldwell@csiro.au

The Administrative Decisions (Judicial Review) Act

The *Administrative Decisions (Judicial Review) Act 1977* (AD(JR) Act) enables a person aggrieved by certain classes of administrative decisions or actions taken by Commonwealth agencies including CSIRO to challenge these decisions in the Federal Court.

Section 13 of the AD(JR) Act gives a person aggrieved by a decision the right to obtain a statement of the reasons for the decision. This right exists independently of the right to apply for a review of a decision.

The statement of reasons is to be in writing and is to set out the findings on material questions of fact, referring to the evidence or the material on which those findings were based and giving the reasons for the decision.

In the year to 30 June 2003, CSIRO received no requests for statements of reason under the AD(JR) Act.

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).

In 2002–03, CSIRO implemented a new Occupational Health, Safety and Environment (OHS&E) function and structure better suited to the needs of the Organisation. Each Division has appointed a professional OHS&E Manager, supported by OHS&E Officers at regional sites. OHS&E Managers have formed a network to facilitate improved sharing of knowledge and practices, as well as effective implementation of organisation-wide OHS&E initiatives.

Devolution, during the previous reporting period, of increased accountability for Occupational Health and Safety (OHS) matters to Divisional level, has led to significant improvements in OHS performance in 2002–03.

OHS policy

CSIRO's Occupational Health and Safety Policy was reviewed in 2002 to reflect CSIRO's new approach to integrating OH&S into its business activities and improved consultative processes.

OHS Agreement

The existing OHS Agreement between CSIRO and involved Unions is due for review in 2003, after the release of the new OHS Policy. The Agreement details staff responsibilities, OHS&E staff functions (including the role of Health and Safety Representatives) and the operation of OH&S Committees.

OHS committees

The Corporate Health and Safety Committee has been formed in accordance with Commonwealth legislation and advises on the development of OHS policies and programs and identification of broad OHS priorities. The Committee meets every three months and all staff have access to the minutes of these meetings via the intranet.

OHS&E Committee guidelines have been established to assist Divisional and site OHS committees to improve their effectiveness.

Health and Safety Representatives

Health and Safety Representatives (HSRs) are elected in accordance with Commonwealth legislation and the CSIRO OHS Agreement and are trained by Comcare accredited providers.

A survey of HSR's has recently been conducted in relation to their election, training, roles and confidence in consultation. The results will assist CSIRO in ensuring that all HSRs are better placed to meet the requirements of their role.

OHS management strategies

Measures taken during the year to ensure the health, safety and welfare of employees and visitors in the workplace include:

- the provision of OHS objectives in all annual performance agreements
- the formation of an OHS&E Project Team consisting of OHS&E and People Development Managers. The role of the Team is to transform CSIRO's OHS&E performance by developing strategies to reduce the injuries and incidents through the development of a safety culture
- reviewing and updating Corporate OHS policies and procedures to reflect better OHS practices and legislative changes
- a review and implementation of the Health Safety & Environmental Assessment and Control of Work Policy, with greater emphasis now placed on treating high consequence risks identified in the risk assessment process and staff consultation
- a review of the OHS&E incident investigation process to ensure prompt reporting of incidents, together with an improved investigation process to ensure that root cause analysis is conducted to prevent re-occurrence
- a targeted review across CSIRO of the management of specific OHS hazards, such as electrical safety, asbestos management and gas safety practices
- quarterly reporting of OHS key performance measures to analyse positive OHS management strategies and incident occurrence, upon which OHS improvement strategies are determined
- internal and external benchmarking to ensure the OHS objectives meet best practice standards
- continued implementation of the OHS Management system, based on Australian Standard/New Zealand Standard (AS/NZS) 4801 OHS Management Systems
- internal auditing of the OHS Management System conducted in 2002–03 across all Divisions
- reporting every two months to the Board on OHS management and performance.

Notifiable incidents

Notifiable Incidents are required to be reported to Comcare under the OH&S Act. The type of incidents to be reported are deaths, 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 79 notifiable incidents were reported to Comcare over the year. This included 35 serious personal injuries, 1 case of work incapacity greater than 30 days and 43 dangerous occurrences.

OHS statistics

Injury statistics

CSIRO's OHS performance has greatly 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 Medical Treatment Frequency Rate (MTFR) have improved. The Average Time Lost

Rate (ATLR) indicates a decline in performance. It is expected that this is due to sub-standard Return to Work Programs. The Rehabilitation Policy and practices are under review to improve this.

The number of incidents reported has increased compared to previous years, and this is probably due to an improved awareness of reporting requirements.

Figure 1: CSIRO's OHS Performance for the past six years

Indicator	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03
LTIFR	8	5	6	7	7	4
MTFR	31	29	25	25	27	18
ATLR	3.1	2.9	4.0	2.9	2.7	3.5
Time lost – weeks	316	185	274	225	222	177
No of incidents reported	796	925	834	975	1 035	960
No of compensation claims	377	343	307	290	318	214

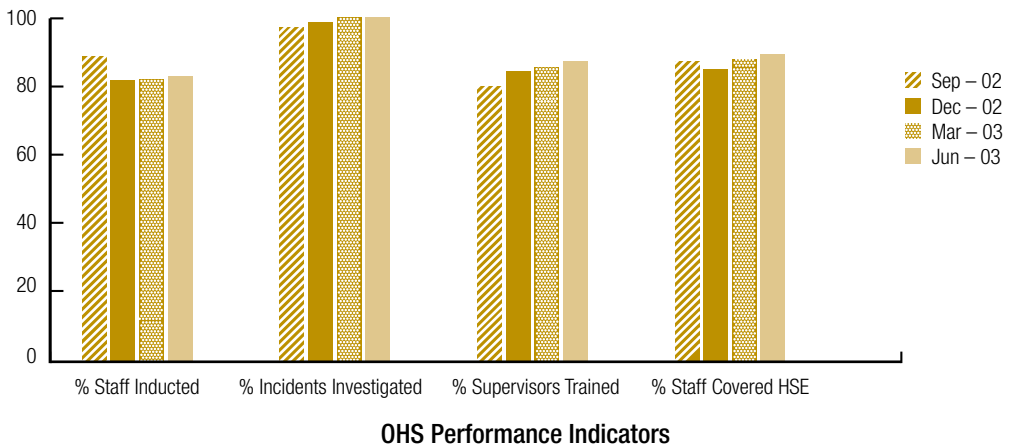
Definitions:

- 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 Sep 02 - Jun 03



Internal Benchmarking

CSIRO Divisions are provided with a quarterly chart of their performance to enable CSIRO to internally benchmark. CSIRO has adopted a target score of 100 for each of the seven injury and positive performance indicators to a total of 700. See Figures 3 and 4 demonstrating improvement over the last year.

Figure 3: CSIRO OHS Performance Zone Scores - End of quarter - 30 June 2002

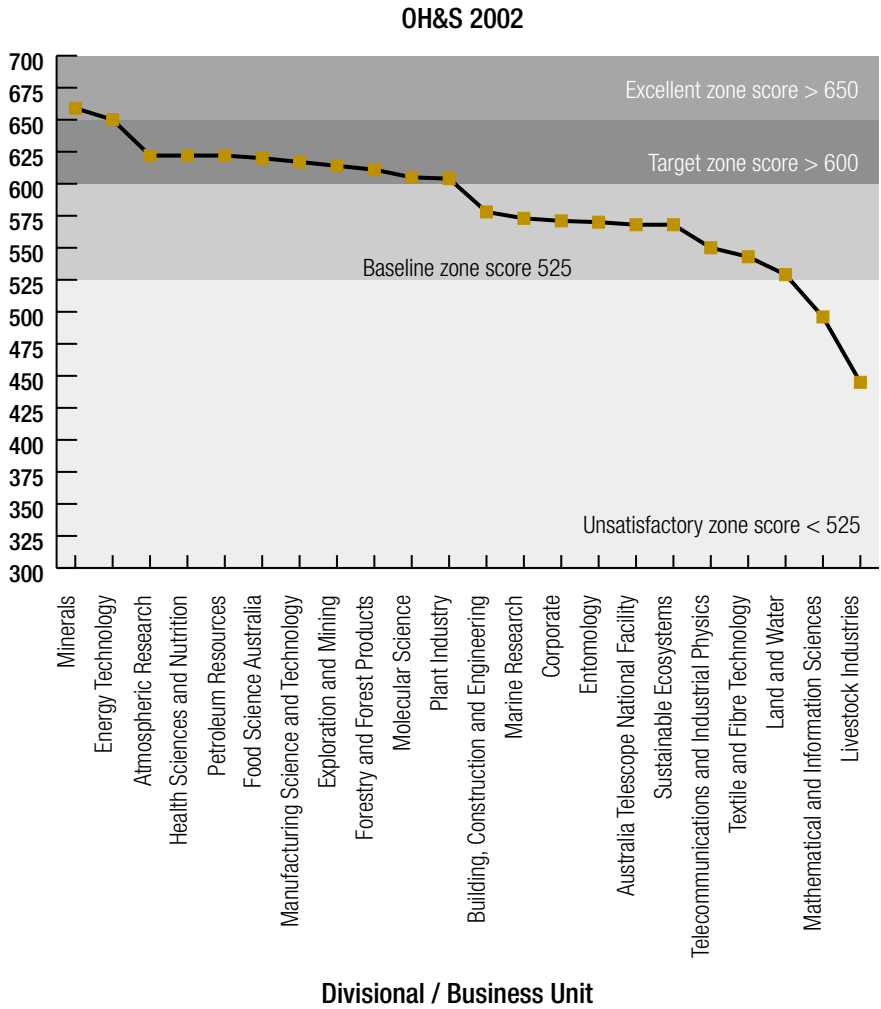
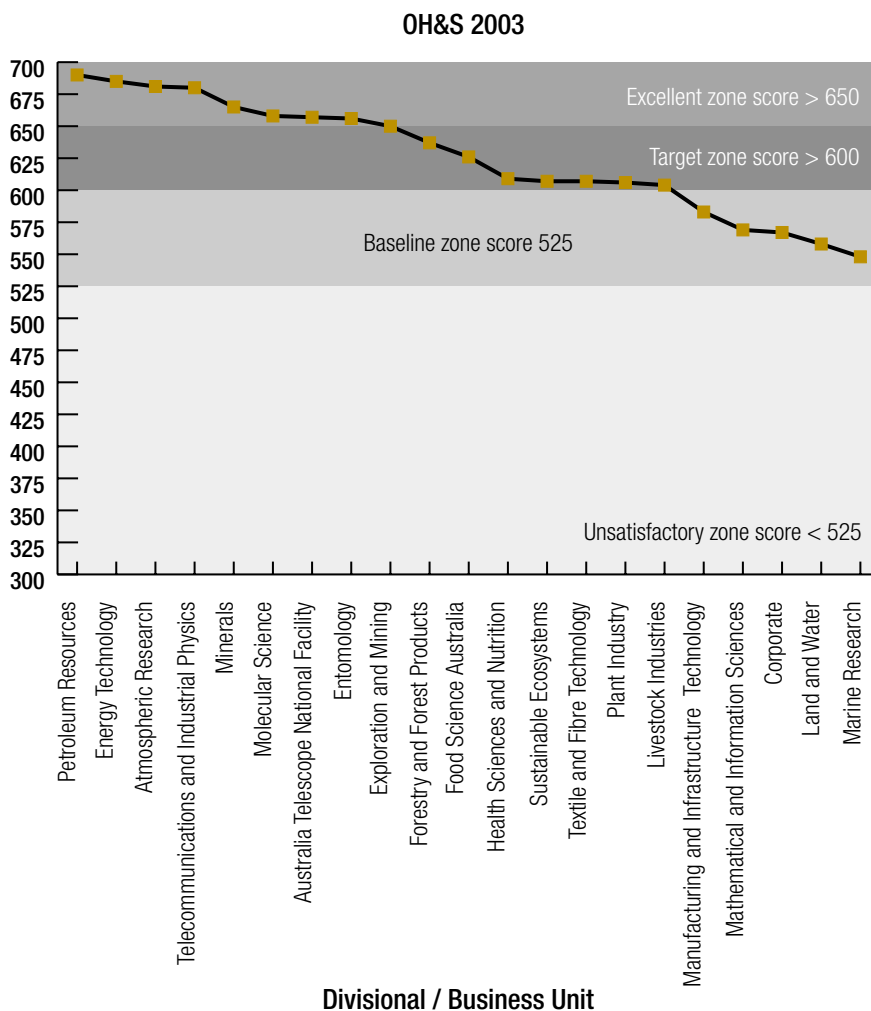


Figure 4: CSIRO OHS Performance Zone Scores - End of quarter - 30 June 2003



3

Section

Corporate Governance

OHS investigations

Provisional improvement notices (PIN)

There was one PIN issued by a HSR to the Land and Water Division in Western Australia regarding maintenance work on roofs of buildings. The PIN expired in a timely manner to the satisfaction of the HSR.

Prohibition and improvement notices

Comcare issued two Improvement Notices at the Division of Forestry and Forest Products in Victoria 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 2003, these notices have not been revoked by Comcare.

No Prohibition Notices were raised.

Comcare investigations

Comcare conducted an audit of CSIRO's OHS&E Incident Reporting, Recording and Investigation Procedures. Comcare was satisfied with the quality of reports, records, investigation standards, staff awareness and follow up by management. No weaknesses were identified.

Comcare conducted four reviews of previous investigations of incidents. Comcare reported their satisfaction on the completion of recommendations to prevent re-occurrences.

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, which was launched in September 2002.

Last year we reported that a Staff opinion poll had been conducted at the end of 2001.

CSIRO conducted its second staff opinion poll in September 2002, which indicated a lower level of satisfaction amongst respondents with disabilities. The Organisation is establishing focus groups made up of staff with disabilities, in order to gain a better understanding of the responses and to inform the development of strategies to address the issues which surface in that process.

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

Performance Indicator	Actions 2002–03
Employment policies, procedures and practices comply with the requirements of the <i>Disability Discrimination Act (DDA) 1992</i> .	In this reporting period seven policy areas have been reviewed, covering topics such as all forms of paid and unpaid leave, all salary related conditions and allowances and classification appeals. In addition, personal and paternity leave provisions were reviewed and renegotiated as part of CSIRO's Enterprise Agreement 2002. These policies comply with the DDA 1992.
Recruitment information for potential job applicants is available in accessible formats on request.	In the past 12 months, CSIRO has increased the use of the Internet for recruitment. 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 <i>What is fair, what is not?</i> which was reviewed and minor changes made. As part of the roll-out of effort logging in late 2002, staff access issues were reviewed. No new 'adjustment' needs were identified.
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.	New leadership/management development programs are progressing, as a result of last year's review.
Complaints/grievance mechanisms, 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 *Environmental 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 focussing 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. This process commenced in 1999 and Divisions report on a quarterly basis on how well their implementation is progressing.

Legal Obligations Directories for each State and Territory are being developed to assist CSIRO to comply with Commonwealth, State and Territory environmental legislation, including the *Commonwealth Environmental Protection and Biodiversity Conservation Act (EPBC) 1999*. This is expected to be completed in 2003.

Environmental Policy

CSIRO's Environmental Policy was reviewed in 2002 and reflects that environmental management is one of its highest corporate priorities. The new policy focusses on responsible care of the environment and demonstrates our good neighbour approach.

Environmental Management Systems Committee

The Corporate Environmental Management Systems Committee advises on the development of environmental policies, programs and environmental priorities. The Committee meets every three months and all staff have access to the minutes of the meetings on the intranet.

Effects of CSIRO's activities on the environment

Environmental incidents

There was one reportable environmental incident within CSIRO during the past year. The Environmental Protection Agency was satisfied with the investigation and measures to prevent re-occurrence.

CSIRO reports and investigates any incident deemed to have environmental impact via its OHS&E incident reporting system.

Environmental waste and remediation on sites

There were three CSIRO sites subjected to remediation management during the past year. The remediation activities have been conducted with validation of clearance by Environmental Protection Authority approved auditors.

Low-level radioactive waste stored at Woomera has been monitored during the year. Drum conditions were assessed and security and emergency management arrangements are being met.

Comprehensive management strategies and reporting systems are in place for these identified environmental aspects.

Environmental Management System improvements and review

Environmental Management System improvements

CSIRO has introduced an Environmental Management System (EMS) to assist in minimising the impact of its business activities on the environment. As part of the EMS, each Division is required to develop an annual Environmental Improvement Plan. These identify improvement strategies such as waste management strategies.

At the project level, 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, as part of the integrated Health Safety and Environmental Assessment and Control of Work Policy. Environmental hazard and incident reporting and investigation has also been integrated into an OHS&E system.

Environmental training has been integrated into OHS&E training.

In December 2002, CSIRO introduced a new Environmental Achievement Award, which was won by CSIRO Queensland Centre for Advanced Technologies for its staff's voluntary remediation of Farm Creek in Queensland (see page 74 for details).

Environmental Management System monitoring and review

This year CSIRO has completed the program of independent environmental audits. The task of completing Preliminary Environmental Assessments is nearly completed and implementation of EMS stages is well underway.

A program to conduct EMS auditing across all 20 Divisions and Corporate Groups has been approved and will commence in August 2003, with completion due in August 2004.

The mechanisms CSIRO uses to monitor and review environmental management processes and to achieve continual improvement include:

- annual reporting on environmental performance indicators:
 - rate of water usage
 - rate of energy usage
 - percentage of environmental assessments completed
 - percentage of supervisory staff trained on environmental management
 - percentage of sites with a waste management program in place.
- quarterly reporting on Divisions' progress with implementing the EMS
- updating the environmental reporting process
- quarterly meetings by the Corporate EMS Committee to review actions to improve the management of environmental activities
- reporting every two months to the Board on environmental management.

The Australian National Audit Office (ANAO) audited CSIRO's Environmental Annual Report 2002 and included the results in a report to the Federal Government on the 'Annual Reporting on Ecologically Sustainable Development'. The report reflected favourably on CSIRO's environmental strategies, resource and performance indicators, internal benchmarking and our comprehensive Environmental Management System plan.

Energy services

The Corporate Energy Services Unit monitors energy usage and advises Divisions and users on energy consumption. It also recommends methods to reduce CSIRO's overall energy usage and greenhouse emissions in line with Government annual reduction targets and when relevant, provides staff awareness and training programs.

Energy usage at most sites has stabilised over the past two years due to various initiatives including more energy efficient buildings, and improved operating practices. During the reporting period a five per cent reduction was achieved on the CSIRO-wide purchase price of energy.

Heritage Sites

Corporate Property maintains a Heritage Register for Land and Buildings and has recently conducted a review of its holdings in conjunction with Commonwealth and State heritage bodies. The outcome of the review confirmed the completeness of the CSIRO Heritage Register. 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.

CSIRO Service charter

Our purpose

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

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 focussed 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.

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 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 the 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.

Review process

This service charter has been changed based on the feedback obtained during the year. The amendments have taken into account input from both within the organisation and from external stakeholders.






Financial Statements

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Independent Audit Report



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 report of the Commonwealth Scientific Industrial and Research Organisation for the financial year ended 30 June 2003 included on the Commonwealth Scientific Industrial and Research Organisation's web site. The Commonwealth Scientific Industrial and Research Organisation is responsible for the integrity of 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 report. 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 report to confirm the information included in the audited financial report presented on this web site.

Scope

I have audited the financial statements of the Commonwealth Scientific Industrial and Research Organisation for the year ended 30 June 2003. 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.

The members of the Board are responsible for the preparation and presentation of the financial statements and the information they contain. I have conducted an independent audit of the financial statements in order to express an opinion on them to you.

The audit has been conducted in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards, to provide reasonable assurance as to whether the financial statements are free of material misstatement. Audit procedures included examination, on a test basis, of evidence supporting the amounts and other disclosures in the financial statements and the evaluation of accounting policies and significant accounting estimates. These procedures have been undertaken to form an opinion as to whether, in all material respects, the financial statements are presented fairly in accordance with Accounting Standards and other mandatory professional reporting requirements in Australia and statutory requirements so as to present a view which is consistent with my understanding of the Commonwealth Scientific Industrial and Research Organisation's financial position, its financial performance and its cash flows.

The audit opinion expressed in this report has been formed on the above basis.

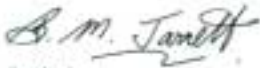
SPD Box 927 CAMBERMA ACT 2004
Commonwealth House 19 National Circuit
BARRON ACT
Phone 081 8312 7388 Fax 081 6261 7377

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
- (ii) give a true and fair view, in accordance with applicable Accounting Standards and other mandatory professional reporting requirements in Australia and the Finance Minister's Orders, of the financial position of the Commonwealth Scientific Industrial and Research Organisation as at 30 June 2003, and its financial performance and cash flows for the year then ended.

Australian National Audit Office



Brandon Jarrett
Acting Executive Director

Delegate of the Auditor-General

Canberra
16 September 2003

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
STATEMENT BY BOARD MEMBERS

In our opinion, the attached financial statements for the year ended 30 June 2003 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 Organisation will be able to pay its debts as and when they become due and payable.

Signed on the 9th day of September 2003 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 2003

	Notes	2003 \$'000	2002 \$'000
Revenues from ordinary activities			
Revenues from Government	5.1	639 264	612 491
Sales of goods and services	5.2	275 440	267 042
Interest	5.3	9 700	7 572
Proceeds from sale of assets	5.4 & 6.4	12 924	85 895
Contributions	5.5	38	13 467
Other	5.6	12 247	37 380
Total revenues from ordinary activities	15(c)	949 613	1 023 847
Expenses from ordinary activities (excluding borrowing costs expense)			
Employees	6.1	469 918	422 408
Suppliers	6.2	290 676	276 967
Depreciation and amortisation	6.3	81 640	77 335
Written down value of assets sold	5.4 & 6.4	14 952	64 281
Write-down of assets	6.5	3 943	6 376
Net foreign exchange losses	6.6	215	9
Other	6.7	1 600	25 000
Total expenses from ordinary activities (excluding borrowing costs expense)	15(c)	862 944	872 376
		86 669	151 471
Borrowing costs expense	6.8	(1 478)	(1 642)
Share of net operating surplus/(deficit) of joint ventures accounted for using the equity method	25(e)	–	62
Net operating surplus from ordinary activities	22	85 191	149 891
Net surplus	22	85 191	149 891
Net credit to asset revaluation reserve	22	–	37 305
Total valuation adjustments recognised directly in equity	22	–	37 305
Total changes in equity other than those resulting from transactions with owners as owners		85 191	187 196

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 2003

	Notes	2003 \$'000	2002 \$'000
ASSETS			
Financial Assets			
Cash	7	158 149	148 389
Receivables	8	66 741	135 940
Investments accounted for using the equity method	9	–	107
Investments – other	9	5 861	2 302
Total financial assets		230 751	286 738
Non-Financial Assets			
Land and buildings	10	853 878	834 106
Plant and equipment	11	233 155	236 669
Intangibles	12	5 815	3 662
Inventories	13	771	790
Other	14	27 221	22 844
Total non-financial assets		1 120 840	1 098 071
Total assets		1 351 591	1 384 809
LIABILITIES			
Interest Bearing Liabilities			
Loans	15(a)	–	52 800
Leases	16	88 025	61 829
Deposits	17	37 696	36 495
Total interest bearing liabilities		125 721	151 124
Provisions			
Capital use charge	18	–	892
Employees	19	187 374	178 483
Total provisions		187 374	179 375
Payables			
Suppliers	20	32 700	29 777
Other	21	55 537	52 257
Total payables		88 237	82 034
Total liabilities		401 332	412 533
NET ASSETS		950 259	972 276
EQUITY			
Reserves	22	481 251	481 251
Accumulated surpluses	22	469 008	491 025
Total equity		950 259	972 276
Current assets		252 882	250 163
Non-current assets		1 098 709	1 134 646
Current liabilities		186 177	177 786
Non-current liabilities		215 155	234 747

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 2003

	Notes	2003 \$'000	2002 \$'000
OPERATING ACTIVITIES			
Cash received			
Appropriations	5.1	639 264	612 491
Sales of goods and services		321 834	311 273
Interest		9 615	7 095
GST recovered from Australian Taxation Office		16 537	1 347
Deposits		1 202	28 018
Total cash received		988 452	960 224
Cash used			
Employees		461 023	413 971
Suppliers		327 172	315 256
Borrowing costs		1 478	1 642
Total cash used		789 673	730 869
Net cash from/(used by) operating activities	24	198 779	229 355
INVESTING ACTIVITIES			
Cash received			
Proceeds from sale of property, plant and equipment		12 924	64 104
Proceeds from sale of shares and intellectual property		–	1 660
Total cash received		12 924	65 764
Cash used			
Purchase of property, plant and equipment		115 001	117 840
Purchase of equity investment		5 037	7 181
Purchase of Financial Instruments		17 200	32 800
Total cash used		137 238	157 821
Net cash from/(used by) investing activities		(124 314)	(92 057)
FINANCING ACTIVITIES			
Cash received			
Proceeds from debt		45 088	51 395
Total cash received		45 088	51 395
Cash used			
Repayment of debt		1 693	27 008
Capital use charge – paid to Government		108 100	100 413
Proceeds from property sales – paid to Government	22	–	49 604
Total cash used		109 793	177 025
Net cash from/(used by) financing activities		(64 705)	(125 630)
Net increase/(decrease) in cash held		9 760	11 668
Cash at the beginning of the year		148 389	136 721
Cash at the end of the year	7	158 149	148 389

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 2003

	2003	2002
	\$'000	\$'000
By Type		
Commitments payable		
Capital commitments		
Land and buildings	8 912	55 985
Plant and equipment	2 438	689
Total capital commitments	11 350	56 674
Other commitments		
Operating leases	422 551	442 685
Research and development commitments	352 508	291 617
Other commitments	11 212	12 797
Total other commitments	786 271	747 099
Total commitments payable	797 621	803 773
Commitments receivable		
Research and development commitments	268 402	253 807
Other receivables	12 904	7 080
Total commitments receivable	281 306	260 887
Net commitments payable	516 315	542 886
By Maturity		
All net commitments		
One year or less	102 532	98 988
From one to five years	106 441	114 105
Over five years	307 342	329 793
Net commitments payable	516 315	542 886
Operating lease commitments		
One year or less	22 489	22 758
From one to five years	88 880	88 279
Over five years	311 182	331 648
Total net operating lease commitments	422 551	442 685

The above schedule should be read in conjunction with the accompanying notes.

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
SCHEDULE OF CONTINGENCIES

As at 30 June 2003

	Notes	2003 \$'000	2002 \$'000
Contingent liabilities			
Loan payable to the Commonwealth Government	15	70 000	–
Loan payable to the Queensland Government	15	5 000	–
Interest payable on the Commonwealth Government loan	15	9 376	5 740
Estimated legal claims arising from employment, motor vehicle accidents and contractual disputes. CSIRO has denied liability and is defending the claims.		980	205
Total contingent liabilities		85 356	5 945
Contingent assets			
Receivable from AMC	15	75 000	–
Royalties receivable from AMC	15	9 376	5 740
Total contingent assets		84 376	5 740
Net contingent liabilities		980	205

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 2003

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4

Section

Financial Statements

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS

For the year ended 30 June 2003

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 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 2003) Orders)
- Australian Accounting Standards and Accounting Interpretations issued by 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, 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 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, which 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 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 2001–02, except in respect of:

- measurement of certain employee benefits at nominal amounts (refer Note 1.10)
- the imposition of an impairment test for non-current assets carried at cost (refer Note 1.7).

1.3 Consolidation

CSIRO acquired seven fully owned R&D Syndication companies listed in Note 9 when investors in the Syndications exercised their put options under the Syndications' agreements. These companies are in the process of being wound up by members' voluntary liquidation. In addition CSIRO has established other subsidiary companies listed in Note 9 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 which would affect CSIRO's financial position and/or performance and as a result they have not been consolidated.

1.4 Revenue Recognition

The revenues described in this Note are revenues relating to the core operating activities of CSIRO.

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 14) 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 goods and other services is recognised upon delivery of goods and services performed.

Note 1 Summary of significant accounting policies – continued

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 parliamentary appropriation for 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 at their fair value as revenue 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 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.

Revaluations

Property, plant and equipment, including assets under finance leases, were revalued in June 2002 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. The next revaluation will be performed in 2004–05.

Land and buildings were revalued as at 30 June 2002. Land, which will continue to be used for research activity, was valued by CSIRO's registered valuer at 'existing use value'. 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 CSIRO 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 and condition. Building valuations include plant, fitouts, 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 as at 1 July 2001 using the 'deprival' method. Other plant and equipment under that \$75 000 threshold was valued in house at their 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.

Note 1 Summary of significant accounting policies – continued

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 45 years

The aggregate amount of depreciation and amortisation for the year is disclosed in Note 6.3.

Recoverable amount test

From 1 July 2002, Schedule 1 no longer requires the application of the recoverable amount test in AASB 1010 Recoverable Amount of Non-Current Assets to the assets of Commonwealth Government authorities when the primary purpose of the asset is not the generation of net cash inflows.

No property, plant and equipment assets have been written down to recoverable amount. Accordingly the change in policy has had no financial effect.

1.7 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 2003. 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.

Note 1 Summary of significant accounting policies – continued

1.8 Investments

Australian Accounting Standard, AASB1041 on 'Revaluation of Non-Current Assets' allows a choice to either adopt the cost basis or the fair value basis in the valuation of its investments. CSIRO has elected to value its investments at cost, where this is not in excess of their recoverable amounts. As at 30 June 2003, CSIRO's investment in listed companies, Australian Magnesium Corporation Ltd and Ambri Ltd have been written down to their recoverable amount (Note 9(c)).

CSIRO has conducted a review of its investment in unlisted R&D and subsidiary companies principally involved in R&D and high technology industries in June 2003. Where the inherent business risk of these companies is high it is doubtful that probable future economic benefit will flow from these companies, CSIRO has fully provided for diminution in value for these companies, except for Ceramic Fuel Cells Ltd, Evogenix Pty Ltd and WindLab Pty Ltd. This has the effect of increasing CSIRO's operating surplus by \$3.753 million before Capital Use Charge.

CSIRO'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.

1.9 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.

1.10 Employee Benefits

Leave

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. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken by employees is less than the annual entitlement for sick leave.

The nominal amount is calculated with regard to the rates expected to be paid on settlement of the liability. This is a change in accounting policy from last year required by initial application of the new Accounting Standard AASB 1028 from July 2002. As CSIRO's certified agreement increased pay rates by 5% on 3 July 2003, and it has been included in the calculation of leave liabilities. The financial effect of this change is not material.

The liability for long service leave benefits is recognised and measured at the present value of the estimated future cash flows to be made in respect of services provided by employees up to 30 June 2003. In determining the present value of the liability, attrition rates and pay increases through promotion and inflation have been taken into account.

The leave liabilities are calculated on the basis of employees' remuneration, including CSIRO's employer superannuation contributions to the extent that leave is likely to be taken during service rather than paid out on termination.

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, has informed employees affected and a reliable estimate of the amount payable can be determined.

Note 1 Summary of significant accounting policies – continued

Superannuation

CSIRO discharges its liability for employees' superannuation by contributing to the Commonwealth Superannuation Scheme (CSS) and the Public Sector Superannuation Scheme (PSS), which provide retirement, death and disability benefits to employees. Contributions to the schemes are 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.

1.11 Workers' Compensation

CSIRO'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.

1.12 Insurance

As part of its risk management strategy, CSIRO has insured for risks through the Commonwealth Government's insurable risk managed fund called 'Comcover', for a range of risks including industrial special risks, professional indemnity, public and product liability, directors and officers liability/company reimbursement, travel and motor vehicles. The insurance cover is designed to protect CSIRO from catastrophic losses. There is a deductible on each of the above insurances, the largest being \$650 000.

1.13 Cash

For the purpose of the Statement of Cash Flows, cash includes cash at bank and on hand, deposits at call and trust monies. They are readily convertible to cash.

1.14 Inventories

Inventories held represent books, CD-ROMs and videos. 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 Capital Usage Charge

A capital usage charge is imposed by the Government on the net assets of CSIRO. The charge is accounted for as a dividend to Government.

In accordance with the recommendations of a review of Budget Estimates and Framework, the Government has decided that the charge will not operate after 30 June 2003. Therefore, the amount of the charge paid in respect of 2002–03 is the amount appropriated (2002 11% of adjusted net assets).

1.17 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.

Note 1 Summary of significant accounting policies – continued

1.18 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, CSIRO 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.

1.19 Taxation

In accordance with section 53 of the *Science and Industry Research Act 1949*, CSIRO is exempt from all forms of Australian taxation except fringe benefits tax and the goods and services tax. CSIRO pays applicable taxes in overseas countries.

1.20 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 9(b)).

1.21 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. CSIRO's interest in a joint venture entity, Food Science Australia (FSA) is accounted for using the equity method. Refer Note 25(e). The share of the surplus or deficit of the FSA joint venture entity is recognised in the Statement of Financial Performance. Details of the joint venture entity are disclosed in Note 25(e).

1.22 Financial Instruments

Accounting policies for financial instruments are stated in Note 36.

1.23 Comparative Figures

Where necessary, comparative figures have been adjusted to conform to changes in presentation in these financial statements.

Note 2 Economic Dependency

CSIRO 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. Current triennium funding agreement with the Commonwealth Government due to complete in 2002–03 has been extended by one year for 2003–04.

CSIRO 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 3 Segment Reporting

CSIRO 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.

Note 4 Reporting of Outcome and Outputs

(a) Reporting of outcome

CSIRO's outputs contribute to a single outcome, 'The application or utilisation of the results of scientific research delivers:

- innovation and competitive industries
- healthy environment and lifestyles
- a technologically advanced society'.

(b) Net cost of outcome delivery

	2003 \$'000	2002 \$'000
Total expenses	851 498	809 737
Total costs recovered from provision of goods and services to the non-government sector*	1 361	–
Other external revenues:		
Sale of goods and services – to related entities	37 760	41 754
Sale of goods and services – to external entities	236 319	225 288
Interest	9 700	7 572
Net gains from sale of assets	–	21 614
Contributions	38	13 467
Reinstatement of receivable from AMC	–	25 000
Rental income	2 995	3 204
Sale of primary produce	1 631	1 619
Other	7 621	7 557
Total other external revenues	296 064	347 075
Net cost/(contribution) of outcome	554 073	462 662

* No comparative is available for 2001–02 due to the change in the new Government requirement to collect and disclose this information in 2002–03.

Note 4 Reporting of Outcome and Outputs – continued

(c) Major Organisational Revenues and Expenses by Output Groups

	Output Group 1		Output Group 2		Output Group 3		Output Group 4		Total	
	Information Technology, Manufacturing & Services		Sustainable Minerals & Energy		Environment & Natural Resources		Agribusiness & Health			
	2003 \$'000	2002 \$'000	2003 \$'000	2002 \$'000	2003 \$'000	2002 \$'000	2003 \$'000	2002 \$'000	2003 \$'000	2002 \$'000
Operating Expenses										
Employees	153 290	120 978	72 040	80 976	120 869	85 115	123 719	135 340	469 918	422 409
Suppliers	83 196	79 323	44 170	53 095	75 905	55 809	87 405	88 740	290 676	276 967
Depreciation and amortisation	25 996	22 149	11 292	14 825	15 612	15 583	28 740	24 778	81 640	77 335
Written down value of assets sold	3 355	18 410	1 649	12 323	6 810	12 952	3 138	20 596	14 952	64 281
Write-down of assets	545	226	458	151	1 912	159	1 028	5 839	3 943	6 375
Reinstatement of Government loans	–	–	–	25 000	–	–	–	–	–	25 000
Other	697	473	236	316	323	333	2 037	529	3 293	1 651
Total operating expenses	267 079	241 559	129 845	186 686	221 431	169 951	246 067	275 822	864 422	874 018
Funded by:										
Revenues from Government	211 067	195 813	88 625	102 194	159 030	130 081	180 542	184 403	639 264	612 491
Sale of goods and services	76 458	63 316	50 338	48 174	75 411	52 153	73 233	103 399	275 440	267 042
Proceeds from sale of assets	3 191	20 366	1 552	15 495	4 835	16 775	3 346	33 259	12 924	85 895
Contributions	26	–	4	13 290	8	–	–	–	38	13 290
Reinstatement of receivable from AMC	–	–	–	25 000	–	–	–	–	–	25 000
Other	5 330	4 773	3 250	3 631	6 417	3 931	6 950	7 856	21 947	20 191
Total operating revenues	296 072	284 268	143 769	207 784	245 701	202 940	264 071	328 917	949 613	1 023 909

Note 4 Reporting of Outcome and Outputs – *continued*

(c) Major Organisational Revenues and Expenses by Output Groups

	Information Technology, Manufacturing & Services				Sustainable Minerals & Energy			
	Outputs for 2003				Outputs for 2003			
	Strategic Research	Contract R&D, Consultancy and Specialised Testing Services	Licencing and Exploitation of Intellectual Property	Total	Strategic Research	Contract R&D, Consultancy and Specialised Testing Services	Licencing and Exploitation of Intellectual Property	Total
	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
Operating Expenses								
Employees	118 266	30 976	4 048	153 290	60 510	11 266	264	72 040
Suppliers	58 940	19 893	4 363	83 196	35 786	8 196	188	44 170
Depreciation and amortisation	16 588	8 819	589	25 996	9 571	1 656	65	11 292
Written down value of assets sold	2 738	510	107	3 355	1 388	244	17	1 649
Write-down of assets	702	430	(587)	545	102	219	137	458
Other	563	106	28	697	186	47	3	236
Total operating expenses	197 797	60 734	8 548	267 079	107 543	21 628	674	129 845
Funded by:								
Revenues from Government	200 839	6 023	4 205	211 067	83 492	4 758	375	88 625
Sale of goods and services	39 328	32 568	4 562	76 458	32 903	16 205	1 230	50 338
Proceeds from sale of assets	2 646	443	102	3 191	1 311	224	17	1 552
Contributions	26	–	–	26	4	–	–	4
Other	2 651	2 085	594	5 330	3 733	(443)	(40)	3 250
Total operating Revenue	245 490	41 119	9 463	296 072	121 443	20 744	1 582	143 769

Note 4 Reporting of Outcome and Outputs – continued

(c) Major Organisational Revenues and Expenses by Output Groups

	Environment & Natural Resources				Agribusiness & Health			
	Outputs for 2003				Outputs for 2003			
	Strategic Research	Contract R&D, Consultancy and Specialised Testing Services	Licencing and Exploitation of Intellectual Property	Total	Strategic Research	Contract R&D, Consultancy and Specialised Testing Services	Licencing and Exploitation of Intellectual Property	Total
Operating Expenses								
Employees	110 772	9 582	515	120 869	115 313	8 361	45	123 719
Suppliers	68 220	7 647	38	75 905	80 911	7 285	(791)	87 405
Depreciation and amortisation	14 434	1 017	161	15 612	25 055	3 503	182	28 740
Written down value of assets sold	6 207	533	70	6 810	2 828	247	63	3 138
Write-down of assets	839	64	1 009	1 912	1 432	(8)	(396)	1 028
Other	288	30	5	323	1 876	162	(1)	2 037
Total operating expenses	200 760	18 873	1 798	221 431	227 415	19 550	(898)	246 067
Funded by:								
Revenues from Government	155 688	2 708	634	159 030	167 477	11 380	1 685	180 542
Sale of goods and services	59 667	12 636	3 108	75 411	59 360	8 697	5 176	73 233
Proceeds from sale of assets	4 458	304	73	4 835	2 998	262	86	3 346
Contributions	8	–	–	8	–	–	–	–
Other	6 749	(207)	(125)	6 417	6 744	374	(168)	6 950
Total operating Revenue	226 570	15 441	3 690	245 701	236 579	20 713	6 779	264 071

The output reporting note disclosure has been developed on the following basis:

- CSIRO Divisions assign each research project to one of the three outputs
- The attribution of costs and revenues to outputs is derived from cost and revenue codes within CSIRO's project-based accounting system
- Divisional support costs are allocated to projects using appropriate cost drivers such as floor space and direct labour hours or dollars
- Corporate support costs are allocated to Divisions and then projects in accordance with their share of total CSIRO revenue.

This methodology involves management decisions/estimation as to (a) the choice of cost driver for use in the allocation of indirect and support costs and (b) the amount of appropriation revenue allocated to projects.

No comparative information is provided as 2002–03 is the first year of reporting at output levels.

CSIRO has advised Parliament, via the PBS, that the outcome-output framework is in a state of transition and that output reporting will be fully operational for both planning and reporting purposes in 2003–04.

Note 4 Reporting of Outcome and Outputs – continued

(d) Appropriations

Particulars	Departmental Outputs		Loans		Equity		Total	
	2003 \$'000	2002 \$'000	2003 \$'000	2002 \$'000	2003 \$'000	2002 \$'000	2003 \$'000	2002 \$'000
Balance carried forward from previous year	–	–	17 200	–	–	–	17 200	–
Appropriation (Act 1)	639 629	614 713	–	–	–	–	639 629	614 713
Appropriation (Act 3) – reduction	(365)	(2 222)	–	–	–	–	(365)	(2 222)
	639 264	612 491	17 200	–	–	–	656 464	612 491
Appropriation (Acts 2 & 4)/Loan	–	–	–	50 000	–	–	–	50 000
Total available for payment	639 264	612 491	17 200	50 000	–	–	656 464	662 491
Total payments made	(639 264)	(612 491)	(17 200)	(32 800)	–	–	(656 464)	(645 291)
Balance carried forward to next year	–	–	–	17 200	–	–	–	17 200
Return contributed equity (Note 22)	–	–	–	–	–	(49 604)	–	(49 604)

Note 5 Operating Revenues

	Notes	2003 \$'000	2002 \$'000
5.1 Revenues from Government			
Appropriations for outputs	4	639 264	612 491
5.2 Sales of goods and services ^(a)			
Strategic R&D – co-investment activities		177 971	228 319
Services and consulting ^(b)		83 681	21 813
Intellectual property revenues (eg royalties and license fees)		13 788	18 508
		275 440	268 640
Less, Net gains on sale of shares and intellectual property included in intellectual property revenue above	5.4	–	1 598
		275 440	267 042
Sales of goods and services			
Goods		6 823	7 930
Services		268 617	259 112
		275 440	267 042
Provision of goods to:			
Related entities		–	–
External entities		6 823	7 930
		6 823	7 930
Rendering of services to:			
Related entities		37 760	41 754
External entities		230 857	217 358
		268 617	259 112
Cost of goods sold – inventory items only		1 276	835
5.3 Interest			
Bank and term deposits		9 700	7 572

Note 5 Operating Revenues – *continued*

	Notes	2003 \$'000	2002 \$'000
5.4 Net gains from sales of assets			
Land and Buildings			
Proceeds from sale		–	81 588
Less, Net book value		–	(61 261)
Net gains/(loss)		–	20 327
Plant and equipment			
Proceeds from sale		–	2 647
Less, Net book value		–	(2 958)
Net gains/(loss)		–	(311)
Shares and intellectual property			
Proceeds from sale		–	1 660
Less, Net book value		–	(62)
Net gains/(loss)	5.2	–	1 598
		–	21 614
5.5 Contributions			
Contributions of capital assets		–	13 290
Donations		38	177
		38	13 467
5.6 Other revenues			
Vehicle contributions – staff		120	137
Rental		2 995	3 204
Sale of primary produce		1 631	1 619
Reinstatement of receivable from AMC	15	–	25 000
Other		7 501	7 420
		12 247	37 380

- (a) CSIRO's share of the joint venture entity, FSA's external revenue of \$12.734 million (2002 \$12.059 million) is not included in the above total revenue of \$936.689 million (2002 \$959.566 million). This represents 86.43% (2002 83.07%) of FSA's external earnings of \$14.733 million (2002 \$14.517 million), based on CSIRO's percentage contribution to FSA, (Note 25(e)).
- (b) In 2002–03 a new revenue code for 'Contract consulting and services' amounting to \$60.305 million was included in 'Services and consulting' revenue of \$83.681 million. The comparative for 'Contract consulting and services' revenue was included in 'Strategic R&D – co-investment activities' revenue of \$228.319 million in 2001–02.

Note 6 Operating Expenses

	Notes	2003 \$'000	2002 \$'000
6.1 Employees expenses			
Wages and salaries		386 133	353 715
Superannuation		34 269	13 321
Leave and other entitlements		54 898	61 317
Separation and redundancy		5 441	5 315
Workers compensation		2 355	2 259
		<hr/>	<hr/>
		483 096	435 927
Less, Recovery of employee expenses from Food Science Australia	25(e)	(13 178)	(13 519)
		<hr/>	<hr/>
		469 918	422 408
6.2 Supplier expenses			
Goods from related entities		–	–
Goods from external entities		63 933	53 787
Services from related entities		9 071	10 264
Services from external entities		194 706	194 796
Operating lease rentals		22 966	18 120
		<hr/>	<hr/>
		290 676	276 967
6.3 Depreciation and amortisation			
Buildings and leasehold improvements		39 872	35 465
Plant and equipment		40 539	40 538
Intangibles		1 229	1 332
		<hr/>	<hr/>
		81 640	77 335
6.4 Net loss from sales of assets			
Land and Buildings			
Proceeds from sale		9 154	–
Less, Net book value		(9 241)	–
Net loss		<hr/>	<hr/>
		87	–
Plant and equipment			
Proceeds from sale		3 770	–
Less, Net book value		(5 711)	–
Net loss		<hr/>	<hr/>
		1 941	–
		<hr/>	<hr/>
		2 028	–

Note 6 Operating Expenses

	Notes	2003 \$'000	2002 \$'000
6.5 Write-down of assets			
Bad debts		219	466
Increase/(decrease) in provision for doubtful debts		2 246	(643)
Increase/(decrease) in provision for diminution in value of investment		285	5 586
Write-down of investments to recoverable amount		1 193	967
		3 943	6 376
6.6 Net foreign exchange losses			
Non-speculative		215	9
6.7 Other expenses			
Reinstatement of Commonwealth and Queensland Government loans	15	–	25 000
Contribution to FSA losses	25(e)	1 600	–
		1 600	25 000
6.8 Borrowing costs expense			
Finance charges on lease liabilities		1 478	1 642

Note 7 Cash (current)

Cash at bank and on hand		58 149	23 429
Deposits – at call		100 000	124 960
Total cash		158 149*	148 389*

*Total cash includes deposits held on behalf of third parties totalling \$37 696 449 (2002 \$36 494 535)

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Note 8 Receivables

	Notes	2003 \$'000	2002 \$'000
Goods and services		44 024	51 541
Provision for doubtful debts		(2 591)	(346)
		<hr/> 41 433	<hr/> 51 195
Property sales		20 250	20 250
Receivable from AMC	15(b)	–	57 800
Net GST receivable		788	1 461
Interest receivable		575	489
Other		3 695	4 745
Total net receivables		<hr/> 66 741	<hr/> 135 940
Gross receivables are aged as follows:			
Not overdue		<hr/> 54 464	<hr/> 124 296
Overdue by:			
Less than 30 days		7 981	7 414
30 to 60 days		2 373	2 288
60 to 90 days		1 181	774
More than 90 days		3 333	1 514
		<hr/> 14 868	<hr/> 11 990
Total gross receivables		<hr/> 69 332	<hr/> 136 286
Provision for doubtful debts is aged as follows:			
Not overdue		–	–
Overdue by:			
Less than 30 days		896	–
30 to 60 days		–	–
60 to 90 days		7	–
More than 90 days		1 688	346
Total provision for doubtful debts		<hr/> 2 591	<hr/> 346
Receivables are categorised as follows:			
Current		69 332	78 486
Non-current		–	57 800
		<hr/> 69 332	<hr/> 136 286

Note 9 Investments (non-current)

	% CSIRO interest	Notes	2003 \$'000	2002 \$'000
Investment – accounted for using the equity method		25(e)	–	107
Unlisted companies (a) – at cost				
Ascentia Pty Ltd (formerly Barley Plus Pty Ltd)	90.0		3 600	3 600
Ceramic Fuel Cells Ltd	14.5		1 879	1 879
Dunlena Pty Ltd	47.0		5	5
Evogenix Pty Ltd	4.2		181	90
Gene Shears Pty Ltd	50.0		580	580
PROVISOR Pty Ltd (formerly NWIRC Pty Ltd)	41.4		2 470	1 894
Quickstep Holdings Pty Ltd	22.5		480	480
Windlab Pty Ltd	66.7		2 700	–
WQI Pty Ltd	12.8		–	–
XRT Limited	25.1		1 390	1 290
			13 285	9 818
Provision for diminution in value		1.8	(9 532)	(9 818)
			3 753	–
Unlisted subsidiary companies (b) – at cost				
		1.3	–	–
Listed companies (c) – at cost				
Ambri Ltd	3.8		–	1 597
Gropep Limited	20.3		545	545
Listed companies (c) – at recoverable amount				
Ambri Ltd	3.8		539	–
Australian Magnesium Corporation Ltd	0.2		23	159
			1 107	2 301
Other unlisted companies/funds (d) – at cost				
SciVentures Pre-Seed Funds	3.4		1 000	–
Other Unlisted entities			1	1
			1 001	1
Total investment – others			5 861	2 302

Note 9 Investments (non-current) – *continued*

(a) & (d) Unlisted Companies/Funds

Names	Principal Activities
Ascentia Pty Ltd	Develop value added foods utilising a new cereal with nutritional and functional characteristics.
Ceramic Fuel Cells Ltd	Research and development of fuel cell technologies and analysing their market application opportunities.
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 hereof.
PROVISOR Pty Ltd	Provide research and development facility in the Australian grape and wine industry.
Quickstep Holdings Pty Ltd	Development and sale of the Quickstep™ process manufacturing technology for uses with polymer composite.
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. CSIRO 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.
SciVentures Pre-Seed Funds	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.

Note 9 Investments (non-current) – *continued*

(b) Subsidiary Companies – Fully Owned

(i) R&D Syndication Companies

The following companies were acquired when investors in the Syndication exercised their put options under the agreements.

Exsynd 1 Pty Ltd	Exsynd 5 Pty Ltd
Exsynd 2 Pty Ltd	Exsynd 6 Pty Ltd
Exsynd 3 Pty Ltd	Exsynd 7 Pty Ltd
Exsynd 4 Pty Ltd	

(ii) R&D Start-up Companies

The following companies have not been rounded to the nearest \$1 000 and they have either been acquired or incorporated to commercialise CSIRO's intellectual properties:

	2003	2002
	\$	\$
Aries Information Services Pty Ltd	2	2
CSIRO Bioinformatics Pty Ltd	12	12
Goldwood Holdings Pty Ltd	2	2
ATM Casting Technologies Pty Ltd*	570 512	12
Polymer Surface Technology Pty Ltd	12	12
Entocsm Pty Ltd	–	–
	<hr/>	<hr/>
	570 540	40
Provision for diminution in value	(570 540)	(40)
	<hr/>	<hr/>
	–	–
	<hr/>	<hr/>

*ATM Casting Technologies Pty Ltd was wound-up by members voluntary liquidation and deregistered in July 2003.

(c) Listed Companies

The quoted market values of the following listed companies as at 30 June were:

	2003	2002
	\$'000	\$'000
Ambri Ltd	539	1 769
Australian Magnesium Corporation Ltd	23	148
Gropep Limited	4 576	6 600
	<hr/>	<hr/>
	5 138	8 517
	<hr/>	<hr/>

Note 10 Land and buildings (non-current)

	2003 \$'000	2002 \$'000
Land		
At cost	1 555	–
At June 2002 valuation	131 726	140 280
	133 281	140 280
Buildings		
At cost	13 336	–
At June 2002 gross valuation	1 270 583	1 273 495
	1 283 919	1 273 495
Accumulated depreciation	(765 592)	(731 119)
	518 327	542 376
Capital works in progress – at cost	16 972	50 830
	535 299	593 206
Leasehold improvements		
At cost	50 276	–
At June 2002 gross valuation	85 856	83 362
	136 132	83 362
Accumulated amortisation	(45 288)	(42 982)
	90 844	40 380
Buildings under finance lease		
At cost	36 929	–
At June 2002 gross valuation	71 536	71 536
	108 465	71 536
Accumulated amortisation	(14 011)	(11 296)
	94 454	60 240
Total land and buildings	853 878	834 106

Note 11 Plant and equipment (non-current)

	2003	2002
	\$'000	\$'000
Plant and equipment		
At cost	86 734	48 962
At July 2001 gross valuation	500 161	515 810
	<hr/> 586 895	<hr/> 564 772
Accumulated depreciation	(370 531)	(346 137)
	<hr/> 216 364	<hr/> 218 635
Research vessels		
At cost	2 160	160
At July 2001 gross valuation	8 731	12 855
	<hr/> 10 891	<hr/> 13 015
Accumulated depreciation	(2 023)	(1 738)
	<hr/> 8 868	<hr/> 11 277
Plant and equipment under finance lease		
At cost	6 034	3 349
At July 2001 gross valuation	4 509	4 994
	<hr/> 10 543	<hr/> 8 343
Accumulated amortisation	(2 620)	(1 586)
	<hr/> 7 923	<hr/> 6 757
Total plant and equipment	<hr/> 233 155	<hr/> 236 669

4**Section****Financial Statements**

Note 11 Plant and equipment (non-current) – continued

(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 12) \$'000	Total \$'000
As at 1 July 2002					
Gross book value	140 280	1 479 223	586 130	15 480	2 221 113
Accumulated depreciation/amortisation	–	(785 397)	(349 461)	(11 818)	(1 146 676)
Net book value	140 280	693 826	236 669	3 662	1 074 437
Additions:					
by purchase	2 201	29 754	40 050	3 382	75 387
by finance lease	–	36 929	2 685	–	39 614
	2 201	66 683	42 735	3 382	115 001
Depreciation/amortisation expense	–	39 872	40 539	1 229	81 640
Disposals:					
Other disposals	(9 199)	(417)	(20 536)	–	(30 152)
As at 30 June 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

(b) Assets at Valuation

Item	Land \$'000	Buildings \$'000	Plant and equipment \$'000	Computer software \$'000	Total \$'000
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
As at 30 June 2002					
Gross value	140 280	1 428 393	533 659	–	2 102 332
Accumulated depreciation/amortisation	–	(785 397)	(346 832)	–	(1 132 229)
Net book value	140 280	642 996	186 827	–	970 103

Note 11 Plant and equipment (non-current) – continued

(c) Assets Held under Finance Lease

Item	Land \$'000	Buildings \$'000	Plant and equipment \$'000	Computer software \$'000	Total \$'000
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
As at 30 June 2002					
Gross value	–	71 536	8 343	–	79 879
Accumulated depreciation/amortisation	–	(11 296)	(1 586)	–	(12 882)
Net book value	–	60 240	6 757	–	66 997

(d) Assets under Construction

Item	Buildings \$'000	Plant and equipment \$'000	Computer software \$'000	Total \$'000
Gross value at 30 June 2003	16 972	–	3 382	20 354
Gross value at 30 June 2002	50 830	–	–	50 830

(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 2003 \$'000	Total 2002 \$'000
Freehold	96 030	552 330	–	–	648 360	683 565
Commonwealth Crown						
Leases	4 150	179 115	–	–	183 265	183 024
Leasehold	–	132 145	–	–	132 145	79 308
National Facilities	9 000	510 476	208 380	–	727 856	680 686
Finance Lease	5 000	108 465	10 543	–	124 008	84 879
Designated for Sale	19 102	45 986	–	–	65 088	72 152
Capital Works in Progress	–	16 972	–	–	16 972	50 831
	133 282	1 545 489	218 923	–	1 897 694	1 834 445
Plant and Equipment	–	–	389 406	–	389 406	371 188
Intangibles	–	–	–	18 862	18 862	15 480
Gross value	133 282	1 545 489	608 329	18 862	2 305 962	2 221 113
Accumulated depreciation/amortisation	–	(824 893)	(375 174)	(13 047)	(1 213 114)	(1 146 676)
Net book value as at 30 June	133 282	720 596	233 155	5 815	1 092 848	1 074 437

Note 11 Plant and equipment (non-current) – continued

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 CSIRO 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 CSIRO and 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 CSIRO’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 CSIRO. Where this is the case the property is valued at ‘existing use value’.

Note 11 Plant and equipment (non-current) – continued

(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 CSIRO on behalf of the Commonwealth Government.

Details of National Facilities included in the above totals of Land and Buildings and Plant and Equipment are as follows:

	AAHL	AT	ORV 'Southern Surveyor'	NML	Total
	\$'000	\$'000	\$'000	\$'000	\$'000
Land	9 000	–	–	–	9 000
Buildings	465 087	–	–	–	465 087
Accumulated depreciation	(246 345)	–	–	–	(246 345)
	218 742	–	–	–	218 742
Plant and equipment	10 503	170 067	10 891	16 919	208 380
Accumulated depreciation	(7 243)	(97 622)	(2 023)	(9 305)	(116 193)
	3 260	72 445	8 868	7 614	92 187
Net book value as at 30 June 2003	231 002	72 445	8 868	7 614	319 929
Net book value as at 30 June 2002	243 838	76 742	4 662*	7 583	332 825

The operating expenses for the above National Facilities for the financial year amounting to \$79 066 838 (2002 \$68 445 952) are included in CSIRO's Statement of Financial Performance. NML's operating expenses include the costs of leasing buildings from CSIRO.

* The net book value of \$4.662 million as at 30 June 2002 was for the ORV 'Franklin' which was sold during 2002–03 and replaced by the 'Southern Surveyor'.

Note 12 Intangibles (non-current)

	Notes	2003 \$'000	2002 \$'000
Computer software – at cost	1.7		
Internally developed and acquired software		15 480	15 480
Accumulated amortisation		(13 047)	(11 818)
		<hr/> 2 433	<hr/> 3 662
Internally developed software – in progress			
– Workflow software		879	–
– CSIRO Live software		2 503	–
		<hr/> 3 382	<hr/> –
Total intangibles – net book value		<hr/> 5 815	<hr/> 3 662

Note 13 Inventories held for resale (current)

Books and media products – at lower of cost and net realisable value	1.14	<hr/> 771	<hr/> 790
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Note 14 Other non-financial assets (current)

Contract research work in progress – at cost	1.4	23 464	20 995
Prepaid property rentals		1 997	1 475
Other prepayments		1 760	374
Total other non-financial assets		<hr/> 27 221	<hr/> 22 844

Note 15 Commonwealth and Queensland Governments/CSIRO/AMC Agreements

	Notes	2003 \$'000	2002 \$'000
(a) Loans (non-current)			
Payable to the Commonwealth Government (interest bearing)		–	52 800
Payable to the Queensland Government (non interest bearing)	21	–	5 000
Total loans		–	57 800

In 1992 the Commonwealth and Queensland Governments provided \$20 million and \$5 million respectively of non-recourse loans to CSIRO 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 CSIRO each has 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. CSIRO expects to receive monies from AMC to repay the loans to the Commonwealth and Queensland Governments. These loans were not recognised as a liability by CSIRO prior to 2001–02 as the decision on the construction of commercial production facilities by AMC had not occurred.

In 2001 the Commonwealth Government provided an additional non-recourse loan of \$50 million to CSIRO to facilitate the commercialisation of the new magnesium production technology by AMC. The \$50 million loan will incur a commercial interest rate during the term of the loan. As at 30 June 2003, \$50 million (2002 \$32.8 million) was fully drawn down by CSIRO.

CSIRO's obligation to pay the non-recourse loan liability totalling \$75 million to the Commonwealth and Queensland Governments is dependent on CSIRO 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 will not be able to complete its magnesium project unless new equity partners are found. Currently the magnesium project is in a 'care and maintenance' mode. In addition, in July 2003 AMC and Ford Motor Company (Ford) have reached agreement to release AMC from its binding obligation to supply magnesium and release Ford from its binding obligation to purchase magnesium under the supply agreement. 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 CSIRO will recover its \$75 million from AMC to repay its non-recourse loans totalling \$75 million. As a result, the liability of CSIRO to the Commonwealth and Queensland Governments in respect of the associated non-recourse loans has been de-recognised. This amount is disclosed as a contingent liability in the Schedule of Contingencies and Note 23.

During the pre-commercial phase of the project, CSIRO has not recognised its liability for interest on the Commonwealth Government loans because it was not considered probable that CSIRO would receive royalties in excess of \$75 million. Interest amounting to \$9.38 million (2002 \$5.74 million) on the Commonwealth loan of \$75 million (2002 \$52.8 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.

To the extent that future royalties exceed the total Government loans plus accrued interest they will be accounted as revenue to CSIRO and interest expense.

(b) Receivable from AMC (non-current)	8	–	57 800
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The agreement with AMC provides that AMC will 'cause to be paid to CSIRO' a minimum payment of \$75 million (2002 \$57.8 million). As noted in 15(a) above, CSIRO has reviewed the recoverability of this amount in the preparation of its 2002–03 financial statements. Having considered the available information and announcements made by AMC, its major creditors and a major shareholder as noted in 15(a), the probable recoverability of the receivable from AMC of \$75 million was considered 'less than probable'. As a result the receivable from AMC has been de-recognised. It is disclosed as a contingent asset in the Schedule of Contingencies and Note 23. In 2001–02 CSIRO recognised the amount of \$57.8 million paid to AMC for the periods to 30 June 2002 as a receivable from AMC.

Note 15 Commonwealth and Queensland Governments/CSIRO/AMC Agreements – continued**(c) De-recognition of the receivable from AMC and loans payable** (Note 15(a) and (b))

CSIRO has de-recognised the receivable of \$75 million against the loan liability of \$75 million in the Statements of Financial Position without taking the transactions through the Statement of Financial Performance. This is in accordance with AASB 1014, Set-off and Extinguishment of Debt, where there is a legal right of set-off, and CSIRO intends to settle the receivable and the loan liability simultaneously.

Note 16 Leases

	2003	2002
	\$'000	\$'000
Finance lease liability is payable as follows:		
Within one year	8 354	5 452
In one to five years	28 684	18 431
In more than five years	92 459	48 130
Minimum lease payments	129 497	72 013
Future finance charges	(41 472)	(10 184)
Total finance lease liability	88 025	61 829
Lease liability is categorised as follows:		
Current	4 837	4 149
Non-Current	83 188	57 680
	88 025	61 829

Note 17 Deposits (current)

Deposits	37 696	36 495
Represents monies held on behalf of third parties:		
Cescade Pty Ltd	19 750	20 401
Cooperative Research Centres	8 450	8 656
National Aeronautical Space Agency (NASA)	5 989	1 285
Department of Communications, Information Technology and Arts	2 420	4 961
The Australian National Wildlife Collection Foundation	294	353
Others	793	839
	37 696	36 495

Note 18 Capital use charge provision (current)

	Notes	2003 \$'000	2002 \$'000
Capital Use Charge		–	892
Movements in capital use charge provision are:			
Balance owing as at 1 July		892	527
Capital use charge paid during year		(892)	(527)
		–	–
Capital use charge provided during year	22	107 208	100 778
		107 208	100 778
Capital use charge paid during year		(107 208)	(99 886)
Balance owing as at 30 June		–	892

Note 19 Employee provisions

Accrued wages and salaries		14 170	12 495
Provision for annual leave		54 158	53 248
Provision for long service leave		110 119	103 435
Provision for severance pay		5 204	4 432
Provision for redundancy		3 723	4 873
Total employee provisions		187 374	178 483
Employee provisions are categorised as follows:			
Current		60 244	59 216
Non-current		127 130	119 267
		187 374	178 483

Note 20 Supplier payables (current)

Trade creditors		32 700	29 777
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Note 21 Other payables

Contract research revenue received in advance		43 554	39 199
Other creditors		9 990	6 058
Provisions – for clean up and others		500	2 000
Loan payable to the Queensland Government	15(a)	–	5 000
Amount owing to FSA	25(e)	1 493	–
Total other payables		55 537	52 257
Other liabilities are categorised as follows:			
Current		55 537	47 257
Non-current		–	5 000
		55 537	52 257

Note 22 Equity – Analysis of Equity

Description	Accumulated Surplus		Asset Revaluation Reserve		Total Equity	
	2003	2002	2003	2002	2003	2002
	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
Balance as at 1 July	491 025	491 516	481 251	443 946	972 276	935 462
Net surplus/(deficit)	85 191	149 891	–	–	85 191	149 891
Net revaluation increase (b)	–	–	–	37 305	–	37 305
Transaction with owners:						
Return on capital						
Capital use charge (Note 1.16)	(107 208)	(100 778)	–	–	(107 208)	(100 778)
Return of capital						
Return of contributed equity (a)	–	(49 604)	–	–	–	(49 604)
Balance as at 30 June	469 008	491 025	481 251	481 251	950 259	972 276

(a) Return of contributed equity

Following a joint (CSIRO/Department of Finance and Administration) review of CSIRO's property holdings, six properties (in ACT, NSW, QLD and WA) were identified for sale and leaseback between 2000 and 2003. CSIRO has made equity repayments to the Government of proceeds from the sale of these properties. The first property at North Ryde, NSW was sold and gross proceeds of \$59 591 303 was repaid to the Government in June 2001. Three properties (ie Campbell, Gungahlin and Yarralumla) in ACT were sold and the gross proceeds of \$49 604 275 were paid to the Government in June 2002. The Government has now decided that the remaining properties will not be sold.

To ensure these sales have no adverse financial impact on CSIRO's research activities, CSIRO will receive Government funding for sale costs and ongoing additional rental and outgoings associated with the lease back arrangements.

(b) Asset revaluation reserve

	2003 \$'000	2002 \$'000
The net revaluation increase in the asset revaluation reserve comprises:		
Net revaluation increase/(decrease) in property, plant and equipment:		
– land	–	15 598
– buildings and leasehold improvements	–	15 765
– plant and equipment	–	5 942
Total net revaluation increase	–	37 305

Note 23 Contingent liabilities and assets

	Notes	2003 \$'000	2002 \$'000
Quantifiable contingencies			
Contingent liabilities			
Loans payable to the Commonwealth Government	15	70 000	–
Loan payable to the Queensland Government	15	5 000	–
Interest on Commonwealth Government loans	15	9 376	5 740
Estimated legal claims arising from employment, motor vehicle accidents and contractual disputes. CSIRO has denied liability and is defending the claims		980	205
Total contingent liabilities		85 356	5 945
Contingent assets			
Receivable from AMC	15	75 000	–
Royalties receivable from AMC	15	9 376	5 740
Total contingent assets		84 376	5 740
Net contingent liabilities		980	205

Unquantifiable contingencies

Preliminary investigation by the CSIRO Environmental Management Committee identified a range of potential environmental risks associated with storage of low-level radioactive waste at Woomera, South Australia, and low-level contamination of a number of sites. The costs associated with the clean-up of these sites have not been quantified. It is not practical to make such an assessment.

CSIRO had a number of legal claims arising from employment, motor vehicle accidents and contractual disputes where the estimated amounts of eventual payments, if any, could not be quantified. CSIRO has denied liability and is defending the claims.

Note 24 Cash flow reconciliation

	Notes	2003 \$'000	2002 \$'000
(a) Reconciliation of operating surplus to net cash from/(used by) operating activities			
Operating surplus		85 191	149 891
Non – cash items			
Depreciation and amortisation of property, plant and equipment	6.3	80 411	76 003
Amortisation of intangibles	6.3	1 229	1 331
Increase/(decrease) in provision for diminution in value	6.5	284	5 584
Increase/(decrease) write down to recoverable amount	6.5	1 193	967
(Profit)/loss on disposal of property, plant and equipment	5 & 6	2 028	(20 016)
(Profit)/loss on disposal of shares	5	–	(1 598)
Changes in assets and liabilities			
(Increase)/decrease in receivables	8	11 313	(8 980)
(Increase)/decrease in inventories	13	19	106
(Increase)/decrease in investment in joint venture, FSA	23	1 600	(62)
(Increase)/decrease in other assets	14	(4 377)	(1 500)
Increase/(decrease) in employee liabilities	19	8 891	8 435
Increase/(decrease) in liability to suppliers	20	2 923	5 866
Increase/(decrease) in other liabilities	21	6 787	(5 355)
Increase/(decrease) in GST receivable	8	86	(9 335)
Increase/(decrease) in deposits – liabilities	17	1 201	28 018
Net cash from/(used by) operating activities		198 779	229 355
(b) Reconciliation of cash			
Cash balance comprises:			
Cash at bank and on hand	7	58 149	23 429
Deposits – at call	7	100 000	124 960
		158 149	148 389

Note 25 Joint ventures

CSIRO participates in a number of joint ventures. In accordance with AASB 1006, these are segregated into joint venture operations and joint venture entities.

(a) Joint Venture Operations – Cooperative Research Centres (CRCs)

The Cooperative Research Centres 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 following 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 operation 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 Office of the Chief Scientist, Department of Education, Science and Training.

CSIRO has interests in 4 incorporated CRCs, and their financial statements as at 30 June 2003 were not available. The net assets of these entities at June 2002 were \$1.6 million and CSIRO's equity in these entities amounted to \$0.094 million. While they are joint venture entities the equity method to account for its interest in 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 and are commercially successful in their research and development and intellectual property, the equity accounting method will be adopted.

During the financial year, CSIRO's total actual 'in kind' and cash contributions to CRCs from its own resources was \$65.1 million; together with monies from the Commonwealth Government and external sources specifically for the CRCs, the total expended was \$99.3 million. CSIRO's contributions and expenses are included in the Statement of Financial Performance. CSIRO's total actual contributions to date, including funding from Commonwealth Government and external sources, for CRCs listed below amounted to \$390.1 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 \$31 million or 13% of CSIRO's total plant and equipment assets are used for CRC activities.

Note 25 Joint ventures – continued

At 30 June 2003, CSIRO is a core participant in 44 CRCs and CSIRO's interest in each of the CRCs is determined by the individual CRC agreement. These are:

Names of Cooperative Research Centres	CSIRO's Equity Interest (%) (excluding Commonwealth contributions)	Actual Cash & In-kind contributions 2002–03 \$'000	Termination Date
Agriculture and rural based manufacturing			
Australian Cotton	26	3 446	1 Jul 2006
Australian Sheep Industry	34	2 241	1 Jul 2008
Cattle and Beef Quality	21	2 075	1 Jul 2006
Innovative Dairy Products	7	703	1 Jul 2008
Sustainable Aquaculture of Finfish	14	1 138	1 Jul 2008
Sustainable Production Forestry	32	2 626	1 Jul 2004
Sustainable Rice Production	16	945	1 Jul 2004
Sustainable Sugar Production	19	588	1 Jul 2003
Tropical Plant Protection	27	577	1 Jul 2006
Viticulture	24	1 835	1 Jul 2006
Environment			
Antarctica and the Southern Ocean	15	1 254	1 Jul 2004
Australian Weed Management	14	1 402	1 Jul 2008
Biological Control of Pest Animals	57	1 520	1 Jul 2006
Catchment Hydrology	29	1 037	1 Jul 2006
Coastal Zone, Estuary and Waterway Management	27	1 523	1 Jul 2006
Freshwater Ecology	9	668	1 Jul 2006
Greenhouse Accounting	16	307	1 Jul 2006
Plant-based Management of Dryland Salinity	7	1 240	1 Jul 2008
Tropical Rainforest Ecology and Management	37	1 632	1 Jul 2006
Tropical Savannas Management	19	1 595	1 Jul 2008
Waste Management and Pollution Control*	8	361	1 Jul 2004
Water Quality and Treatment	8	728	1 Jul 2008
Information and communication technology			
Australian Telecommunications	4	461	1 Jul 2006
Enterprise Distributed Systems Technology*	21	979	1 Jul 2006
Satellite Systems	32	849	1 Jul 2005

Note 25 Joint ventures – continued

Names of Cooperative Research Centres	CSIRO's Equity Interest (%) (excluding Commonwealth contributions)	Actual Cash & In-kind contributions 2002–03 \$'000	Termination Date
Manufacturing technology			
Bioproducts	61	378	1 Jul 2006
Cast Metals Manufacturing	47	4 339	1 Jul 2006
Construction Innovation	22	2 466	1 Jul 2008
Functional Communication Surfaces	29	906	1 Jul 2008
Innovative Wood Manufacturing	5	596	1 Jul 2008
Intelligent Manufacturing Systems and Technologies*	7	486	1 Jul 2006
Microtechnology	9	789	1 Jul 2006
Polymers	28	953	1 Jul 2006
Welded Structures*	14	623	1 Jul 2006
Medical science and technology			
Cellular Growth Factors	9	747	1 Jul 2004
Diagnostics	23	1 842	1 Jul 2008
Eye Research and Technology ^(a)	21	2 091	1 Jul 2004
Vaccine Technology	26	715	1 Jul 2006
Mining and energy			
A J Parker CRC for Hydrometallurgy	60	6 346	1 Jul 2006
Australian Petroleum ^(b)	53	891	1 Jul 2004
Clean Power from Lignite	15	767	1 Jul 2006
Coal in Sustainable Development	14	2 550	1 Jul 2008
Landscape Environments and Mineral Exploration	28	3 702	1 Jul 2008
Predictive Mineral Discovery ^(c)	16	2 233	1 Jul 2008
Total actual Cash & In-kind contributions 2002–03		65 150	

(a) CSIRO is a participant in the CRC for Eye Research and Technology, which has a beneficial interest in Biocure Inc.

(b) CSIRO is a participant in the Australian Petroleum CRC, which has a beneficial interest in APCRC Commercial Ventures Pty Ltd.

(c) CSIRO is a participant in the CRC for Predictive Mineral Discovery, which has a beneficial interest in Ausmodel Pty Ltd.

Note 25 Joint ventures – continued

(b) Joint Venture Operations – High Performance Computing and Communication Centre (HPCCC)

CSIRO participates in a joint venture operation with the Bureau of Meteorology (BOM) in a 50/50 ownership and operation of a HPCCC. CSIRO and BOM jointly own the super computer and also jointly share in the usage and operating expenses of HPCCC. CSIRO's 50% share of the super computer and other plant and equipment in the joint venture of \$3.1 million (2002 \$4.4 million) written down value and its share of operating expenses are included in CSIRO's Statement of Financial Position and Statement of Financial Performance respectively.

(c) Joint Venture Operations – Graingene

CSIRO has a one third interest in the joint venture Graingene with the Grains Research and Development Corporation and the Australian Wheat Board Ltd. Graingene is a collaborative research and development venture where research and industry participants work together to identify, develop and bring to market grains technology. CSIRO's one-third share of operating expenses of Graingene is included in CSIRO's Statement of Financial Performance.

(d) Joint Venture Operations – other

In addition, CSIRO has collaborative arrangements with other parties to perform research and share in the outputs (ie mainly 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 numbers of this type of arrangement make it impractical to list separately. CSIRO's contributions to these joint ventures are included in CSIRO's Statement of Financial Performance.

(e) Joint Venture Entity – Food Science Australia (FSA)

CSIRO's investment in FSA has been accounted for using the equity method in prior years. However, in 2002–03 the equity method was discontinued due to CSIRO's share of the net operating deficit incurred by FSA during the year. It has a 50% interest in an unincorporated joint venture, FSA. It provides food industry clients with complete, integrated research for local training and commercial product and process levels for end services. During the year FSA made an operating deficit (unaudited) of \$3.2 million (2002 \$124 000 surplus). In accordance with the joint venture agreement the operating surplus is shared equally between the joint venture parties. CSIRO's share of the operating deficit was \$1.6 million (2002 \$62 000 surplus).

Movements in carrying amounts of investments/(liability) in joint venture entity, FSA is as follows:

	2003	2002
	\$'000	\$'000
Carrying amount at beginning of the financial year	107	45
Share of FSA's net operating surplus/(deficit) for the year	(1 600)	62
Investment in/(liability to) FSA at the end of the financial year	(1 493)	107

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 2002–03 CSIRO did not provide any in-kind contributions in the form of scientific staff and research facilities to BRI. The contributions in accordance with formal agreements between CSIRO and BRI were accounted for as expenses in CSIRO's Statement of Financial Performance in prior years. As at 30 June 2003, CSIRO has a 62% 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 CSIRO and not included in the Statement of Financial Position

	Land \$'000	Buildings \$'000	Plant and equipment \$'000	Total \$'000
At valuation or cost	6 752	44 980	31 124	82 856
Accumulated depreciation	–	(25 016)	(28 918)	(53 934)
Net value as at 30 June 2003	6 752	19 964	2 206	28 922
Net value as at 30 June 2002	6 762	19 986	2 807	29 555

The above assets are made available to CSIRO 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 the accounting policy Note 1.6, or made available to CSIRO 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 the 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 CSIRO.

The major contributor of the above assets is Australian Wool Innovation Pty Ltd.

Note 28 Monies held in trust

	2003 \$'000	2002 \$'000
Monies held in trust currently for the benefit of CSIRO, which are not included in the Statement of Financial Position, except for monies relating to ANWC are:		
Sir Ian McLennan Achievement for Industry Award	211	212
The Ken and Yasuko Myer Plant Science Research Fund	375	645
The Elwood and Hannah Zimmerman Trust Fund	1 266	1 252
The Australian National Wildlife Collection Foundation (ANWC)	294	353
Total monies held in trust as at 30 June	2 146	2 462

Monies held in trust represented by cash, deposits and investments.

The Ken and Yasuko Myer Plant Science Research Fund – Established to fund plant science research.

The Elwood and Hannah Zimmerman Research Trust Fund – Established to fund weevil research and the curation of the Australian National Insect Collection (ANIC) weevil collection.

The Australian National Wildlife Collection Foundation – Established to advance the interests and activities of the Australian National Wildlife Collection, a national reference record of Australian vertebrate fauna.

Sir Ian McLennan Achievement for Industry Award – Established to award outstanding contributions by CSIRO scientists to national development.

Note 28 Monies held in trust – continued

(b) Movements of trust funds summary

	McLennan \$'000	Myer \$'000	Zimmerman \$'000	ANWC \$'000	Total \$'000
Balance at 1 July 2002	212	645	1 252	353	2 462
Receipts during year	–	101	–	–	101
Interest and dividends	5	38	24	16	83
Expenditure	(6)	(409)	(10)	(75)	(500)
Balance at 30 June 2003	211	375	1 266	294	2 146

Note 29 Remuneration of auditors

	2003 \$	2002 \$
Remuneration to the Auditor-General for auditing the financial statements for the reporting period	183 200	162 000

The Auditor-General received no remuneration for other services during the reporting period.

Note 30 Collections

CSIRO owns several collections used for scientific research. CSIRO'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, CSIRO has not recognised them as an asset in its financial statements. The main collections held by CSIRO include:

Australian National Herbarium (ANH) – The ANH is one of the largest plant collections in Australia with approximately one million preserved plant specimens. It is unique among the Australian Herbaria in having a national focus for its collections, acquisition and research programs.

Australian National Insect Collection (ANIC) – The ANIC has over 11 million specimens and is the largest research collection of Australian insects and related organisms in the world.

Australian National Wildlife Collection (ANWC) – The ANWC, with over 80 000 specimens, holds CSIRO's 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, Antarctic, 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 31 Remuneration of Board Members

	2003 \$	2002 \$
Remuneration and superannuation benefits received or due and receivable by full-time and part-time Board Members were:		
Board Members' remuneration	616 230	587 362
Payments to superannuation funds for Board Members	48 799	42 171
	665 029	629 533

The number of Board Members whose total remuneration fell within the following bands were:

\$	2003 Number	2002 Number
Nil – 10 000	4	6
20 001 – 30 000	6	5
30 001 – 40 000	–	1
40 001 – 50 000	–	1
60 001 – 70 000	1	–
430 001 – 440 000	1	1
Total	12	14

Note 32 Meetings of Board Members and Audit Committee

During the financial year, six Board Meetings and four Audit Committee Meetings were held. The number of meetings attended by each of the Board and Audit Committee members was as follows:

	Board Members' Meetings		Audit Committee Meetings	
	No eligible to attend	No attended	No eligible to attend	No attended
C B Livingstone (Chairman)	6	6	4	4
G G Garrett	6	6	4	4
S Cory	6	5	–	–
T A Cutler (appointed 25/7/02)	6	6	3	3
P J B Duncan	6	5	–	–
J Harmer (appointed 16/4/03)	2	2	–	–
D F J McDonald	6	5	–	–
D P Mercer (term ended 3/3/03)	4	4	3	3
D O'Toole (appointed 16/4/03)	2	2	1	1
V R Sara	6	5	–	–
P Shergold (resigned 24/3/03)	3	2	–	–
E D Tweddell	6	6	3	3

The members of the Audit Committee are Mr D P Mercer (Chairman) (term ended 3/3/03), Ms Deborah O'Toole (Chairman, appointed 16/4/03), Dr T A Cutler, Dr Ed Tweddell and Ms E Alexander (independent adviser and non Board Member). Ms E Alexander attended all Audit Committee meetings held for the year.

The Chairman of the Board is an *ex officio* member of the Audit Committee and the Chief Executive is invited to attend meetings of the Audit Committee.

Note 33 Remuneration of Officers

	2003 \$	2002 \$
Aggregate amount of remuneration for Officers shown below	8 108 790	6 673 592
Aggregate amount of separation/termination benefit payments during year to Officers shown below	66 653	10 720
	8 175 443	6 684 312

The number of Officers, who received or were due to receive total remuneration of \$100 000 or more:

\$	2003 Number	2002 Number
100 001 – 110 000	–	1
110 001 – 120 000	2	–
140 001 – 150 000	–	1
150 001 – 160 000	2	1
160 001 – 170 000	2	1
180 001 – 190 000	2	1
190 001 – 200 000	4	5
200 001 – 210 000	1	5
210 001 – 220 000	3	4
220 001 – 230 000	4	3
230 001 – 240 000	4	–
240 001 – 250 000	5	1
250 001 – 260 000	1	–
270 001 – 280 000	1	3
280 001 – 290 000	–	1
290 001 – 300 000	1	–
300 001 – 310 000	–	2
320 001 – 330 000	2	–
350 001 – 360 000	1	–
430 001 – 440 000	1	1
Total	36	30

The Officers' remuneration includes all officers concerned with taking part in the management of CSIRO during 2002–03. They include the Chief Executive Officer, other members of the Executive Team and Chiefs of Divisions.

Note 34 Related party disclosures

Board Members – The Board Members of CSIRO during the financial year were:

C B Livingstone (Chairman)	D F McDonald
G G Garrett	D P Mercer (term ended 3/3/03)
S Cory	D O'Toole (appointed 16/4/03)
T A Cutler (appointed 25/7/02)	V R Sara
P J B Duncan	P Shergold (resigned 24/3/03)
J Harmer (appointed 16/4/03)	E D Tweddell

Remuneration – Information on remuneration of Board Members is disclosed in Note 31.

Board Members' interests in contracts

Since 1 July 2002 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, Rural Press Ltd, the Australian Business Foundation and the Sydney Institute. She was also a Director of Goodman Fielder Ltd until 19 March 2003. She is also a member of the Advisory Board of the Department of Accounting and Finance at the Macquarie University. 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.

Professor S Cory is Director of The Walter and Eliza Hall Institute of Medical Research and Professor of Medical Biology of the University of Melbourne. She is also a Director of Bio21 Australia Ltd. She is currently a member of the Knowledge, Innovation, Science and Engineering (KISE) Council of the Victorian Government; the Council of the Cancer Council Victoria; Committee for Melbourne Board; the Board of Management of the CRC for Cellular Growth Factors; the Education sub-committee of the CRC for Discovery of Genes for Common Human Diseases; the Commonwealth Government's Science and Innovation Mapping Taskforce; the Commonwealth Government's Review of Collaboration Between Universities and Research Agencies; and the Council of the Australian Academy of Science. 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.

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 elect of the CRC for Interaction Design, President of the Australian Centre for the Moving Image, and a member of the Library Board of Victoria. 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 designate 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 D P Mercer is the Chairman of Orica Ltd and Australia Pacific Airports Corporation Ltd. He was a Director of Australian Prudential Regulating Authority until June 2003 and Chancellor of RMIT University until January 2003. Orica Ltd has commercial relationships with CSIRO, and RMIT University is involved in a number of Cooperative Research Centres in which CSIRO is a participant. 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.

Note 34 Related party disclosures – continued

Professor V R Sara is a full-time Commonwealth Officer. She is Chief Executive Officer of the Australian Research Council. She is also a member of several Government committees including the Cooperative Research Centres Committee and the Coordinating Committee on Science and Technology. She is a Director, APEC R&D Leaders Network Advisory Board; Chair of the Bureau of Meteorology Advisory Board; a member of the Rio Tinto Foundation for a Sustainable Minerals Industry Advisory Board; and Vice-Chair of the OECD Global Science Forum. 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.

Dr P Shergold was the Chief Executive Officer and Secretary of the Department of Education, Science and Training (DEST) until February 2003, when he was appointed as Secretary of the Department of Prime Minister and Cabinet. All contracts and transactions with the Department are based on normal commercial terms and conditions, and there is no personal benefit to him.

Dr E Tweddell is Chairman of Ansell Ltd 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.

Note 35 Average staff levels

	2003 Number	2002 Number
The average staffing levels measured on a full-time equivalent basis for CSIRO during the year	5 921	5 835

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	7	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	8	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	9	These are carried at cost or recoverable amounts. No dividends have been declared or paid by the investee.	–
Receivables from AMC	15(b)	Receivables from AMC are not recognised in the Statement of Financial Position as at 30 June 2003 (refer Note 15 for details). They are disclosed in the Schedule of Contingencies and Note 23.	Refer Note 15 for details of terms and conditions.

Note 36 Financial instruments – continued

(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, CSIRO had finance leases with terms averaging 17 years and a maximum term of 25 years. The interest rate implicit in the leases averaged 4.3% pa. (2002 2.7%). 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 2003.	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	15 & 21	Loans payable to the Commonwealth and Queensland Governments are not recognised in the Statement of Financial Position as at 30 June 2003 (refer Note 15 for details). They are disclosed in the Schedule of Contingencies.	Loans from the Commonwealth and Queensland Governments are unsecured. Refer Note 15 for details of terms and conditions.

Note 36 Financial instruments – continued

(b) Interest rate risk

Financial Instrument	Notes	Floating Interest Rate		Fixed Interest Rate						Non Interest Bearing		Total		Weighted Average Effective Interest Rate		
		2003	2002	1 to 2 years		2 to 5 years		> 5 years		2003	2002	2003	2002	2003	2002	
		\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	%	%	
Financial assets (recognised)																
Cash at bank and cash on hand	7	58 149	23 429									58 149	23 429	4.7	4.4	
Deposits – at call	7			100 000	124 960							100 000	124 960	5.0	4.8	
Receivables for goods and services	8										41 433	51 195	n/a	n/a		
Receivable from AMC	8										–	57 800	n/a	n/a		
Receivables for property sales	8									20 250	20 250	20 250	20 250	n/a	n/a	
Net GST receivable	8									788	1 461	788	1 461	n/a	n/a	
Other receivables	8									4 270	5 234	4 270	5 234	n/a	n/a	
Investments	9									5 861	2 409	5 861	2 409	n/a	n/a	
Total financial assets (recognised)		58 149	23 429	100 000	124 960	–	–	–	–	72 602	138 349	230 751	286 738			
Total assets												1 351 591	1 384 809			
Receivable from AMC, including royalties	23	70 000	–							14 376	5 740	84 376	5 740	n/a	n/a	
Total financial assets (unrecognised)		70 000	–							14 376	5 740	84 376	5 740			
Financial liabilities (recognised)																
Loans payable	15	–	52 800							–	5 000	–	57 800	5.6	4.0	
Finance lease liabilities	16			19 674	19 844							88 025	61 829	4.3	2.7	
Trade creditors	20								8 772	8 178		32 700	29 777	n/a	n/a	
Research revenue received in advance	21										43 554	39 199	43 554	n/a	n/a	
Deposits	17	37 696	36 495									37 696	36 495	4.7	4.4	
Other creditors	21									9 990	6 058	9 990	6 058	n/a	n/a	
Total financial liabilities (recognised)		37 696	89 295	19 674	19 844	–	8 772	8 178	59 579	33 807	86 244	211 965	231 158			
Total liabilities												401 332	412 533			
Legal claims & Loans payable	23	70 000	–							15 356	5 945	85 356	5 945	n/a	n/a	
Total financial liabilities (unrecognised)		70 000	–							15 356	5 945	85 356	5 945			

Note 36 Financial instruments – continued

(c) Net fair values of financial assets and liabilities

	Notes	2003		2002	
		Total carrying amount \$'000	Aggregate net fair value \$'000	Total carrying amount \$'000	Aggregate net fair value \$'000
Financial assets (recognised)					
Cash at bank and on hand	7	58 149	58 149	23 429	23 429
Deposits at call	7	100 000	100 000	124 960	124 960
Receivables for goods and services	8	41 433	41 433	51 195	51 195
Receivable from AMC	8	–	–	57 800	57 800
Receivables for property sales	8	20 250	20 250	20 250	20 250
GST receivable	8	788	788	1 461	1 461
Other receivables	8	4 270	4 270	5 234	5 234
Investments	9	5 861	5 861	2 409	8 517
		230 751	230 751	286 738	292 846
Financial assets (unrecognised)					
Receivable from AMC, including royalties	23	84 376	84 376	5 740	5 740
Financial liabilities (recognised)					
Loans payable	15	–	–	57 800	57 800
Finance lease liabilities	16	88 025	88 025	61 829	61 829
Trade creditors	20	32 700	32 700	29 777	29 777
Research revenue received in advance	21	43 554	43 554	39 199	39 199
Deposits	17	37 696	37 696	36 495	36 495
Other creditors	21	9 990	9 990	6 058	6 058
		211 965	211 965	231 158	231 158
Financial liabilities (unrecognised)					
Legal claims & loans payable	23	85 356	85 356	5 945	5 945

Note 36 Financial instruments – continued

Financial assets

The net fair values of cash, deposits at call, receivables from AMC, for sale of properties, goods and services 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.

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

CSIRO has specific forward exchange contracts to sell a total of USD1 450 200 (2002 USD3 319 110) at an average exchange rate of USD 0.517.

In addition, CSIRO has specific forward exchange contracts to buy a total of USD85 450 (2002 USD1 364 504) at an average exchange rate of USD 0.5093.

These contracts were taken out before the Commonwealth Government restricted agencies, like CSIRO from entering into external hedges for foreign currency transactions from 1 July 2002. The above contracts have various maturity dates after 30 June 2003.

(d) Credit risk exposures

CSIRO'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.

4

Section

Financial Statements





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Appendices

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 2003.

Agribusiness Sector

Chair

Mr Trevor Flugge, AO
Farmer
Tel (08) 9330 4188
Email tflugge@iprimus.com.au

Members

Dr Geoffrey Annison
Research and Technology Director
Goodman Fielder Ltd

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

Mr David Roberts
Scientific and Technical 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 Leader

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 kparer@powerup.com.au

Members

Ms Tricia Caswell
Executive Director, Global Sustainability
RMIT University

Mr Roman Domanski
Executive Director
Energy Users Association of Australia

Mr Barry Jones
Executive Director
Australian Petroleum Production and Exploration Association

Mr Lauchlan McIntosh
Executive Director
Australian Automobile Association

Mr Bill Nagle
Chief Executive
Australian Gas Association

Mr Ian Nethercote
Chief Executive
Loy Yang Power Management Pty Ltd

Mr Bryan Nye
Executive Director
Australian Institute of Petroleum

Mr Dennis O'Neill
Chief Executive Officer
Australian Council for Infrastructure Development

Mr Mark O'Neill
Executive Director
Australian Coal Association

Mr Keith Orchison
Managing Director
Electricity Supply Association of Australia Ltd

Mr John Ryan
Deputy Secretary
Department of Industry, Tourism and Resources

Mr Tony Slatyer
Executive Director, Bureau of Transport and Regional
Economics
Department of Transport and Regional Services

Ms Anthea Tinney
Deputy Secretary
Environment Australia

Sector Leader

Dr Adrian Williams
CSIRO Energy and Transport
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Environment and Natural Resource Management Sector

Chair

Mr Greg Bourne
Regional President
BP Australasia
Tel (03) 9268 4754
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Members

Mr Don Blackmore
Chief Executive
Murray-Darling Basin Commission

Ms Leith Bouly
Farmer

Mr David Carter
Chief Executive Officer
Newfishing Australia Pty Ltd

Mr John Corrigan
Chief Executive
Filtra Ltd

Mr Richard Dinham
Chairman
DesignInc Sydney Pty Ltd

Mr Don Henry
Executive Director
Australian Conservation Foundation

Mr Stephen Hunter
Deputy Secretary
Environment Australia

Mr Oleg Morozov
Manager, Environmental Affairs
Santos Ltd

Dr Conall O'Connell
Acting Deputy Secretary
Environment Australia

Professor Lowitja O'Donoghue
Visiting Professor
Flinders University

Mr Roger Payne
Chief Executive Officer
Water and Rivers Commission (Western 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 Leader

Dr Steve Morton
CSIRO Environment and Natural Resources Group
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Health Sector

Chair

Professor Terry Dwyer
Director
Menzies Research Institute
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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

Mr Ross O'Donoghue
First Assistant Secretary, Population Health Division
Department of Health and Ageing

Ms Helen Owens
Commissioner
Productivity Commission

Professor Alan Pettigrew
Chief Executive Officer
National Health and Medical Research Council

Professor Dave Roberts
Director
Australian Food and Grocery Council

Mr George Sawides
Managing Director
Medibank Private

Dr Robert Wooding
First Assistant Secretary, Information and Communications
Division
Department of Health and Ageing

Sector Leader

Professor Richard Head
CSIRO P-Health Flagship
Tel (08) 8303 8855
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Information, Communication and Services Sector

Chair

Mr Ric Clark
Managing Director
Ericsson AsiaPacificLab Australia Pty Ltd
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Members

Dr Rod Badger
Deputy Chief Executive Officer
National Office for the Information Economy

Dr Chris Beare
Director, Business Development
Cisco Systems Pty Ltd

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
Business Advisor and Company Director

Mr John Kranenburg
Kranenburg and Associates

Dr Phil Robertson
Director
Canon Information Systems Research Australia

Mr Silvio Salom
Managing Director
Adacel

Mr Stuart Simson
Executive Chairman
emitch Ltd

Ms Judy Slatyer
Business Advisor
Arraycomm Inc

Sector Leader

Dr Rhys Francis
CSIRO Mathematical and Information Sciences
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Mineral Resources Sector

Chair

Mr Andrew Michelmore
Chief Executive Officer
WMC Resources Ltd
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Members

Mr Alan Broome
Chairman
Austmine

Dr Bobby Danchin
Chief Executive Officer, Exploration/Acquisitions
Anglo American Corporation of South Africa Ltd

Mr Richard Davies
Chief Executive Officer
Australian Mineral Industries Research Association
International Ltd

Mr Eduard Eshuys
Chairman
National Institute of Metal Exploration Ltd

Dr Ian Gould
Retired

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 John Ryan
Deputy Secretary
Department of Industry, Tourism and Resources

Dr Ray Shaw
General Manager, Technology Support
Rio Tinto Technology

Sector Leader

Dr Rod Hill
CSIRO Sustainable Minerals and Energy Group
Tel (03) 9545 8300
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Manufacturing Sector

Chair

Mr Bob Herbert
Chief Executive
Australian Industry Group
Tel (02) 9466 5566
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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 Peter Lloyd
Managing Director
Setec Pty Ltd

Mr Ken Pettifer
Manufacturing, Engineering and Construction Division
Department of Industry, Tourism and Resources

Dr Stuart Romm
Chief Executive
HPM Industries Pty Ltd

Professor Alan Sale
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
Director
Baad Concepts Pty Ltd

Sector Leader

Dr Ian Sare
CSIRO Corporate
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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 2003 CSIRO was a core participant in 44 of the 62 existing CRCs.

During 2002–03, CSIRO's total in-kind and cash contribution to CRCs from its own resources was \$65.1 million. When combined with funding from the Commonwealth Government and external sources provided specifically for CRCs, the total expended during the financial year was \$99.3 million.

Working in CRCs has enabled CSIRO to contribute to a range of exciting advances in research and development. Among those announced during 2002–03 were:

- the release of the bridal creeper leaf beetle to destroy bridal creeper, one of Australia's most destructive plant pests
- the determination of the high-resolution structures of two cell-surface proteins that are directly involved in cancer. The discoveries of these two proteins have been hailed as landmark achievements and provide the framework for the development of new approaches to cancer therapy that target this very important receptor family
- the risk to the Great Barrier Reef of accelerating levels of coral bleaching and death due to global climate change
- the development of a unique polymer coating for electrical cables that turns into a protective ceramic barrier when exposed to fire. In addition to the cables, the technology can also be applied across a range of passive fire protection applications, including fire door and window seals, and fire barriers.

Full details of CRC activities are available through their annual reports and publications and from the Internet on <http://www.crc.gov.au/>

Cooperative Research Centres in which CSIRO was a participant at 30 June 2003

Manufacturing Technology

Bioproducts (<http://www.bioproducts.org.au>)

CAST Metals Manufacturing (<http://www.cast.crc.org.au>)

Construction Innovation
(<http://www.construction-innovation.info>)

Functional Communication Surfaces (<http://crc-fcs.com>)

Innovative Wood Manufacturing
(<http://www.crcwood.unimelb.edu.au/>)

Intelligent Manufacturing Systems and Technologies
(<http://www.crcimst.com.au/>)

Microtechnology (<http://www.microtechnologycrc.com/>)

Polymers (<http://www.crcp.com.au>)

Welded Structures (<http://www.crcws.com.au>)

Note: CSIRO was also a core participant in the CRC for International Food Manufacture and Packaging Science which ceased on 30/9/2002.

Information and Communication Technology

Australian Telecommunications
(<http://www.telecommunications.crc.org.au>)

Enterprise Distributed Systems Technology
(<http://www.dstc.edu.au>)

Satellite Systems (<http://www.crcss.csiro.au>)

Mining and Energy

AJ Parker CRC for Hydrometallurgy
(<http://www.parkercentre.crc.org.au>)

Australian Petroleum¹ (<http://www.apcrc.com.au>)

Clean Power from Lignite (<http://www.cleanpower.com.au>)

Coal in Sustainable Development (<http://www.ccsd.biz>)

Landscape Environments and Mineral Exploration
(<http://leme.anu.edu.au/>)

Predictive Mineral Discovery (<http://www.pmdcrc.com.au/>)

Agriculture and Rural Based Manufacturing

Australian Cotton (<http://www.cotton.crc.org.au/>)

Australian Sheep Industry (<http://www.sheep.crc.org.au/>)

Cattle and Beef Quality (<http://www.beef.crc.org.au>)

Innovative Dairy Products (<http://www.dairyrcr.com>)

Sustainable Aquaculture of Finfish
(www.aquafincrc.com.au)

Sustainable Production Forestry
(<http://www.forestry.crc.org.au/>)

Sustainable Rice Production (<http://www.ricecrc.org>)

Sustainable Sugar Production²
(<http://www-sugar.jcu.edu.au>)

Tropical Plant Protection (<http://www.tpp.uq.edu.au>)

Viticulture (<http://www.crcv.com.au>)

Environment

Antarctica and the Southern Ocean¹
(<http://www.antcrc.utas.edu.au>)

Australian Weed Management
(<http://www.weeds.crc.org.au/>)

Biological Control of Pest Animals
(<http://www.pestanimal.crc.org.au>)

Catchment Hydrology (<http://www.catchment.crc.org.au>)

Coastal Zone, Estuary and Waterway Management
(<http://www.coastal.crc.org.au>)

Freshwater Ecology
(<http://enterprise.canberra.edu.au/WWW/www-crcfe.nsf>)

Greenhouse Accounting
(<http://www.greenhouse.crc.org.au/>)

Plant-based Management of Dryland Salinity
(<http://www.crcsalinity.com>)

Tropical Rainforest Ecology and Management
(<http://www.rainforest-crc.jcu.edu.au>)

Tropical Savannas Management
(<http://savanna.ntu.edu.au>)

Waste Management and Pollution Control³
(<http://www.crcwmpc.com.au>)

Water Quality and Treatment
(<http://www.waterquality.crc.org.au/>)

Medical Science and Technology

Cellular Growth Factors (<http://www.ludwig.edu.au/crc-cgf>)

Diagnostics (<http://diagnosticscrc.org>)

Eye Research and Technology⁴ (<http://www.crcert.org>)

Vaccine Technology (<http://www.crc-vt.qimr.edu.au>)

- 1 Following successful renewal bid, current CRC ceases operations on 30 June 2003. New CRC will begin operations 1 July 2003. CSIRO will be a core participant in the new CRC.
- 2 CRC ceases operations 30 June 2003.
- 3 Following successful renewal bid, current CRC ceases operations on 30 June 2003. New CRC will begin operations 1 July 2003. CSIRO will not be a participant in the new CRC.
- 4 Following successful renewal bid, current CRC ceases operations on 30 June 2003. New CRC will begin operations 1 July 2003. CSIRO will only be a supporting participant in the new CRC.

Appendix 3: Senior staff contacts

CSIRO Head Office – Canberra

PO Box 225, DICKSON, ACT 2602
Tel (02) 6276 6000; Fax (02) 6276 6608

Executive Team

Chief Executive

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Deputy Chief Executive

Dr Ron Sandland
Tel (02) 6276 6127
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Executive Director, Business Development and Commercialisation

Mr Mehrdad Baghai
Tel (02) 9490 8400
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Executive Director:

Science Planning

Dr Michael Barber
Tel (02) 6276 6388
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Corporate Secretary;

Chair: Risk Management

Dr Ted Cain
Tel (02) 6276 6694
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Executive Chair: Agribusiness and Health

Dr Michael Eyles
Tel (02) 9490 8341
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Executive Chair: Sustainable Minerals and Energy

Dr Rod Hill
Tel (03) 9545 8300
Email rod.hill@csiro.au

Executive Chair: Information Technology, Manufacturing and Services

Dr Warren King
Tel (02) 9490 8204
Email warren.king@csiro.au

Executive Chair: Environment and Natural Resources

Dr Steve Morton
Tel (02) 6246 4551
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Executive Director:

Corporate Operations and Chief Financial Officer

Mr Mike Whelan
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Divisions

Atmospheric Research

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Web www.dar.csiro.au

Australia Telescope National Facility

Director: Dr Brian Boyle
PO Box 76
EPPING NSW 1710
Tel (02) 9372 4300 Fax (02) 9372 4310
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Energy Technology

Chief: Dr Adrian Williams
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NEWCASTLE NSW 2300
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Entomology

Chief: Dr Joanne Daly
GPO Box 1700
CANBERRA ACT 2601
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Exploration and Mining

Chief: Professor Neil Phillips
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CLAYTON SOUTH VIC 3169
Tel (03) 9545 8202 Fax (03) 9545 8222
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Food Science Australia*

Acting Chief Executive: Dr Martin Cole
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Web www.foodscience.afisc.csiro.au
* Joint venture between the Australian Food Industry Science Centre (Afisc) and CSIRO Food Science & Technology

Forestry and Forest Products

Chief: Dr Paul Cotterill
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KINGSTON ACT 2604
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Health Sciences and Nutrition

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Land and Water

Chief: Dr John Williams
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Indexes

Acronyms

ACIAR	Australian Centre for International Agricultural Research	ET	Executive team
AFMA	Australian Fisheries Management Authority	EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
AHRI	Australian Human Resources Institute	FOI	Freedom of Information
AIIA	Australian Information Industry Association	GMOs	Genetically Modified Organisms
ANAO	Australian National Audit Office	GRA	Global Research Alliance
ANU	Australian National University	GMRA	Global Mining Research Alliance
APMP	Asia-Pacific Metrology Program	HELP	Hydrology for Environment Life and Policy
ARC	Australian Research Council	HSR	Health and Safety Representative
ASCE	American Society of Civil Engineers	HYMOD	Hybrid Modular Processor
ATLR	Average Time Lost Rate	ICT	Information Communication Technology
AWRI	Australian Wine Research Institute	IPM	Integrated Pest Management
BCC	Board Commercial Committee	ISI	Institute for Scientific Information
CAC Act	<i>Commonwealth Authorities and Companies Act 1997</i>	ISO	International Standards Organisation
CBF	CSIRO Bioinformatics Facility	ISR	International Survey Research
CD	Compact disc	LICHEE	Life Cycle House Energy Evaluation
CDS	Commonwealth Disability Strategy	LTIFR	Lost Time Incident Frequency Rate
CFCs	Chlorofluorocarbons	MFAT	Murray Flow Assessment Tool
CFD	Computational Fluid Dynamics	MTFR	Medical Treatment Frequency Rate
CO ₂	Carbon Dioxide	NASA	National Aeronautics and Space System Administration
COMEx	Executive Management Commercial Committee	NIS	National Innovation System
CPM	Corrosion Prediction Modelling	NRP	National Research Priorities
CRC	Cooperative Research Centre	NSW	New South Wales
CREST	CREativity in Science and Technology	OHS	Occupational Health and Safety
CRSS	Collaborative Research Support Scheme	OHS&E	Occupational Health Safety and Environment
CSIRO	Commonwealth Scientific and Industrial Research Organisation	PIN	Provisional Improvement Notice
CSIROSEC	CSIRO Science Education Centre	PMF	Performance Management Framework
CVS	Customer Value Survey	PPF	Program Performance Framework
DAS	Dynamic Automation Systems	PMI	Program Management Improvement
DAFGS	Diesel Alternative Fuel Grants Scheme	PSS	Project System Support
DC	Direct Current	QBP	Queensland Bioscience Precinct
DDA	<i>Disability Discrimination Act 1992</i>	RA&A	Risk Assessment and Audit
DEST	Department of Education, Science and Training	RDC	Research and Development Corporation
D-VASS	Dynamic Vehicle Allocation and Scheduling System	RMIT	Royal Melbourne Institute of Technology
EMC	Executive Management Council	SAC	Sector Advisory Council
EMS	Environmental Management System	SARS	Severe Acute Respiratory Syndrome
EPA	Environment Protection Authority	SIR Act	<i>Science and Industry Research Act 1949</i>
ESD	Ecologically Sustainable Development	SME	Small to Medium Enterprises
		SOPA	Sydney Olympic Park Authority

SQUID	Superconducting Quantum Interference Device
TIMBRS	Tree Identification Methodology Based on Remote Sensing
UNESCO	United Nations Educational Scientific and Cultural Organisation
UQ	University of Queensland
US	United States
WA	Western Australia
WOCE	World Ocean Circulation Experiment

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