

CSIRO

CSIRO – the Commonwealth Scientific and Industrial Research Organisation – is one of the largest and most diverse scientific organisations in the world. It has over 6,500 staff located across 57 sites throughout Australia and overseas.

Our purpose

CSIRO's purpose is defined through the functions we undertake for the benefit of Australia, which are set down in the *Science and Industry Research Act 1949*. These primarily include:

- to carry out scientific research for any of the following purposes:
 - assisting Australian industry
 - furthering the interests of the Australian community
 - contributing to the achievement of Australian national objectives or the performance of the national and international responsibilities of the Commonwealth.

CSIRO's Values Compass

Our values guide our decisions and interactions with our colleagues and with our external partners and stakeholders. CSIRO's Values Compass was introduced in July 2009 with minor modifications taking effect from 1 July 2011. Our values are symbolised through the Values Compass:



Responsible Minister



Senator the Hon
Kim Carr
Minister for
Innovation, Industry,
Science and
Research.

- any other purpose determined by the Minister
- to encourage or facilitate the application or utilisation of the results of such research.

Our mission

We deliver innovative solutions for industry, society and the environment through great science.

Our vision

Our science is used to make a profound and positive impact for the future of Australia and humanity.

- Embracing **scientific excellence** and working together ethically and with **integrity** in everything we do.
- Building **trust and respect** each day with our communities, partners and colleagues, knowing that with trust comes accountability.
- Igniting our **creative spirit**, exploring new horizons and creating an environment where innovation thrives.
- Consistently **delivering on our commitments**. 'Do what we say we will do'.
- Striving towards a **healthy, safe and sustainable** future.

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Senator the Hon Kim Carr
Minister for Innovation, Industry, Science and Research
Parliament House
CANBERRA ACT 2600

We have pleasure in submitting to you, for presentation to Parliament, the sixty-third Annual Report of the Commonwealth Scientific and Industrial Research Organisation (CSIRO). 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 Deregulation as set out in the *Commonwealth Authorities and Companies (Report of Operations) Orders 2008*.

The report has been approved for presentation to you, signed this 24th day of August 2011 in accordance with a resolution of the Board members.

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

Since 30 June 2011, no developments have arisen that have significantly affected or may significantly affect CSIRO's operations or state of affairs.

We commend the Organisation's achievements to you.

A handwritten signature in black ink that reads 'Simon McKeon'.

Simon McKeon
Chairman of the Board

A handwritten signature in black ink that reads 'Megan Clark'.

Megan Clark
Chief Executive

19 September 2011

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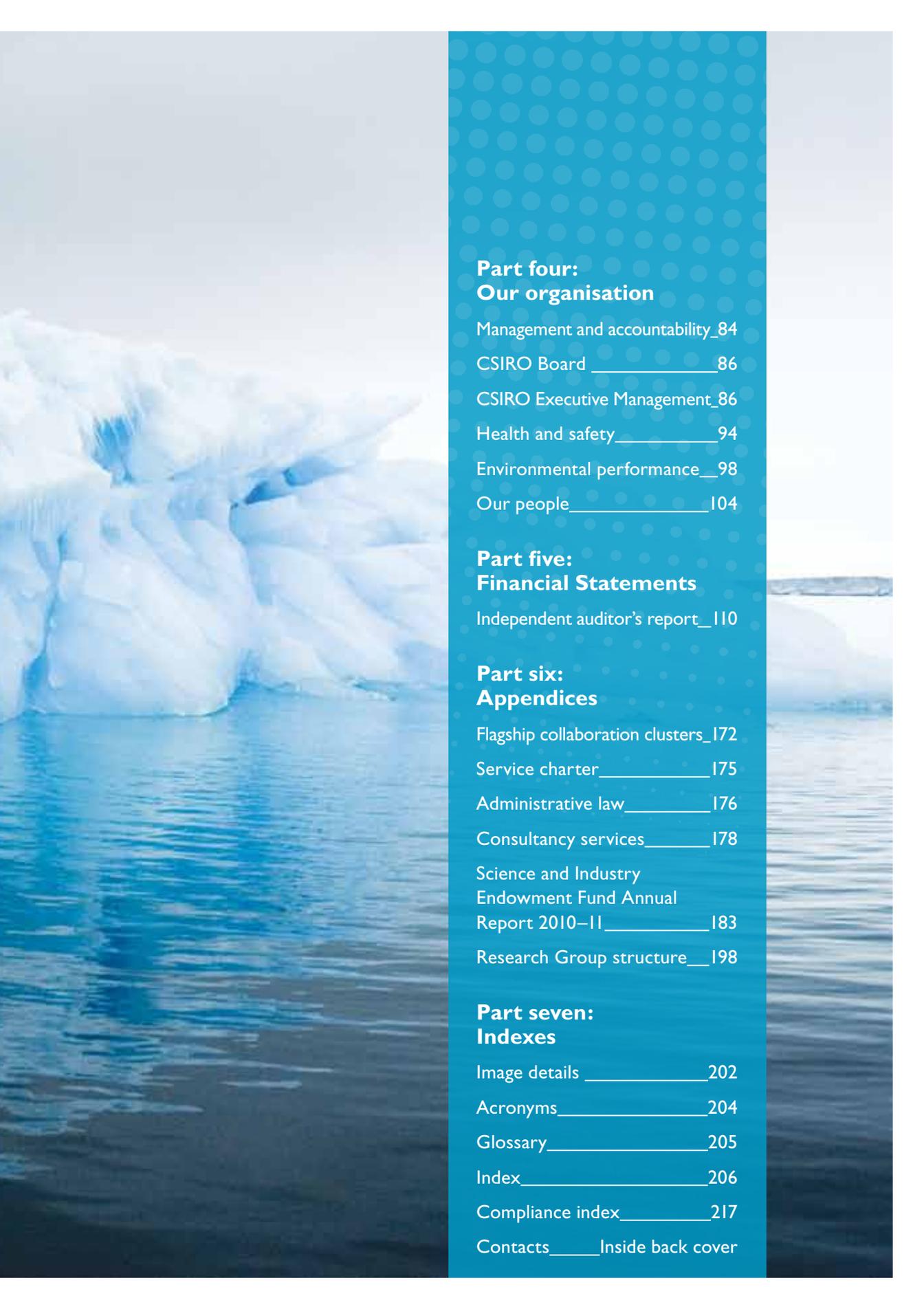
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Our history

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

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

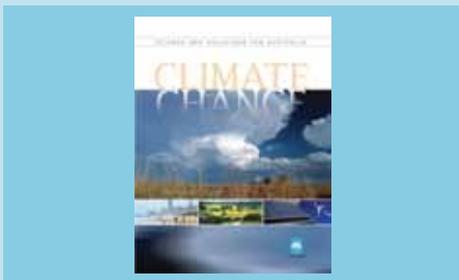
Today, CSIRO is a trusted source of creative ideas and practical technologies to deliver impact for the nation.

Highlights of 2010–11

CSIRO is Australia's national science organisation. We are one of the largest and most diverse scientific organisations in the world. This report highlights a wide array of our science and its applications. Here are just a few examples of the impact science has on our lives, our industries and our environment.

Climate

Climate Change: Science and Solutions for Australia highlights the importance of climate change as a matter of significant economic, environmental and social concern in Australia. CSIRO's new book draws on the latest peer-reviewed literature contributed by thousands of researchers in Australia and internationally (more on page 54).



Health

Researchers at CSIRO's Australian Animal Health Laboratory (AAHL) have shown that a new experimental vaccine will help protect horses against the deadly Hendra virus. AAHL is continuing to provide critical support to the Queensland and New South Wales Governments' response to the Hendra outbreaks (more on page 56).



Energy

A \$4.2 million international hub for developing and commercialising solar thermal technologies was opened on 18 June 2011 at CSIRO's National Solar Energy Centre in Newcastle, New South Wales (more on page 32).



Information technology

The Australian Square Kilometre Array Pathfinder project saw the first six (of 36) dishes successfully installed on site at the Murchison Radio-astronomy Observatory in Western Australia (more on page 69).





Manufacturing

CSIRO's breakthrough polymer technology known as RAFT (Reversible Addition-Fragmentation chain Transfer) has revolutionised polymer synthesis and spawned a new generation of polymeric materials (more on page 29).

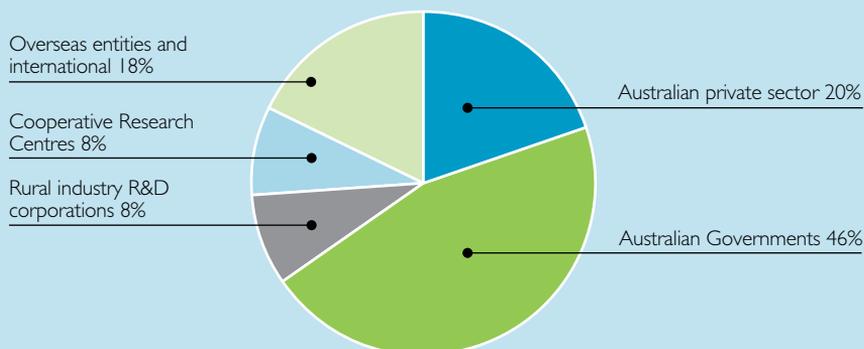
Financial performance 2010–11

CSIRO's financial result for 2010–11 was a deficit of \$10.5 million which included net losses of \$23.1 million attributable to the impairment of equity investments and assets, net of small gains from the sale of assets. Total revenue for the year was \$1,220 million and total expenses were \$1,231 million. CSIRO's financial performance for 2010–11 is summarised in Table 2.2 on page 6.

Sources of CSIRO revenue in 2010–11



Sources of co-investment, consulting and services revenue 2010–11



Foreword by the Chairman

Challenges create opportunities. The great thing about CSIRO science is the way it informs our choices and provides new choices as individuals and as a nation.

The scientific technologies and know-how highlighted in this report will enable us to better understand, adapt and respond to challenges associated with climate change, energy, food security and sustainable land and water management. They represent new opportunities for Australian industry to diversify and secure its international competitiveness, operate sustainably and generate employment.

For the community, CSIRO science is helping to prevent chronic diseases by enhancing the food we eat and providing healthier dietary choices. Our science education and outreach programs are bringing a sense of excitement and inspiration to Australia's youth.

Importantly, at this time, CSIRO science and our capacity to apply knowledge from around the world is enabling us to give authoritative scientific advice to Governments, industry and the community so they can make informed choices about the future.

This report demonstrates the value and importance of CSIRO's continued contribution to science, nationally and globally, and to Australia's social, economic and environmental development.

With this contribution in mind, a major focus for the Board and management of CSIRO over the past year has been the development of our strategy for 2011–15 and beyond. The new strategy reflects our distinct role as the nation's leading large-scale, multidisciplinary, mission-directed science and technology organisation.

Over the next four years, we will increase our investment in response to national challenges and opportunities through the National Research Flagships Program. We will also invest in people and infrastructure to support the delivery of impact and scientific preparedness and form deep connections with the best partners in Australia and the world. We want to see CSIRO play a leading role in the trusted delivery of scientific evidence and advice.

Central to the strategy is our people. Their creativity, integrity and commitment reflect CSIRO values essential to success. During the Organisation's response to the natural disasters in Queensland earlier this year, we saw first hand the compassion and resourcefulness of the people who make up CSIRO. They demonstrated CSIRO values in a very real way. We will build on their commitment and enhance our culture of innovation.

On behalf of the Board of CSIRO, I would like to acknowledge with appreciation the continued support of the Australian Government and of our many research and commercial partners, as well as the members of our advisory committees.



I would also like to congratulate the management and staff of CSIRO for the many scientific outcomes achieved in 2010–11. Ms Deborah O'Toole and Mr Doug Rathbone completed their terms and Mr Mark Paterson resigned, as members of the CSIRO Board. I would like to thank them for their valuable contributions to the governance of the Organisation.

I am pleased to say CSIRO is well placed to continue to conduct great science and deliver innovative solutions for Australia.

Simon McKeon
Chairman of the CSIRO Board

Chief Executive's report 2010–11 in summary and looking ahead

Year in review

Over the past year the efforts of our people have seen our science make a positive impact on the competitiveness of Australian industry and the wellbeing of all Australians and have contributed to a sustainable future for the nation.

The relevance of our science was demonstrated with another record number of active licenses of our innovations and a record \$495 million in external revenue from our intellectual property and partnerships with industry, government and research partners.

The Hendra outbreak in Queensland and New South Wales has seen us respond with the successful development of a horse vaccine now under trials for commercial release in 2012. We were named Boeing R&D global supplier of the year following our work with them on polymers and new materials.

We have provided scientific advice to the community to assist with understanding complex national and global issues like climate change and have advised our decision-makers on scientific observation, evidence and uncertainties.

Importantly, through our scientific research we are identifying innovative solutions to those challenges and with our partners turning them into genuine opportunities for Australia.

This year we undertook the most extensive consultation in our history with leaders from industry, the community, environmental sector and from all sides of government as we worked with the Board to develop the CSIRO 2011–15 Strategic Plan.

Our strategy will see CSIRO fully embrace its distinct role as the nation's leading large-scale, multidisciplinary, mission-directed science and technology organisation. It also builds roles that will increase our differentiation over time. Our role as a trusted scientific advisor and our vision of creating national global precincts, and our role in providing deep connections across the innovation system to lift Australia's science and innovation position globally.

This year we worked with our stakeholders and staff to better secure CSIRO's future, with the successful completion of a new enterprise agreement with our staff, a record \$3 billion, four-year funding from the Australian Government and a solid pipeline of external research partnership for the next three years.

Our performance

We have made considerable progress in our efforts to achieve 'Zero Harm' to our people and the environment. However, we had 34 lost time injuries this year, an increase on the previous year. I ask all our leaders and staff to continue our efforts and take the time to assess the risks of our work and take steps to eliminate or manage those risks to ensure our colleagues go home safely.



Our impact is about how well we apply our knowledge and research capabilities to deliver social, economic and environmental benefits to Australia.

CSIRO is continuing to expand the **National Research Flagships Program** as the focal point for CSIRO's strategy of responding to national challenges and opportunities and building large-scale research and commercial partnerships.

This year, CSIRO's \$20 million, five-year agreement with General Electric (GE) is one example of how we are delivering our Flagship goals by fostering collaborations with world-leading research partners. Under that agreement our scientists will work together with some of GE's 36,000 researchers with the aim of delivering breakthroughs in clean coal technology, urban water conservation, healthcare and the development of 'smart grid' technologies.

Our **Energy** portfolio is working towards a clean energy future and sustainable management of oceans and coasts. Working with our partners, we are delivering results in new low-emissions energy technologies that address unique Australian needs.

We are creating cleaner synthetic transport fuels through our synthetic fuels research facility, SynCat. We are helping local exploration companies find oil in the Perth Basin and our scientists are developing new technology that can capture and burn fugitive methane emissions from underground mines. The Prime Minister launched our new solar thermal research hub at the CSIRO Energy Centre in Newcastle, where we are already working with Mitsubishi Heavy Industries (Japan) and Abengoa Solar (Spain).

Our whole world is being re-shaped by climate change and our **Environment Group** aims to deliver the highest quality scientific research to address this issue.

CSIRO's new book *Climate Change: Science and Solutions for Australia* highlights the importance of climate change as a matter of significant economic, environmental and social concern. Drawn from the latest peer-reviewed literature, it provides the depth of science that this complex issue demands.

As custodians of Australia's National Insect Collection, we have developed *The Atlas of Living Australia*, a national initiative focused on making biodiversity information about Australian species more discoverable and useable online.

We are safeguarding our borders by investigating the threat posed by Asian honeybees and varroa mites, while at home we have developed new technologies to identify damaging exotic pests and diseases.

Our **Food, Health and Life Science Industries Group** is helping improve the health and wellbeing of Australians through prevention, early detection and intervention. In collaboration with the Baker IDI, CSIRO's *Diabetes Diet and Lifestyle Plan* is helping Australians living with diabetes. A CSIRO-led International Sheep Genomics Consortium has revealed the reference genome for sheep.

The **Information Sciences Group** is the core of CSIRO's research focus in the data-intensive sciences and services, and space research. Our teams completed a successful demonstration of our Ngarra wireless broadband technology for people living in rural and regional Australia.

Due to our capabilities in information technology, our Australian Animal Health Laboratory has been equipped with high-definition video conferencing and a shared workspace that offers secure access to critical technology that will allow disease experts to work in real-time with veterinary officers across Australia.

The Australian Square Kilometre Array Pathfinder (ASKAP) project saw six antennas successfully installed at the Murchison Radio-astronomy Observatory by the end of June 2011. By early 2012, all 36 antennas should be built with the telescope operational in 2013. ASKAP antennas have already been linked with other existing telescopes to make images ten times more detailed than those of the Hubble Space Telescope and have been used to peer into the heart of neighbouring galaxies.

Our scientists and collaborators have also tracked down 25 ultrafast 'millisecond' pulsars in just two years; the same number discovered in the previous 20 years, using facilities at Parkes in New South Wales and the Fermi Gamma-Ray Space Telescope. This combination of land and space-based pulsar detection may one day help us in the search for gravitational waves predicted by the general theory of relativity.

In **Manufacturing, Materials and Minerals** we are assisting industry become more sustainable. Our LANDTEM™ technology, which enables the minerals industry to detect ores underground, has been deployed on four continents helping to unearth around \$6 billion of new mines worldwide.

In response to the floods across eastern Australia, we developed extensive documents and interactive tools to help the Australian public deal with flood damaged buildings.

Our performance is also about how well we govern the Organisation to ensure we operate efficiently and deliver on our commitments. This year we have improved how we support our research, maintain research infrastructure and train and mentor our future leaders. We have also revised our Code of Conduct which sets out the standard of behaviour expected of our staff members in the context of the standard we expect of the Organisation.

Our people

At the heart of our achievements and goals are our people. Every day I am humbled by the talent and creative spirit of everyone at CSIRO. CSIRO's people bring something special and share a desire to ensure our science is used to make a profound and positive impact for the future of Australia and humanity.

I sincerely thank all of our people for their extraordinary effort and commitment and thank everyone for their valuable contribution to our successes and discoveries that have added to our proud track record.

To our staff, I reinforce the responsibility of every person in CSIRO to ensure the integrity of our excellent science, to build trust and respect each day, ignite our creative spirit, do what we say we will do and strive towards 'Zero Harm' to our people and the environment.

The year ahead

In the year ahead we will focus on implementing the 2011–15 strategy and in particular increasing our investment through the National Research Flagships, building our capacity to deliver excellent science, forming deep national and international connections with research and commercial partners, and being an innovation organisation and trusted scientific advisor.

We will support our people to be their best. Our shared commitment to CSIRO values will provide confidence to our investors, our research partners and importantly to the Australian community.

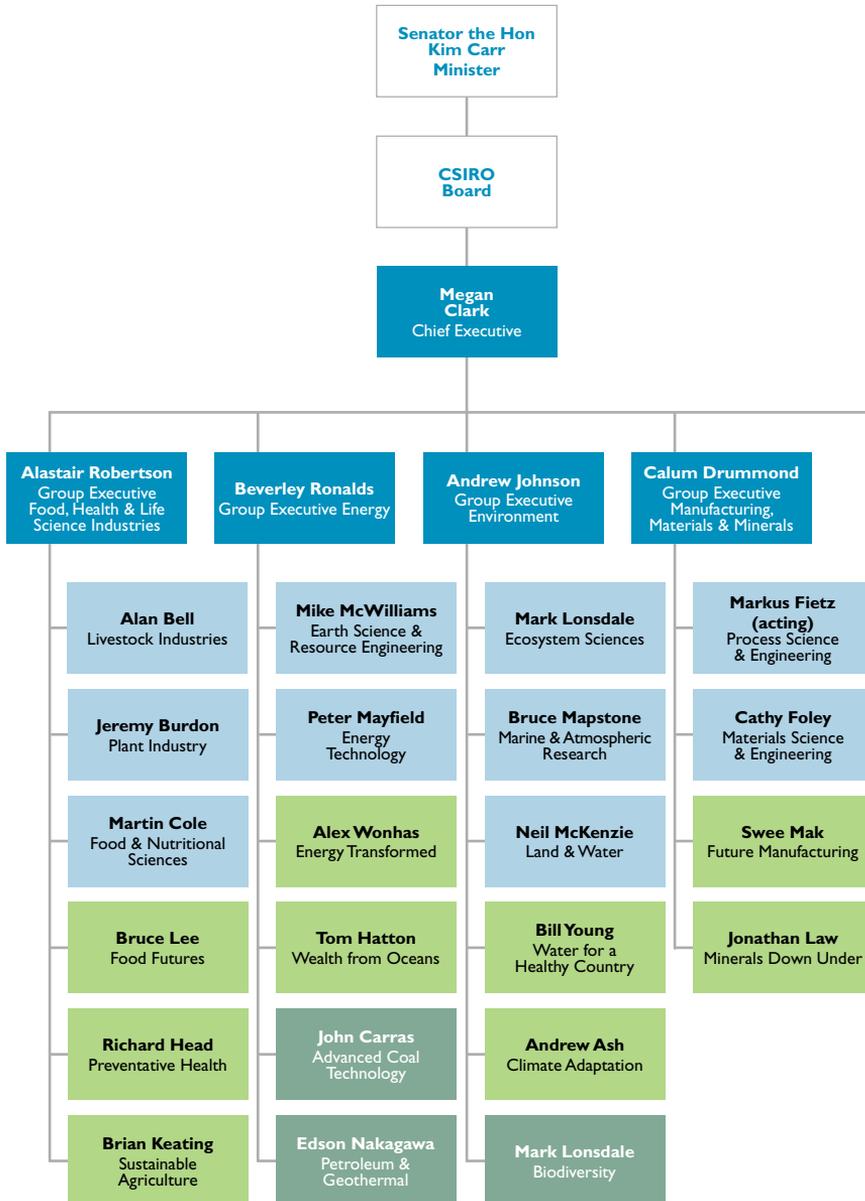
I would like to thank everyone in CSIRO for their dedication and hard work this year as well as the members of the CSIRO Board and Executive Team for their insights, enthusiasm and encouragement.

I am confident CSIRO will continue to deliver great science and look forward to the opportunities and challenges in the year ahead.

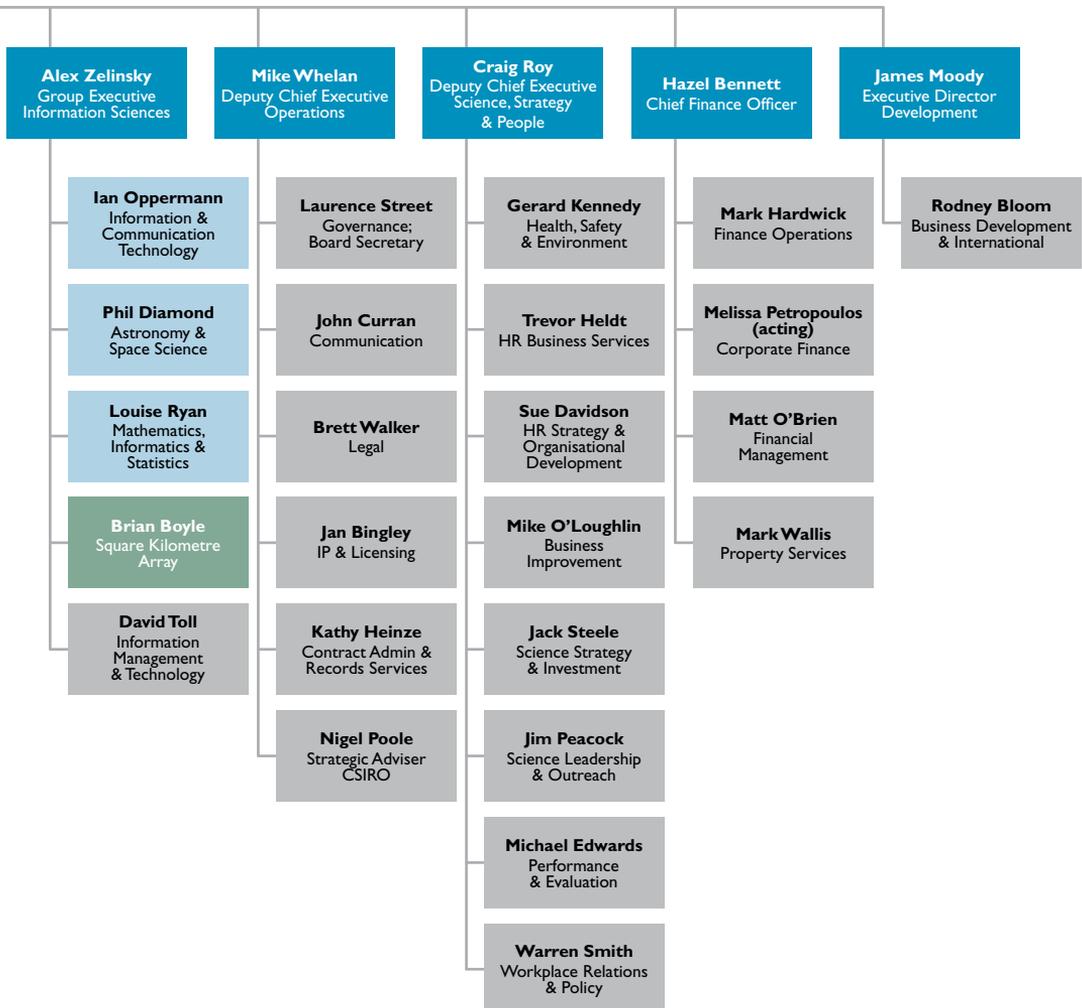


Megan Clark
Chief Executive
September 2011

CSIRO Organisational Chart as at July 2011

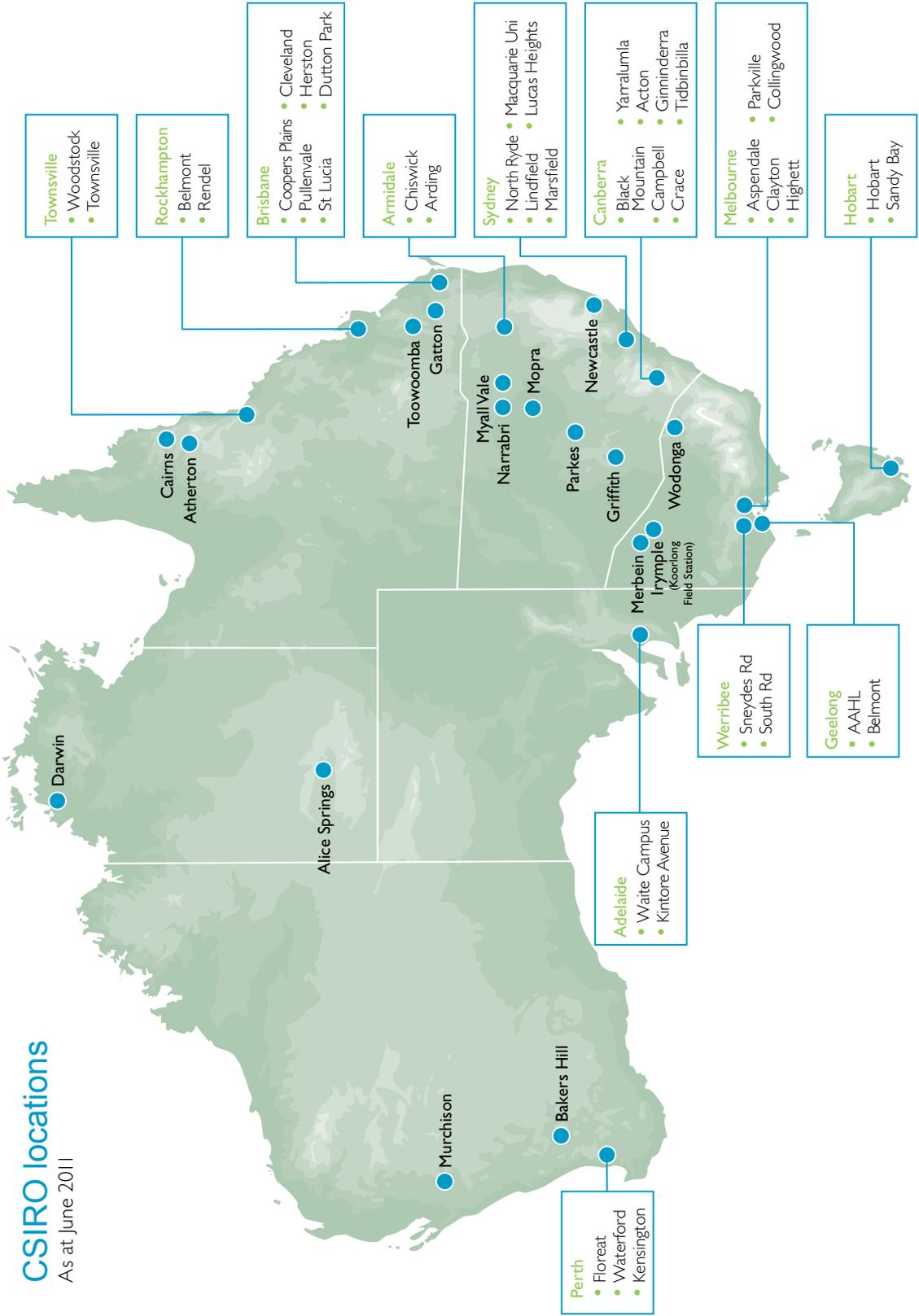


- Executive Team Member
- Chief of Division
- Flagship Director
- Enterprise Services Leader
- Portfolio Leader



CSIRO locations

As at June 2011





Boeing names CSIRO 'Supplier of the Year'

For the past 22 years, CSIRO has partnered with aeronautical company Boeing to develop world-leading technological innovations.

The success of the partnership was recognised in May 2011 when Boeing named CSIRO its Global Research and Development 'Supplier of the Year'.

The award recognises a relationship that has seen CSIRO and Boeing jointly invest in a wide range of projects, including world-leading technological innovations in aircraft repainting methods, sustainable aviation fuels, aircraft assembly processes, fire retardants and aircraft maintenance management software.

One successful venture included the effective application of a 'spray on and leave on' paint. Repainting aircraft is frequently required for decorative finishes, refurbishment and repair. The manual sanding of an aircraft and applying multiple paint layers is laborious and time-consuming and has caused the highest rate of injury for Boeing.

The CSIRO-Boeing technology involves applying a metal alkoxide-based surface treatment that modifies and activates an

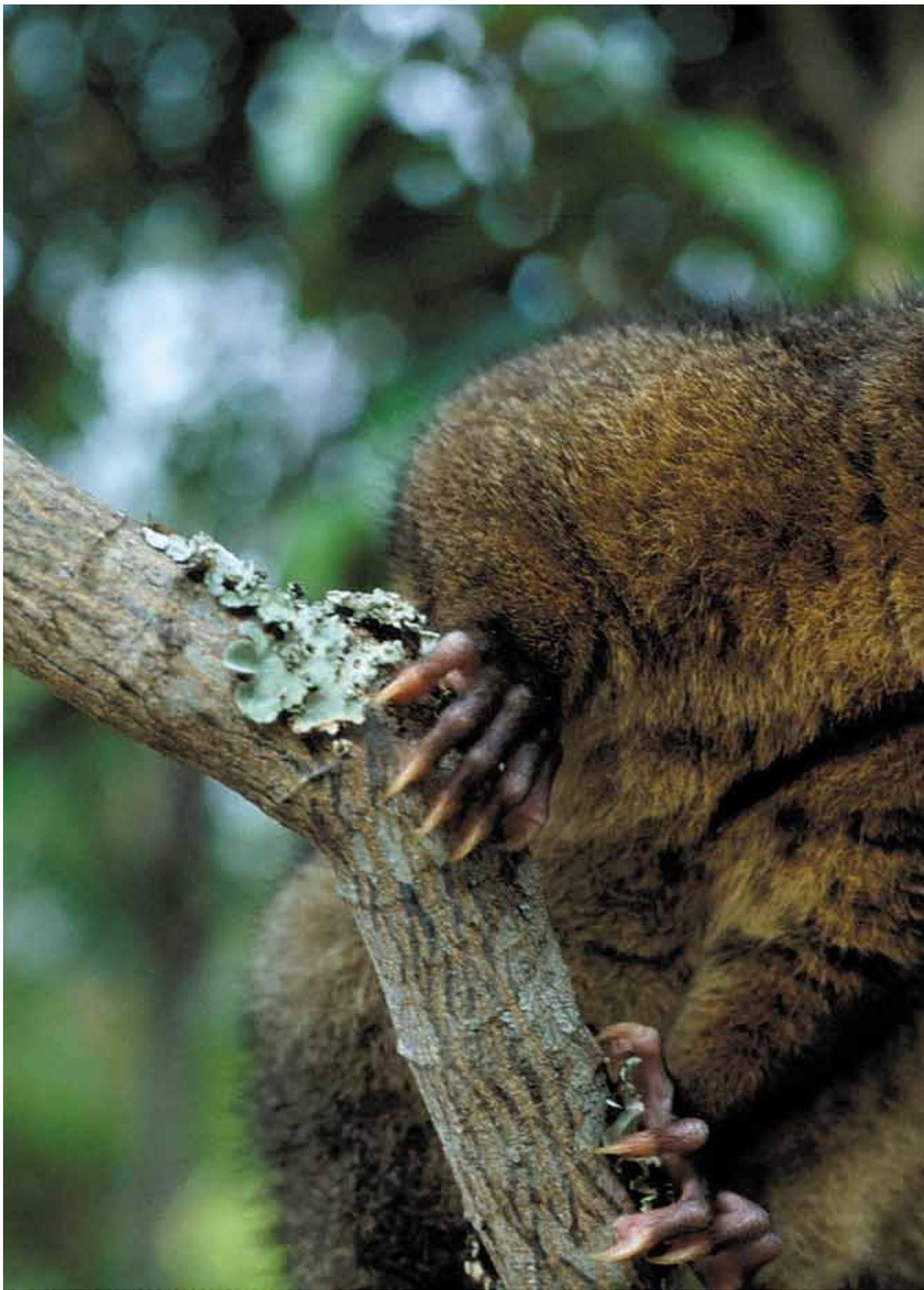
'aged' paint surface. It forms a strong chemical bond with the fresh paint layer. Since June 2008, this simple but effective technology has been applied to over 800 commercial aircraft including recent deliveries to both Qantas and Virgin Australia, resulting in multi-million dollar cost savings.

The strong relationship with Boeing has also played a key role in the development of Boeing's operations in Australia – most notably the decision to establish research and development laboratories in Brisbane and Melbourne. There are now 37 scientists employed within these facilities, many of whom collaborate with CSIRO on joint projects.

CSIRO was one of only 16 recipients to be recognised at the Supplier of the Year Awards and was judged the 'the best of the best' by taking out the Global Research and Development category.



CSIRO-Boeing's 'spray on and leave on' paint being applied to an aircraft. Credit: CSIRO





PART 2

ENTERPRISE PERFORMANCE

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PART TWO: ENTERPRISE PERFORMANCE

Measuring our performance

CSIRO occupies an important place in Australia's National Innovation System, offering a unique combination of size, breadth and depth of capability, active research portfolio management and expertise in conducting large-scale, multidisciplinary, mission-directed research.

As the nation's largest research agency, our research addresses many of the complex interactions of human activity with natural and built environments, with a particular focus on tackling major challenges that matter to Australia's future. Over 90 per cent of CSIRO's resources are directed to the Government's National Research Priorities and our activities are strongly aligned with the National Innovation Priorities. CSIRO's activities and achievements are outlined in Parts Two and Three of this Annual Report, collectively providing evidence of our performance in four dimensions that are critical to CSIRO's success.¹ These dimensions are:

- **Impact:** Delivering results with relevance and impact in areas of importance for Australia
- **Science:** Performing high-quality science
- **Relationships:** Building and maintaining strong relationships with customers, partners, staff and other stakeholders
- **Resources:** Effective resourcing of CSIRO's activities.

Strategy implementation

In the 2010–11 Operational Plan, CSIRO's Executive Team identified five high priority areas of focus for executive action in this final year of the 2007–11 Strategy period.² Table 2.1 provides a summary of actions taken and progress achieved.

¹ CSIRO Strategic Plan 2007–2011, (page 84): www.csiro.au/resources/StratPlan07-11.html

² CSIRO Operational Plan 2010–11, (page 7): www.csiro.au/operational-plan

Table 2.1: Strategy implementation 2010–11

Strategic element and key focus area	Assessment of progress ¹	Summary of progress
Delivering on national challenges		
Further refine CSIRO's portfolio of research addressing national challenges and opportunities and contribute to the development of national research capacity.	●●●●●	<p>A new Flagship Oversight Committee (FOC) is fully functional and strengthening the oversight of the National Research Flagships Program.</p> <p>The Australian National Audit Office (ANAO) completed an audit of the National Research Flagships Program and made two recommendations. The first was to improve financial reporting for Flagships and the second was to make better use of information collected from reviews. These recommendations were accepted and will be implemented through the enhanced FOC process.</p> <p>Collaborative demonstration projects in low-emission energy technologies are on track. The post-combustion capture pilot plant at Tarong Power Station and the solar tower research hub at Newcastle were launched this year.</p> <p>Development of new national research infrastructure facilities is progressing well. For example, the broadband network fibre has been laid between the Pawsey High-Performance Computing Centre in Perth and the Australian Square Kilometre Array Pathfinder in Murchison, Western Australia; the first online tools for <i>The Atlas of Living Australia</i> were released in late 2010; and the contract for the replacement Marine National Facility research vessel has been signed.</p>

¹ The strength of overall progress compared with the Operational Plan is rated on a scale from one to five in each focus area.

Strategic element and key focus area	Assessment of progress	Summary of progress
Exploring new horizons		
Invest in building the capability and infrastructure required to deliver world-class responses to meet future needs.	●●●●○	<p>An assessment of our current scientific capability was completed. The results indicate the need to maintain the current level of capability investments.</p> <p>CSIRO submitted a four-year Capital Asset Plan to the Department of Finance and Deregulation and continues to participate in Departmental discussions on the review of depreciation funding. A Capital Assets Management Plan is still in development.</p> <p>Most of CSIRO's 'national footprint' initiatives, including site consolidations, are on schedule, although bad weather has delayed construction at some sites.² To ensure the optimum location of corporate groups on the Black Mountain site in Canberra, their relocation from Campbell has been postponed for two years.</p>
Conducting science with impact		
Build internal management practices and external partnerships that enhance the prospects of effective translation of research into impact.	●●●●○	<p>Significant progress has been achieved but ongoing attention is required to ensure improved practices and relationships are maintained over the long-term.</p> <p>A wide range of engagement initiatives with industry and government partners are progressing well, including Boeing; Abengoa Solar (Spain); Mitsubishi Heavy Industries (Japan); the National Oceanic and Atmospheric Administration; AusAID; The University of Queensland; General Electric; Bayer and Australia Pacific LNG.</p> <p>Internal management practices have been strengthened, with the introduction of new commercial standards to provide a basis for sound commercial relationships and to inform commercial decision-making processes. New methodologies to improve our capacity to deliver and demonstrate triple bottom line³ impact are being developed. A new organisational structure has been introduced for our Communication function. New strategies for enabling the use of information technology in research are being introduced including testing of an electronic laboratory notebook.</p>

² Our national footprint map can be viewed in the Strategic Plan at: www.csiro.au/resources/CSIRO-Strategy-2011-2015.html

³ The triple bottom line refers to economic, social and environmental impacts.

Strategic element and key focus area	Assessment of progress	Summary of progress
Harnessing One-CSIRO		
Develop a clear and compelling strategy for 2011–15 and align CSIRO's operating and funding models to support strategy implementation at all levels.	●●●●○	<p>A new Strategic Plan⁴ has been approved by the CSIRO Board; some further work is required to fully align our operating and funding models to support the new strategy.</p> <p>The strategy embraces the Organisation's distinct role as a large-scale, mission-directed, multidisciplinary science and technology organisation, a connector of the National Innovation System, and a trusted science advisor on the big issues facing the nation.</p> <p>The strategy has been supported with a record \$3 billion of appropriation funding for 2011–15. However, depreciation funding is still inadequate to support future capital needs and is under negotiation with the Department of Finance and Deregulation.</p> <p>A number of difficulties have been encountered in the process for translating identified science investment priorities for implementation through 2011–12 internal budget allocations and the process will be subjected to a thorough internal review.</p>
Building our people, capability and scientific excellence		
Invest in developing engaged, focused and productive people working in a safe, sustainable and innovative environment.	●●●●●	<p>The majority of actions planned have been completed or are in the final stages.</p> <p>A new Enterprise Agreement was approved by Fair Work Australia and came into operation on 7 July 2011.</p> <p>An enterprise wide induction, training and leadership development framework was developed. Around 3,300 training days were provided by our internal learning and development teams.</p> <p>Significant progress was made on embedding a culture of active safety and sustainability leadership in CSIRO. A new Health, Safety and Environment strategy, operating model and policies were introduced in the reporting period.</p> <p>An innovation maturity model was developed to benchmark CSIRO's capacity to innovate. The model will be launched in August and a baseline established in December 2011.</p>

⁴ www.csiro.au/resources/CSIRO-Strategy-2011-2015.html

Financial performance

In 2010–11, CSIRO delivered a surplus from ongoing operations of \$12.5 million. However, our overall position was a deficit of \$10.5 million due to a write down of \$23.1 million in the value of our equity investments and assets³, net of small gains from the sale of assets. Total revenue of \$1,220 million included appropriation from government of \$720 million and \$500 million in revenue generated from other sources (representing an 8.9 per cent increase over prior year). Compared with 2009–10, the value of CSIRO's non-financial assets increased by \$283 million including \$227 million attributable to the revaluation of land and buildings and further increase relating to assets under construction.

CSIRO's financial performance in 2010–11 is summarised in Table 2.2, (by source of revenue) and Table 2.3 (by Program).

Table 2.2: CSIRO financial performance 2010–11, \$m

Financial performance					
Revenue source	2006–07	2007–08	2008–09	2009–10	2010–11
Co-investment, consulting and services					
Australian private sector	58	68.2	76.3	71.8	81.6
Australian Governments	116	119.5	148.3	169.8	188.6
Rural industry R&D corporations	43.2	30.2	36.5	31.8	34.4
Cooperative Research Centres	39.8	38.2	40.3	42.3	34.8
Overseas entities and international	37.2	35.3	61	78.3	72.8
Work in progress / deferred revenue	-8.5	-1.4	-14.5	-13.6	5.9
Total co-investment, consulting and services	285.7	290	347.9	380.4	418.1
IP – royalty and licence revenues	30.6	81.7	229.6	46.7	29.2
Total research and services revenue	316.3	371.7	577.5	427.1	447.3
Other external revenue	44.5	41.3	40.1	32.1	47.9
Gain / (loss) on sale of assets	2.7	4.8	17.2		4.9
Other fair value gains and reversals	0.1	10.8	-	-	0.1
Total external revenue	363.6	428.6	634.8	459.2	500.2
Revenue from Government	610.1	663.2	668.1	704.9	720.4
Total revenue	973.7	1,091.8	1,302.9	1,164.1	1,220.6
Less: expenses	972.7	1,044.1	1,180.9	1,333.1	1,231.1
Operating result	1.0	47.7	122.0	(169)	(10.5)

³ Land and building were revalued as at 30 June 2011 by a panel of independent valuers. The primary valuer was CB Richard Ellis.

Table 2.3: CSIRO – financial summary by PBS Program⁴, 2010–11, \$m

	Actual	Original PBS budget	Variance
Government revenue	720.4	720.9	0.5
External revenue	495.3	462.3	(33.0)
Other revenue	4.9	-	(4.9)
Total revenue	1,220.6	1,183.2	(37.4)
Program 1 – National Research Flagships	536.5	552.4	15.9
Program 2 – Core Research and Services	542.5	466.3	(76.2)
Program 3 – Science Outreach: Education and Scientific Publishing	35.3	31.8	(3.5)
Program 4 – National Research Infrastructure: Facilities and Collections	116.8	132.7	15.9
Total expenses	1,231.1	1,183.2	(47.9)

Intellectual property and equity portfolio

Intellectual property management and licensing

CSIRO manages intellectual property (IP) in a manner consistent with the *Statement of IP Principles for Australian Government Agencies*. This provides a robust framework for the effective identification, protection, ongoing management and exploitation of intellectual property. Recent highlights include:



CSIRO's fibre optic catheter technology is set to be adopted worldwide following the signing of two licences with international medical device companies. The fibre optic catheters will be used to diagnose and monitor gastrointestinal disorders once regulatory approval has been gained.

CSIRO's Reversible Addition and Fragmentation chain Transfer (RAFT) technology has opened up huge licensing opportunities with multi-national organisations keen to use RAFT in the development of smart materials (see case study on page 29).

Through CSIRO's Australian Growth Partnership (AGP) program, Biofiba Ltd received up to \$2 million to fund the company's process for manufacturing shipping pallets made from CSIRO's revolutionary bio-composite timber (see page 36 for more details).

⁴ Portfolio Budget Statement Programs. For information on these programs see Part 3 of this report.

New management processes implemented during 2010–11 have resulted in more strategic decision-making – including the abandonment of aged, costly intellectual property and an increase in strategic, outcome oriented filings. Table 2.4 outlines registrable forms of intellectual property rights pursued by CSIRO. CSIRO also generates and transfers non-registrable forms of intellectual property rights, such as software, that are not reflected in Table 2.4.

Table 2.4: CSIRO intellectual property by type

IP category ^(a)	Sub category	2006–07	2007–08	2008–09	2009–10	2010–11
Patents	Current PCT ^(b) applications	91	111	97	90	101
	Granted	2,067	1,933	1,625	1,630	1,631
	Live cases	3,922	3,787	3,710	3,379	3,370
Inventions	Patent families	734	741	743	712	709
	New	84	67	80	99	92
Trade marks	Australian	287	291	265	263	259
	Foreign	104	113	130	114	109
Plant breeder's rights	Australian	119	122	122	122	122
	Foreign	25	25	25	21	21
Registered designs	Australian	3	2	2	2	2
	Foreign	12	11	10	10	10

^(a) IP categories are defined in the glossary on page 205.

^(b) Patent Cooperation Treaty

Equity portfolio

The total value of CSIRO's equity portfolio at 30 June 2011 was \$32.0 million compared to \$32.6 million at 30 June 2010, a decrease of \$0.6 million or 1.9 per cent in value. The major contributing factor was the decrease in value through an impairment of the shareholding in the unlisted company Arista Cereal Technologies Pty Ltd.

The portfolio transaction activity for 2010–11 is listed in Table 2.5. 2010–11 was a quiet year for the creation of companies. Seven companies managed to raise \$44.3 million of new capital and CSIRO exited or partially exited five companies to realise \$3.8 million cash to be reinvested into research.

In 2010–11, four companies were added to CSIRO's portfolio; one via a technology licensing agreement and three from AGP investments.

Table 2.5: Portfolio transaction activity, 2010–11

Activity	Number of companies	Value (\$m)
Companies created	0	0
Change in structure (e.g. private to public)	1	1.4
Capital raisings	7	44.3
New CSIRO contributions	9	6.2
New companies	4	4.2
Exited (full or partial)	5	3.8
Wound-up	1	0

Research capability and scientific excellence

CSIRO invests in the development of high-quality scientific capabilities (including world-class researchers, research infrastructure and collaborative relationships) and assesses its performance through a program of independent science reviews and examination of five key performance indicators.

Science assessment reviews

The science assessment review program is a robust, rigorous and independent assessment process involving a review of each Division's research capabilities by independent experts from Australia and overseas. Divisional responses to the recommendations made by review panels are monitored by the CSIRO Executive and Board.

The first cycle of reviews, comprising 17 Divisions, was undertaken between 2005 and 2007. The second cycle of reviews began in late 2008. At the end of June 2011, 14 Divisions had been reviewed, including two during 2010–11. The remaining two Divisions will be reviewed in the second half of 2011. Panels usually consist of five scientific experts, three from overseas and two from Australia. The reviews help to establish the level of our research performance. With an international review comprised of world leading scientists in the appropriate areas, we gain a realistic appraisal of the performance of a Division as well as suggestions as to how the performance of research teams can be increased. In general the Review Panels found the Divisions to be of high-quality in their research, while noting that only some programs in any Division reach international leadership status.

CSIRO Marine and Atmospheric Research (CMAR) was reviewed in August 2010. Panel members were unanimous in their view that CMAR has a team of high-quality scientists producing excellent science focused on achieving their mission. They were impressed by the enthusiasm and commitment of all personnel. The Panel commented favourably on the formation of The Centre for Australian Weather and Climate Research in partnership with the Bureau of Meteorology, regarding this to be a highly significant achievement that

has already delivered major research benefits. The Panel noted that a Division as large and diverse as CMAR can be good at many things but it can only lead the world in a small number of these. It recommended that the Division should articulate the four or five research areas in which it would set out to lead the world.

CSIRO Mathematics, Informatics and Statistics (CMIS) was reviewed in October 2010. The Panel commented that the Division has made good progress since the first round review in 2006. It noted that scientific productivity and recognition had improved but that there is still further scope to lift recognition as a significant contributor to the mathematical sciences research community. The Panel made specific recommendations in regard to the Division's role in the leadership of CSIRO's bioinformatics capability, and in regard to the development of scientific capability in support of the services sector of the economy. The Panel further recommended that CMIS should build more strategic national and international collaborations to promote cutting-edge advancement in methods and techniques.

Key performance indicators

Table 2.6 provides a summary of progress against the five performance indicators relating to research capabilities identified in CSIRO's 2010–11 Operational Plan⁵. More detailed analyses and trend data follow.

Table 2.6: Performance indicators for research capability – summary

Indicator	Target	Result summary
Proportion of research capabilities rated as benchmark or strong.	Maintain or increase	There was a slight increase in the proportion of capabilities rated 'benchmark' or 'strong' in Round Two assessments compared with Round One.
Journal articles per research scientist.	1.5 articles per year	The number of articles is trending upwards and reached 1.27 per researcher in 2010.
Journal publications in top quartile journals.	40 per cent	Data not available. ¹
CSIRO citations per paper compared to world rate in each research field.	Greater than ten per cent above world rate	CSIRO is at least ten per cent above the world average citation rate in 13 of the 14 research fields in which it is in the top one per cent of global institutions.
Total citations per paper compared to world rate.	Greater than 40 per cent above the world rate	The average citation rate for CSIRO journal articles is 29 per cent above the world rate.

¹ The bibliometric analysis required for this indicator was previously sourced from an external provider and is no longer available.

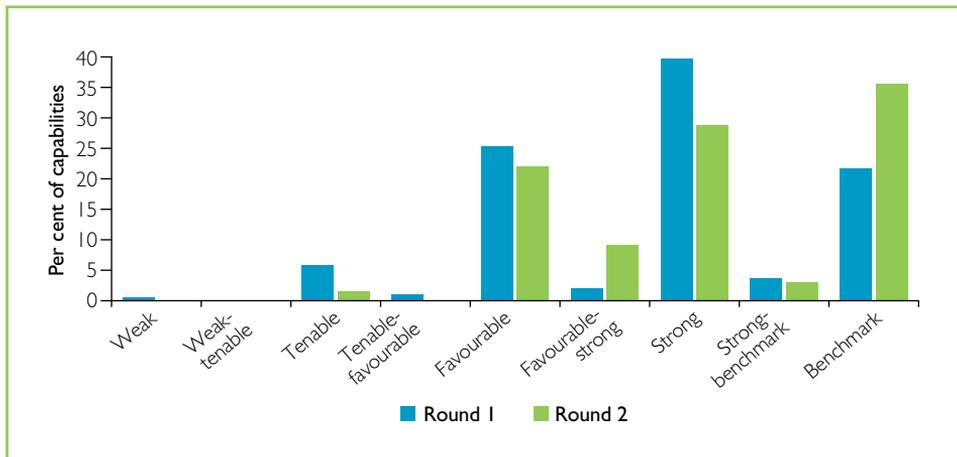
⁵ www.csiro.au/operational-plan.

Proportion of research capabilities rated as benchmark or strong

As part of the science assessment review process (noted previously), the review panels provide a formal assessment of each Division's capabilities in two dimensions: industry/community and international research.

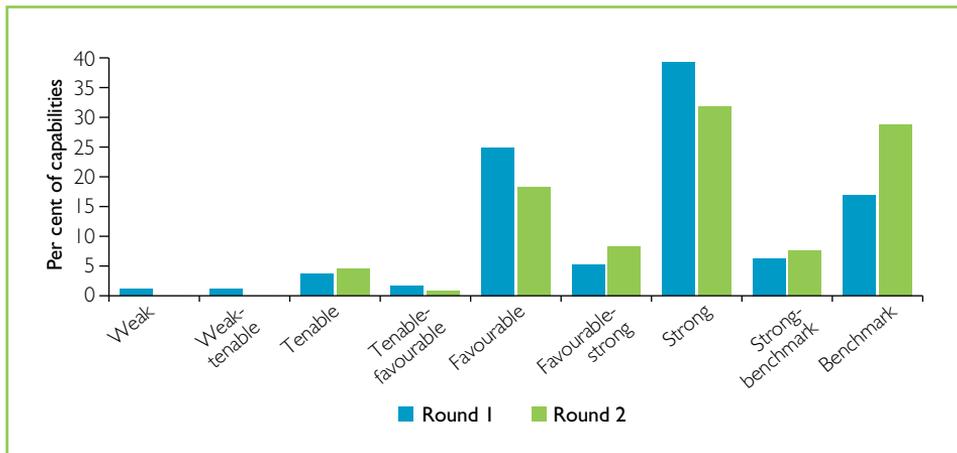
Interim results show some improvement in overall ratings compared with round one results (see Figures 2.1 and 2.2). The proportion of capabilities rated as strong or better increased from 65 to 67 per cent on the industry/community dimension and from 62 to 68 per cent on the international research dimension.

Figure 2.1: Ratings of Divisional capability groups – industry/community dimension



Source: CSIRO Divisional reviews

Figure 2.2: Ratings of Divisional capability groups – international research dimension



Source: CSIRO Divisional reviews

Journal articles per researcher

The number of journal articles per researcher has been trending upwards over the last ten years. Data for the most recent five years are shown in Figure 2.3.

Figure 2.3: Journal articles per researcher



Source: CSIRO

Citations per paper in each research field

A metric commonly used to assess the contribution of research institutions in a particular field of research is the total number of citations received by its publications in the field. On this basis, as at May 2011, CSIRO ranks in the top one per cent of scientific institutions in 14 out of 22 research fields. These 14 fields account for approximately 94 per cent of all CSIRO's publications. The citation rate for CSIRO's publications is higher than the world average citation rate in all 14 fields – and at least ten per cent above the world average in all but one of these fields (see Figure 2.4)⁶.

⁶ Source: Thomson Reuters/ISI Essential Science Indicators. Data updated as at 1 May 2011 to cover a ten-year and two month period, 1 January 2001 to 28 February 2011.

Figure 2.4: CSIRO citation rates compared with world average citation rates by field



Source: Thomson Reuters/ISI Essential Science Indicators

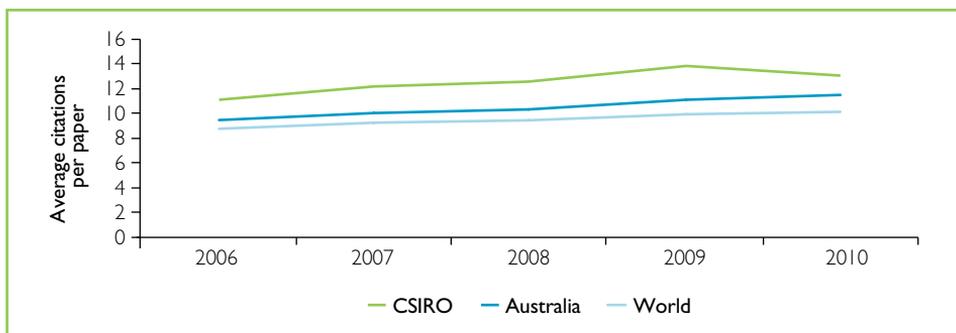
Total citations per paper compared to world rate

CSIRO's overall citation rate of 13.09 citations per paper is 29 per cent above the world rate of 10.18 (as at May 2011). This compares with a margin of 38 per cent in 2010 and a margin of 19 per cent recorded in 2004. CSIRO citations per paper decreased by five per cent, whereas the Australian average increased by three per cent and the world average increased by two per cent (see Figure 2.5).

The decrease in CSIRO's citation rate is partly due to a 12 per cent increase in the number of CSIRO publications recorded in the Essential Science Indicators database as at May 2011, compared with May 2010. Papers typically receive few citations in the year of publication, so a sudden influx of papers could reduce the citations per paper rate. Another possibility is that some highly cited CSIRO papers from ten years ago have dropped out of the calculation.

While a single data point does not indicate a downward trend, we will monitor the situation closely. Understanding and improving our science health is a key focus for the 2011–15 strategy.

Figure 2.5: Average citations per paper



Source: Thomson Reuters/ISI Essential Science Indicators

Collaboration and partnering

University collaboration

CSIRO has extensive collaborative relationships with universities in Australia and internationally. CSIRO is a key player in the training of future researchers (see Table 3.5, page 62) and provides a high-quality, applied-research environment for building Australia's scientific capability and capacity.

Approximately 40 per cent of CSIRO's staff are located on, or directly adjacent to, university campuses. In collaboration with university and industry partners, CSIRO is developing a number of innovation precincts of global scale. These precincts will attract overseas partners and investment, will ensure efficient use of science infrastructure, and will provide the environment to tackle some of the world's most complex challenges.

Through the Flagship Collaboration Fund, CSIRO committed to the investment of \$17.2 million in research conducted by more than 26 universities.

Some examples of collaborations during 2010–11 include:

- An array of technical equipment has been commissioned to observe the physical properties of the nation's surrounding deepwater oceans. The array, funded by the Integrated Marine Observing System, will be shared by CSIRO, the University of Western Australia, University of Tasmania, James Cook University and Curtin University and other research institutes.
- CSIRO and the University of Western Australia opened a joint laboratory to develop legume crops with improved resistance to disease.
- CSIRO and the Chinese Academy of Sciences reached an agreement to increase collaboration through projects on sustainable water, agriculture and crop breeding; climate science and remote sensing; and nanotechnology and new materials for energy.

Cooperative Research Centres

CSIRO remains the largest single participant in the Cooperative Research Centre (CRC) program. Throughout the life of the program, CSIRO has been a participant in 134 of the 190 CRCs that have existed, (rounds 1–13 inclusive). In 2010–11 CSIRO's direct contribution to CRCs was \$34.8 million.

CSIRO is a participant in three of the four Round 13 CRCs that were announced to receive funding in December 2010: the High Integrity Australian Pork CRC, the Contamination Assessment and Remediation of the Environment CRC and the CRC for Mental Health.

The opening of Round 14 was announced in December 2010, with proposals to the Department of Innovation, Industry, Science and Research submitted on 2 July 2011. CSIRO has participated in 11 CRC bid submissions, of which nine are extensions to existing CRCs and two are new.

CSIRO engages in CRCs to build critical mass in research ventures which tackle clearly articulated major challenges for end users and Australia.

Customer engagement

CSIRO has reaffirmed its commitment to its customers and partners with the introduction of a strategic pillar 'Deep Collaboration and Connection' in CSIRO's new 2011–15 Strategy.

Specific strategies were developed for each of CSIRO's key customer segments. A four-year forecast was produced for these segments and major clients through the introduction of a new commercial planning component into CSIRO's existing annual Science Investment Process. In terms of Section 311A of the *Commonwealth Electoral Act 1918*, no advertising campaigns were undertaken in 2010–11.

CSIRO has continued to establish large research alliances with key partners. CSIRO secured a landmark \$20 million, five-year research alliance with General Electric in September 2010, solidifying a growing portfolio of long-term alliances with clients including Orica Ltd, AusAID, Centrelink, the Bureau of Meteorology, the Queensland Government, Boeing and Bayer.

CSIRO also continued to engage with other major clients including the Department of Agriculture, Fisheries and Forestry, the Department of the Environment, Water, Heritage and the Arts, the Grains Research and Development Corporation, as well as major multinational organisations. During the financial year, the total value of projects each worth more than \$7 million increased from \$316.5 million to \$539.5 million, evidencing growing maturity of our business development and commercial activities and relationships with clients.

Flagship Collaboration Fund

The Flagship Collaboration Fund (FCF) has engaged with over 70 different external institutions since 2005, with international partners increasing steadily. The engagement spans 27 Clusters, over 100 Projects, 30 visiting fellowships and more than 140 postgraduate scholarships.

Recommendations from the first external review of the FCF in 2010 were implemented during 2010–11 as operational improvements, including development of the first formal performance measures for the Fund. See page 27 for information on investment of the Fund.

Government engagement

A critical part of CSIRO's broader relationship with Government is its role as a trusted advisor, providing relevant scientific and technical input and advice to decision-makers. Key activities during 2010–11 included:

- Membership on seven of the Australian Government's eight Industry Innovation Councils and membership on a range of other government boards and advisory bodies, for organisations including Commercialisation Australia and the Office of the Chief Scientist.
- Regular meetings with Ministers and parliamentarians and with senior staff from relevant government departments to provide scientific information and advice to inform policy development and program implementation and evaluation. Examples include ongoing engagement on issues of sustainability and carbon management, as well as on development of the National Plan for environmental information.

- CSIRO made eight submissions to Federal parliamentary inquiries and CSIRO officers attended six hearings to provide further evidence to these inquiries.
- CSIRO held three *Science for Breakfast* briefings at Parliament House and in parallel with these also provided targeted briefings for departments and individual parliamentarians.
- CSIRO hosted a number of visits by Ministers and other Parliamentarians to our sites.

International engagement

CSIRO continues to strengthen existing research relationships and forge new links globally. During the reporting year, the Organisation participated in over 800 international activities, ranging from collaborative research to consulting and the supervision of scientists from as many as 60 countries. The value of CSIRO's international transactions exceeded \$72 million.

CSIRO's single most important international partner country continues to be the USA. CSIRO's involvement with China continues to strengthen, with a significant increase in the number of joint publications during 2010–11. Ongoing development of strategic relationships with emerging nations (Brazil, Chile and South Korea) is of significant importance as is CSIRO's work in 'Innovation for Development' through its partnership with the Global Research Alliance, AusAID and the Australian Centre for International Agricultural Research (ACIAR).

Highlights during 2010–11 include:

- CSIRO and AusAID signed a Strategic Partnership Agreement that sets out the framework for ongoing strategic cooperation between the organisations.
- The CSIRO–AusAID Africa Food Security Initiative was established. The focus of this \$50 million, three-to-four year initiative is to foster integrated agricultural research for development in East, West and Central Africa, and to develop capacity building and research activities to improve animal health and the nutritional quality of foods.
- CSIRO hosted 42 PhD students from China under a Memorandum of Understanding with the Chinese Ministry of Education/China Scholarship Council.
- Orders for CSIRO's air cargo equipment scanning technology developed under a joint venture between CSIRO and Chinese equipment manufacturer Nuctec were placed.
- CSIRO's engagement with the Chinese Academy of Sciences (CAS) continued to grow with the commencement of five workshops and three joint projects in the four CAS-CSIRO priority areas for collaboration: health, materials, climate change and remote sensing, and agriculture.
- An MoU with the National Oceanic and Atmospheric Administration (NOAA) was signed in February 2010. The inaugural joint CSIRO-NOAA meetings followed in June 2010.
- The 11th Australia – European Union Joint Science and Technology Cooperation Committee (JSTCC) meetings were held from 7–9 June 2010. CSIRO hosted one of the six JSTCC thematic workshops in Canberra on Biotechnology, Agriculture and Food as part of the current 'Knowledge Based Bioeconomy'.
- Continuation of CSIRO's work within the Global Research Alliance (GRA). CSIRO and its fellow GRA members are currently collaborating with the World Bank in Vietnam to develop an 'Inclusive Innovation' framework for the country.

Indigenous Engagement Strategy

2010–11 marked the commencement of Phase 2 implementation of CSIRO's Indigenous Engagement Strategy. The four pillars of the strategy are Indigenous Employment; Cultural Learning and Development; Science and Research Opportunities; and Outreach Education. The Office of Indigenous Engagement (OIE) is developing a sharper focus on two key pillars by identifying more Indigenous employment opportunities and building on CSIRO's ability to engage more effectively with Indigenous communities. The aim is to deliver science through more targeted cultural learning and development activities.

Indigenous employment: A 2.7 per cent Indigenous employment benchmark has been set for all Australian Public Service Agencies. CSIRO aims to achieve this target by 2015. During 2010–11, six Indigenous cadets successfully progressed through their undergraduate science studies, making a valuable contribution during their 12-week work placements. A number of cadets completed their undergraduate science degrees and are now undertaking an Honours or Masters. Two cadets commenced PhD programs. One cadet completed a PhD and is now CSIRO's first Indigenous participant in a postdoctorate research program. Towards the end of 2010, CSIRO initiated an Indigenous Student Internship Program, recruiting three Indigenous interns as part of a new Indigenous employment initiative. All three candidates completed their internships and gained valuable experience in the business development of a large science organisation.

Cultural learning and development: Three events were held to promote a better understanding of how to engage more effectively with Indigenous Australians in relation to the science we deliver.

An inaugural *'Indigenous Science Speakers Forum'* was held at the CSIRO Discovery Centre in Canberra during the National Aboriginal Islander Day Observance Committee (NAIDOC) week. Mr Bradley Moggridge, an Indigenous CSIRO water researcher, provided the keynote address.

The Chief Executive launched CSIRO's protocols for conducting a 'Welcome to Country' and 'Acknowledgement of Country'. This was coupled with a Welcome to Country ceremony provided by Ms Matilda House, an elder of the Ngunnawal and Ngambri Nations. Several other ceremonies have since been conducted by science leaders.

The Indigenous naming of CSIRO's Ngara Wireless Technology was conducted in recognition of the Dharuk people, the traditional custodians of the land in which the technology was developed. The name 'Ngara', which means to *'listen'* to *'hear'* to *'think'*, symbolises the true intent of an effective information network.

During 2010–11, the OIE developed a multi-tiered Cultural Learning and Development Plan to assist CSIRO engage with Indigenous Australians in a culturally sensitive and efficient way.

Science and research opportunities: Science and research that has a strong Indigenous focus is emphasised in the Ecosystem Sciences Division, which is addressing issues associated with Indigenous water access and allocation, climate change impacts, carbon sequestration and market opportunities.

A unique partnership has been forged between CSIRO and the Wajarri Yamatji people of Western Australia through a negotiated Indigenous Land Use Agreement. The agreement will make astronomy available to all Australians and will provide



Dr Megan Clark (Chief Executive, CSIRO) received a message stick wrapped in a possum skin from Ms Matilda House, an Elder of the Ngambri-Ngunnuwal Nations, the traditional custodians of the Canberra region.
Credit: Cris Kennedy

benefits through education, enterprise and employment opportunities to the Wajarri Yamatji people.

Outreach education opportunities: During 2010–11, CSIRO continued its development with the Nudgee Beach Environmental Education Centre of an Indigenous Science Education Pathway pilot project aimed at increasing the participation of Indigenous students taking up science. It is anticipated that 14 high school students will graduate later in 2011. CSIRO's Darwin Laboratory continues to deliver Indigenous Education activities through the Jack Cusack Memorial

Science Scholarship, which provides opportunities for Indigenous students from Kormilda College to work side-by-side with scientists on research projects. The Darwin Laboratory also has a strategic partnership with the Tiwi College to raise awareness of science as an attractive career path, and to assist with science education. In 2010, the 'Literacy through Science' program was established, focusing on ecology and environmental monitoring. In 2011, CSIRO will play a key role in helping deliver formal vocational and educational training in conservation and land management to Tiwi College students.

Awards and honours

Outstanding performance in research is recognised by various international and national award schemes. Here are just a few examples of awards and honours granted in 2010–11 that demonstrate our effectiveness in research and its application in industry and the community.

2011 Australian of the Year

Mr Simon McKeon (CSIRO Board Chairman) was named 2011 Australian of the Year. This award celebrates eminent Australians by profiling leading citizens who are role models for all Australians. Winners are those who inspire through their achievements, and who challenge others to make their own contribution to creating a better Australia.

Order of Australia

Member (AM)

Dr Penny Olsen (formerly, Ecosystem Sciences) for service to the conservation sciences as an author and researcher, and through the study and documentation of Australian bird species and their history.

Dr Anthony Smith (Marine and Atmospheric Research) for service to marine science through research and development of ecosystem based fisheries management, particularly the implementation of harvest strategies and policy governing sustainable practices.

Australian Museum Eureka Prizes 2010

Dr Amanda Barnard (Materials Science and Engineering) was awarded the *Research and Innovation Eureka Prize* for predicting properties of nanoparticles in sunscreens.

Dr Drewe Ferguson (Livestock Industries) and **Dr Robyn Warner** (Food and Nutritional Sciences) as part of the interdisciplinary Meat Standards Australia Team won the *Research for an Interdisciplinary Team Eureka Prize* for co-developing the world's first 'paddock-to-plate meat grading system'.

CSIRO Chairman's Medal

The Chairman's Medal honours the most exceptional research in CSIRO and is awarded to the scientist or team whose research is of national or international importance in advancing scientific knowledge, technology application or commercialisation.

The winners of the *2010 Chairman's Medal* were **Dr Bill Barendse**, **Dr Brian Dalrymple**, **Dr James Kijas** and **Dr Ross Tellam** (team leaders) and the **Livestock Genomics Team**. The team played key roles in developing and leading two international consortia that managed the cattle and sheep genome projects. They identified the urgent need to decode these livestock genomes to progress animal sciences and improve industry productivity.

Further information on CSIRO Awards can be found at: www.csiro.au/science/CSIRO-Chairmans-Medal-Recipients.html



Winners of the Chairman's Medal: the Livestock Genomics Team (left to right, bottom row) Dr James Kijas, Dr Bill Barendse, Dr Megan Clark (Chief Executive, CSIRO), Senator the Hon Kim Carr (Minister for Innovation, Industry, Science and Research), Dr Ross Tellam, Dr Brian Dalrymple, Mr Simon McKeon (Chairman, CSIRO Board). Middle row: Mr Russell McCulloch, Mr Rowan Bunch, Mr Wes Barris, Mr Warren Sim, Mr Nick Corbett. Back row: Mr Laercio Porto Neto, Mr Blair Harrison, Dr Rachel Hawken, Mr Paul Williams, Mr Sean McWilliam. Credit: Leo Farrell, Rokeby Studios

The CSIRO Medal for Lifetime Achievement

The CSIRO Medal for Lifetime Achievement is awarded to individuals who have a record of sustained and meritorious achievement over a prolonged period of CSIRO service.

The 2010 winner was **Dr Ta-Yan Leong** (International) for contributions to CSIRO's international group for 25 years, supporting the full range of CSIRO's international activities, building deep, trusting and long-term productive relationships with overseas partners which have benefitted CSIRO and Australia.

Sir Ian McLennan Achievement for Industry Award

This award was established by the former CSIRO Advisory Council in 1985 to recognise outstanding contributions by CSIRO scientists to Australian industry.

The 2010 winner was **Dr Wojciech 'Voytek' Gutowski** (Materials Science and Engineering) for his contribution to industry through breakthrough eco-sustainable technologies that have delivered worldwide industrial, economic and environmental impact.



Winner of the CSIRO Lifetime Achievement Medal, Dr Ta-Yan Leong. Credit: Leo Farrell, Rokeby Studios

Fellows of Societies

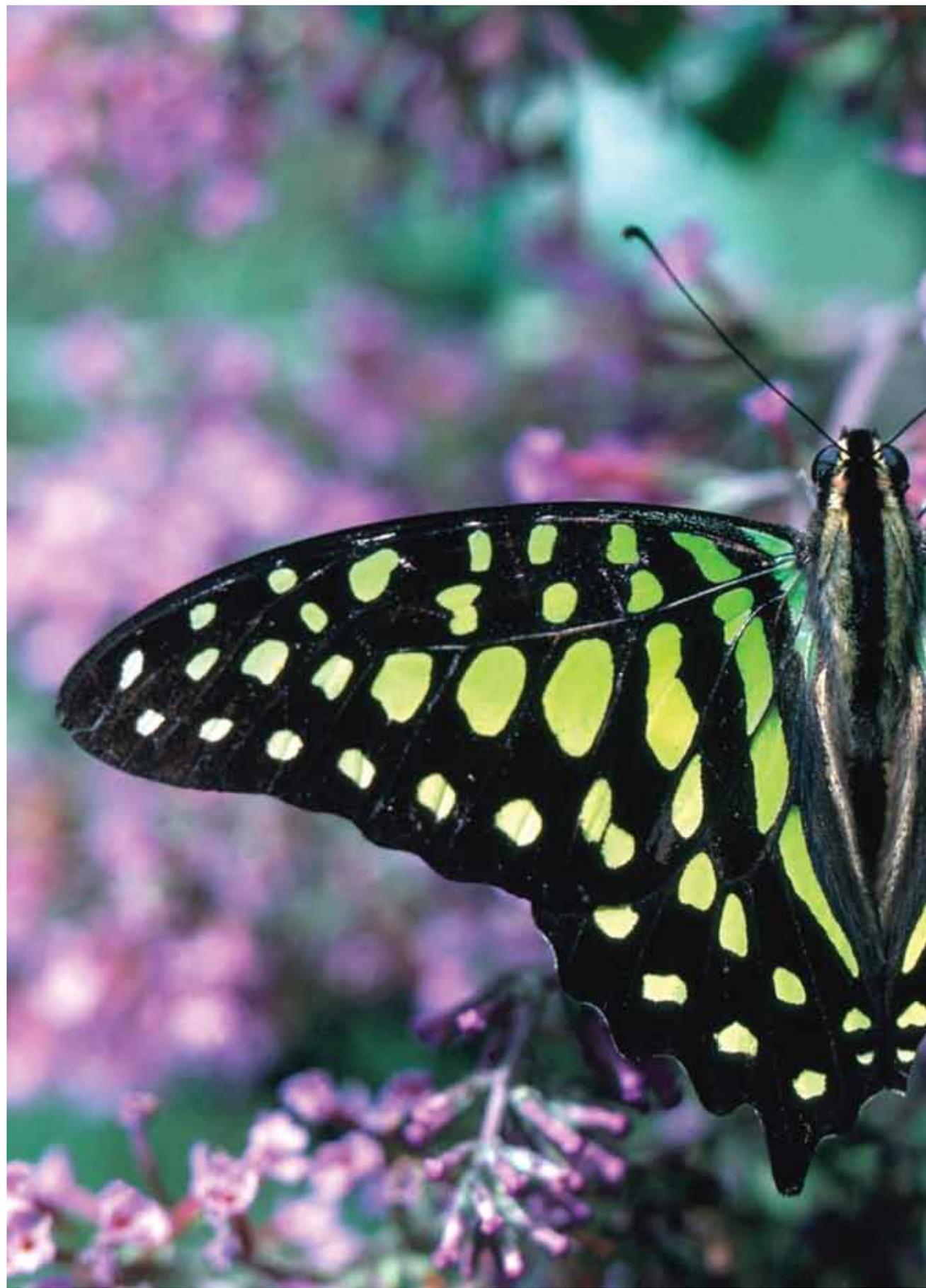
Dr Jenny Bennett (CSIRO PUBLISHING) was appointed a Fellow of *The Royal Australian Chemical Institute*.

Dr John Church (Marine and Atmospheric Research), **Dr Mike McLaughlin** (Land and Water) and **Dr Michael Raupach** (Marine and Atmospheric Research) were appointed as CSIRO Fellows.

Dr Rob Fitzpatrick (Land and Water) was appointed a Fellow of the *Soil Science Society of America*.

Dr Matthew Morell (Plant Industry), **Dr San Thang** (Materials Science and Engineering) and **Dr Linfa Wang** (Livestock Industries) were elected as Fellows of the *Australian Academy of Technological Sciences and Engineering*.

Dr Colin Ward (retired, Molecular and Health Technologies) was elected a Fellow of the *Australian Academy of Science*.





PART 3

OUTCOME AND PROGRAM PERFORMANCE

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PART THREE: OUTCOME AND PROGRAM PERFORMANCE

CSIRO's outcome and program structure

CSIRO receives approximately 60 per cent of its operating revenue in appropriation funding through the Federal Budget. Our commitment to the parliament and people of Australia, set out in the 2010–11 Portfolio Budget Statements, is to contribute to the following outcome:¹

Innovative scientific and technological solutions to national challenges and opportunities to benefit industry, the environment and the community, through scientific research and capability development, services and advice.

In pursuit of this outcome in 2010–11, CSIRO allocated funds across four Programs listed below and as outlined in Table 2.3, page 7:

- Program 1 – National Research Flagships
- Program 2 – Core Research and Services
- Program 3 – Science Outreach: Education and Scientific Publishing
- Program 4 – National Research Infrastructure: National Facilities and Collections

These Programs reflect the Organisation's focus on delivering scientific solutions to Australian industry and communities, while simultaneously helping to build Australia's science base to meet ongoing challenges and opportunities.

The following sections provide a report against the deliverables and key performance indicators specified for each Program in the Portfolio Budget Statements.

Program 1 – National Research Flagships

National Research Flagships – objectives and deliverables

Since the launch of the first three National Research Flagships in 2003, CSIRO has committed an increasing proportion of its resources to addressing major national challenges and opportunities through the National Research Flagships Program. In 2010–11, CSIRO devoted 44 per cent of its resources to ten Flagships: **Climate Adaptation; Energy Transformed; Food Futures; Future Manufacturing; Light Metals; Minerals Down Under; Preventative Health; Sustainable Agriculture; Water for a Healthy Country; and Wealth from Oceans.**

The Flagships address complex challenges by forming large-scale multidisciplinary research partnerships with Australian Universities and publicly funded research institutions, the private sector and selected international organisations. They target clearly defined goals, framed from a careful analysis of the needs of people and enterprises, and have a strong focus on adoption and impact.

¹ The relevant section of the Portfolio Budget Statements can be viewed at www.innovation.gov.au.

The Outcome is the formal legal statement of the purpose for which funds are appropriated to CSIRO.

National Research Flagships – Program performance

The performance of the Program is assessed through five key performance indicators and a series of Flagship reviews. Table 3.1 provides a summary of progress. More detailed analysis and trend data follow the Table.

**Table 3.1: Performance indicators for Program 1
– National Research Flagships**

Key performance indicator	Target	Performance
Demonstrated adoption and impact of Flagship outputs.	Growing economic, social, environmental and intangible benefits	Independent assessments provide positive feedback on the impact and value of the two Flagships that were subject to external review in 2010–11 (see page 28). Recent achievements from each of the ten Flagships are reported on pages 30–49.
The number of refereed Flagship publications.	Maintain or increase	The Flagships published 584 journal articles and 1,204 publications in total in 2010 (the first year for which these data are separately available for Flagships).
Financial support by Flagship partners.	Maintain or increase	Flagship partners increased their financial support to the Flagships by \$29.9 million or 17 per cent in 2010–11.
Customer satisfaction.	Maintain	Implementation of a formal customer satisfaction measurement program was planned for 2010–11 but has been re-prioritised and deferred to 2011–12.
Investment of the Flagship Collaboration Fund (FCF).	On Plan	The FCF disbursed \$17.2 million in 2010–11, in line with the agreed budget.

Economic, social, environmental and intangible benefits

As an input to an external review of the Wealth from Oceans Flagship, the consultancy firm RMDSTEM was commissioned to conduct an economic analysis on 14 research areas representing around 50 per cent of the research funded by the Flagship. Taking a conservative approach (impacts were quantified only where reliable and logical evidence was provided), the 14 areas were calculated to have an expected value, taking into account risk factors on the path to adoption, in excess of \$4 billion. The present value of benefits from technical results already achieved at the time of the assessment was calculated to be in excess of \$2.6 billion.

Similarly, the consultancy firm ACIL Tasman was engaged to assess the likely impact and value of the Climate Adaptation Flagship. ACIL Tasman concluded that 'subject to continued careful management and focus on the issues of good science and good institutional arrangements for planning and adoption of options, the Flagship offers value that is well in excess of likely costs. Modelling of the Flagship as a whole suggests a present value across the period to 2030, as a result of Flagship activities in developing new options, and encouraging earlier and sounder use of existing cost-effective options, of the order of \$16 billion'.

Flagship publications

In 2010, CSIRO's new electronic publications repository, 'ePublish', became operational, allowing us, for the first time, to identify Flagship publications as a subset of CSIRO's total publications. However, the repository is still in development and the numbers are subject to review.

Table 3.2 shows the number of Flagship publications, by type. Total CSIRO publications are shown in Table 3.4, page 51.

Table 3.2: Number of Flagship publications by type, 2010

Publication type ¹	Number
Conference papers	420
Journal articles	584
Books / book chapters	61
Technical reports	139
Total	1,204

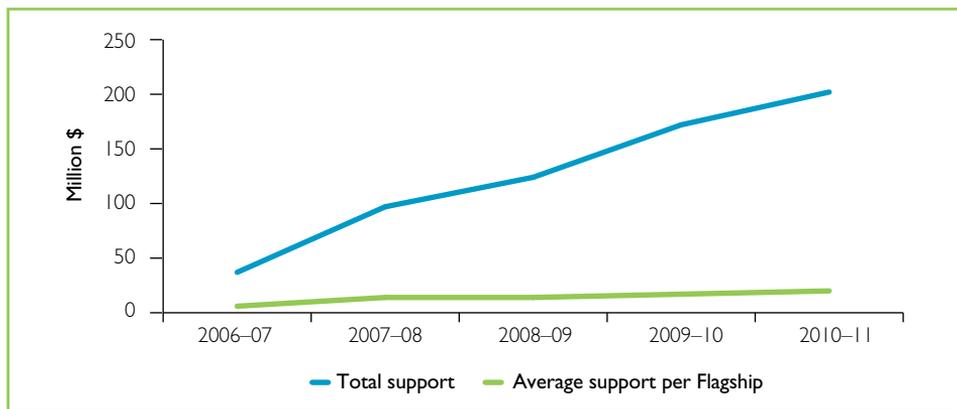
¹ See glossary page 205 for definition of publication types.

Financial support by Flagship partners

In 2010–11, the National Research Flagships Program earned revenue of \$201.7 million from external partners. This accounts for 38 per cent of the Program's total investment, up from seven per cent in 2003–04 and 32 per cent in 2009–10.

Figure 3.1 shows the growth in financial support from external partners in the last five years. The average amount of support received per Flagship also increased from \$6 million to \$20.2 million over the same time period.

Figure 3.1: Financial support for Flagships from external partners



Customer satisfaction

Implementation of a formal customer satisfaction measurement program planned for 2010–11 was delayed by other priorities. CSIRO will now establish a baseline rating of customers' 'willingness to recommend CSIRO' in 2011–12.

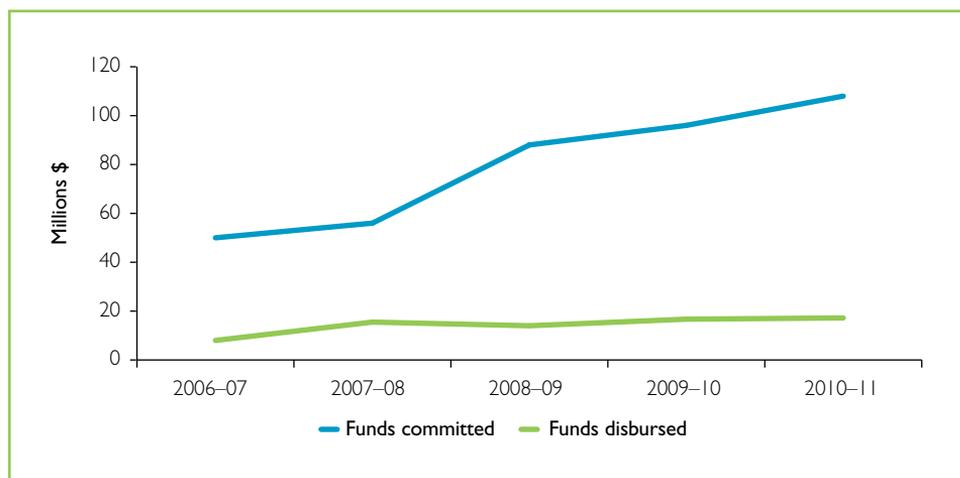
The continuing commitment of major customers to strategic levels of engagement with CSIRO – such as multi-year research alliances – is evidence that these customers see CSIRO as an essential partner in the success of their organisations. As recognition for more than 22 years of productive engagement, CSIRO was named 'Supplier of the Year' by Boeing in May 2011 (see case study page xix).

Investment of the Flagship Collaboration Fund

Investment in the Flagship Collaboration Fund² continued as planned with \$17.2 million disbursed to research in 2010–11. Overall \$108 million of the initial \$114.25 million has been committed (see Figure 3.2). The remaining \$6.25 million will be allocated to projects, visiting fellowships, or postgraduate scholarships to fully expend the \$114.25 million by 2013–14.

In 2010–11, three new clusters involving 14 national and international universities and industry partners were approved for funding. See Appendix I for a full list of Flagship Collaboration Clusters.

² For more information, see page 172 and www.csiro.au/org/FlagshipCollaborationFundOverview.html

Figure 3.2: Flagship Collaboration Fund disbursements and commitments

Flagship reviews

To maximise the likelihood of achieving Flagship goals, CSIRO conducts a three-to-four year cycle of independent reviews of each Flagship by a panel of experts from Australia and overseas. Two Flagships, Climate Adaptation and Wealth from Oceans, were reviewed in 2010–11.

The panel reviewing the Climate Adaptation Flagship commented on the excellent progress made in its first two-and-a-half years, including a number of significant impacts on the Australian understanding and uptake of climate adaptation programs and projects. They noted that a 'strong and talented' team were leading a highly appropriate research program for CSIRO, and that the Flagship has the necessary research capabilities to deliver a very creditable program, but with some emerging capacity constraints. The panel recognised the uncertainty of many key external factors in planning and implementing the Flagship's research program and was impressed at the progress the Flagship has made in engaging with its clients and delivering results.

The panel for the Wealth from Oceans Flagship review were impressed with the talent, enthusiasm and commitment of the staff and the international standard of research leadership. They found that the inaugural (2003) Flagship goal – to position Australia by 2020 as an international benchmark in the delivery of economic, social and environmental wealth based on leadership in understanding ocean systems and processes – had been largely met by September 2010. The panel commented that innovative work was evident in all three research themes and that 'Flagship scientists have been very successful in applying and adapting new technology... that could revolutionise management of the coastal zone in Australia and internationally'. The panel further commented that the Flagship should seriously consider how it markets or promotes its innovative research and science to potential stakeholders to ensure greater adoption.



RAFT: World-class technology commercialised

The challenge to develop new polymer materials with new and improved performance to meet industry and consumer needs has gone a long way to being solved by CSIRO's breakthrough polymer technology known as RAFT (Reversible Addition-Fragmentation chain Transfer).

Invented by CSIRO and developed in partnership with DuPont, the new technology provides control over the formation of polymer structures and offers the ability to tailor these materials for different applications. This technology allows us to make polymers that were impossible pre-RAFT.

Applications for the technology will include intelligent drug delivery; biocompatible materials; paints and coatings to meet stricter environmental guidelines; targeted personal care and cosmetics; additives to promote fuel efficiency; better synthetic rubbers; and new and improved agricultural delivery systems.

CSIRO has recently signed its fifteenth license agreement, the latest with a multi-national organisation that controls a share in the healthcare products market worth billions of dollars.

Internationally, over 3,000 papers have been published on RAFT developments and there are over 450 patents that have been filed by research and commercial institutions globally. CSIRO's Dr Ezio Rizzardo, one of the key inventors of RAFT, was named as one of the Top 100 Chemists in the world, ranked at eighteenth by the United States information and analysis company Thomson Reuters.

More details about RAFT can be found at: www.csiro.au/products/RAFT



RAFT technology is a living radical polymerisation process that enables users to tailor polymer properties. Credit: Stuart Dunn

Climate Adaptation Flagship

Flagship goal: Equip Australia with practical and effective adaptation options to climate change and variability and in doing so create \$3 billion per annum in net benefits by 2030.

Overview

CSIRO's Climate Adaptation Flagship ensures Australia can effectively adapt to the impacts of climate change and variability. CSIRO's scientists are working in partnership with governments, industries and communities to address this urgent national challenge.

There is now wide scientific agreement that the world is heading for at least two degrees Celsius warming and quite possibly four degrees Celsius by 2070 as a result of human activities. Climate change is likely to exacerbate climate variability and extremes across Australia causing changes to wind, precipitation and weather extremes and exposing our coastline to rising sea levels.

The Flagship is supporting Australia to address the challenges of climate change through improving knowledge of climate change projections and pathways to adaptation which provide both an underpinning research base to our endeavours, and strong engagement into three priority sectors: cities and coasts, natural ecosystems, and primary industries with their associated enterprises and communities. Our research has a strong emphasis on applicability and on large-scale, integrated projects made possible by diverse partnerships.

Achievements 2010–11

Climate change effects on concrete



Concrete is the basic building block of Australian buildings and infrastructure. Understanding how climate change could impact on the deterioration of concrete is crucial to ensuring major assets such as roads, ports and buildings continue to perform up to expectations. A recent CSIRO report outlines major findings for the benefit of policy-makers, engineering designers, asset managers and other professionals and decision-makers in both public and private sectors. The report makes a number of recommendations on the design of new, and maintenance of existing concrete structures. It is hoped that the impact of corrosion in new structures can be countered at the design stage through new technologies and materials.

Conservation management under climate change



From 2008–11, CSIRO has authored a series of studies commissioned by the Australian Government to address the effects of climate change on Australia's biodiversity and how best to respond. Building on a previous report on the National Reserve System, this year the Flagship coordinated a national report on four major regional biomes across the continent. The report outlined how to plan conservation in an integrated way for these different exemplar regions and highlighted the need for a major revision of objectives for conservation and the role of protected areas. These results are being integrated into policy at the national and state level.

Attitudes to climate change: results of an online survey



Research into Australians' views of climate change – through 22 recent surveys conducted in Australia by groups including universities, media organisations and CSIRO – is informing policy recommendations through the 2011 Garnaut Review. While the studies asked a diverse range of questions about climate-related issues, they are clear in showing that most Australians believe the climate is changing – about 75 per cent. The surveys indicated that people are confused about the science of climate change and what are effective policies or actions for adaptation. The results have important implications for those trying to communicate the science of climate change or develop policy for responding to climate change.

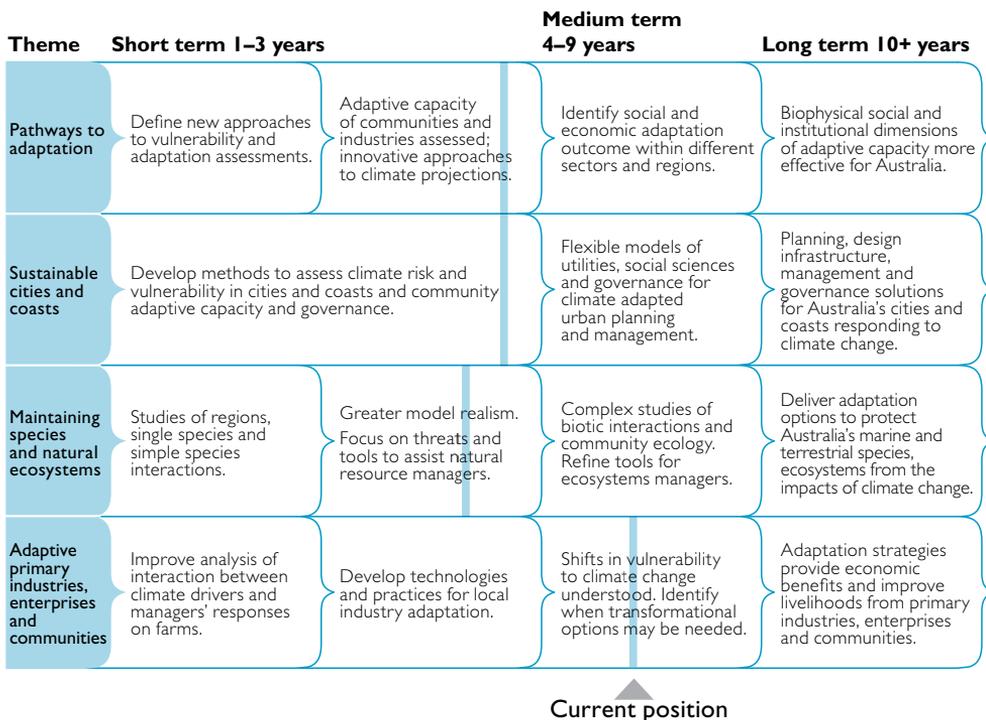
Ocean warming detrimental to south-east Australia fish species



Researchers have identified forty-three species, representing about 30 per cent of the inshore fish families occurring in south-east Australia, exhibiting shifts in their territories thought to be climate-related. In another study, Australian scientists have published the first known detrimental impact of southern hemisphere ocean warming on a fish species

– the banded morwong. In response to requests by Tasmania's four major salmon companies, Flagship scientists will provide ocean temperature forecasts to assist marine farmers to plan for warmer water, which can have adverse effects on farmed fish.

Climate Adaptation Flagship Roadmap



Energy Transformed Flagship

Flagship goal: To develop, demonstrate and ensure deployment by 2020 of integrated low carbon pathways for Australia and alternative stationary and transport energy solutions that realise a reduction of Australia's CO₂e emissions greater than 20 million tonnes per annum by 2030 and greater than 50 million tonnes per annum by 2050.

Overview

CSIRO's Energy Transformed Flagship is focused on developing renewable and alternative energy solutions to provide Australians with affordable, secure and sustainable electricity and transport fuels.

Electricity and transport contribute 69 per cent of Australia's greenhouse gas emissions. Furthermore, Australia's net petroleum imports could increase from \$14 billion today to \$70 billion by 2030. It is therefore vital to identify pathways and solutions that will help reduce greenhouse gas emissions and, at the same time, secure Australia's environmental, economic and social wellbeing.

This objective can only be achieved in close collaboration with industry, research organisations and government. The Energy Transformed Flagship, since its inception, has been a catalyst for this broad collaboration.

Achievements 2010–11

New solar tower and research facility opened



A \$4.2 million international hub for developing and commercialising solar thermal technologies was opened on 18 June 2011 at CSIRO's National Solar Energy Centre in Newcastle, New South Wales. With a new 30-metre tower and 450 mirrors (heliostats), the facility will generate temperatures of up to 1,500° Celsius and will be used to develop new low-cost solar technologies that produce power when people need it. The project has secured the interest of local and international energy organisations all eager to make solar power cheaper and more efficient (see: www.csiro.au/science/Solar-Brayton-Cycle.html).

Volunteers use 'Energymark' to reduce power bills



CSIRO led an initiative to help people across New South Wales and the Brisbane and Redlands City Council areas in Queensland to reduce their carbon footprint and lower their energy usage. Around 3,000 volunteers are taking part in 'Energymark', a program designed to help participants lower their power bills by providing tips and resources. On average, Energymark participants saved up to 20 per cent on their energy bills and reduced their carbon footprint by around 25 per cent. Gathering in small groups, family, friends, neighbours and workmates got together to discuss energy, climate change, water and waste issues over eight sessions using CSIRO material (see: www.csiro.au/energymark).

Sustainable aviation fuels



CSIRO, working with Australia's major aviation players, produced a joint report, *Flight Path to Sustainable Aviation*, which outlines a range of possible future scenarios for the use of sustainable aviation fuels in Australia and New Zealand. The report supported the possibility of a local bio-derived jet fuel industry that, over the next 20 years, could generate more than 12,000 jobs, reduce Australia's reliance on fuel imports by \$2 billion per annum and decrease greenhouse gas emissions of the aviation sector by 17 per cent. The report also identified the market, infrastructure and governance changes that will be required for success (see: www.csiro.au/science/Sustainable-Aviation-Fuels-Road-Map.html).

UltraBattery technology licensed to China



CSIRO has licensed its UltraBattery technology to one of the world's largest battery manufacturing companies to enable manufacturing in China for the automotive market. The rechargeable lead-acid battery, combined with a supercapacitor, delivers low-cost, long life, high-performance power. The licence will enable the CSIRO invention to be mass produced for conventional and hybrid-electric vehicles, making hybrid electric vehicles cheaper, more powerful and quicker to recharge. The UltraBattery has already been licensed to enable manufacture in North America, Mexico, Canada, Japan and Thailand (see: www.csiro.au/science/Ultra-Battery.html).

Energy Transformed Flagship Roadmap¹

Theme	Short term 1–3 years	Medium term 4–9 years	Long term 10+ years
Carbon futures	Develop models and reports to inform policy, industry and research. Undertake social attitude mapping. Hold stakeholder energy forum.	Hold transport sector stakeholder forums. Undertake longitudinal and larger population social analysis studies; commercialise software. Initiate integrated carbon assessment service.	Deploy an integrated energy, water, food and carbon assessment service to help Australia identify the least cost and risk transition pathways to a prosperous and secure low carbon future.
Sustainable stationary energy and transport	Develop technologies for low-cost solar power production and energy storage. Prioritise potential fuel crops for large-scale, sustainable biofuels production.	Demonstrate significant technologies at pilot scale, with industry and government support.	Drive the cost-effective take-up of renewable electricity and transport fuels in Australia to 2020 and beyond and maximise the long-term renewables uptake to 2050.
Local energy systems	Develop low-emission distributed energy technologies. Identify and begin engagement with partners.	Develop distributed generation and efficient options model to inform government and industry. Commercialise technologies.	Reduce greenhouse gas emissions by driving the uptake of distributed energy solutions, demand reduction and energy efficiency measures to 2020.

▲
Current position

¹ In 2011, the Flagship refined the long-term goal for Carbon futures.

Food Futures Flagship

Flagship goal: To transform the international competitiveness of the Australian Agrifood sector, adding \$3 billion in annual value, by applying frontier technologies to high potential industries.

Overview

The Food Futures Flagship is a collaboration involving CSIRO, industry and research partners which will transform the Australian agrifood sector.

The Flagship's research programs cover the entire food supply chain linking our science projects with farmers, governments, the food industry and consumers. Our research teams are developing healthier ingredients, delivering higher quality food products and improving sustainability and food security for farmers, manufacturers and consumers both here in Australia and around the world.

The Flagship's research is adding value to primary products through innovative food design, providing new opportunities in domestic and foreign export markets, improving farm profitability and producing healthier and safer foods for consumers.

The Food Futures Flagship's work focuses on:

- future grains, grain based foods and feed
- breeding better Australian seafood and beef
- biosensor technology.

Achievements 2010–11

New source of omega-3



The Flagship has initiated a \$50 million dollar research collaboration which will use leading-edge gene technology to develop and commercialise canola oil rich in the same high quality long-chain omega-3 oil that traditionally comes from marine plants and fish. CSIRO and partners have developed canola plants that produce long-chain omega-3 oils containing DHA (docosahexaenoic acid). Until now, this oil has only been available in beneficial quantities from ocean-based algae and the fish that eat it (see case study page 99).

BARLEYmax™ cereals available in supermarkets



The success of CSIRO's new BARLEYmax™ grain continues with a growing range of breakfast cereals and porridges now available on supermarket shelves. These new products can be found in most major Australian supermarkets and are securing a growing share of the Australian breakfast cereal market. A key factor in their success has been CSIRO's ten year multidisciplinary research and development program designed to understand and substantiate the grain's health benefits. BARLEYmax™ can have a significant impact on preventing disease by delivering high levels of resistant starch and other dietary fibres and is a leading example of scientific and commercial success stemming from collaboration within CSIRO and with a range of external partners.

Using sensory evaluation to improve shellfish quality



The Flagship is working with the oyster industry to measure and map the regional differences in oysters grown in South Australia, New South Wales and Tasmania. By developing a sensory 'language' to describe the appearance, aroma, taste and texture of oysters, researchers can measure and analyse how oysters stimulate the senses. This sensory information can be used to guide growing, harvesting and processing to improve product quality and deliver the right product to the right consumers.

Breeding fish to boost sustainability



Researchers based in Tasmania are adopting selective breeding techniques traditionally used in land-based livestock animals to boost the sustainability of farmed seafood. Much of the aquaculture industry still relies on wild fish for its breeding stock, but the Food Futures Flagship is working to introduce domesticated fish stocks into the aquaculture production system. Enabling breeding technology that uses genetic markers to identify specific

desirable characteristics is an approach much the same as that used by sheep and cattle farmers for centuries. Their goal is to help the industry become more sustainable by reducing or removing the need to rely on catching wild fish every year for breeding purposes.

Food Futures Flagship Roadmap

Theme	Short term 1–3 years	Medium term 4–9 years	Long term 10+ years
Future grains	Optimise carbohydrate in grains, optimise omega-3 oils in plants and investigate genetic traits for improved quality and nutrition.	Combine beneficial traits for farmers and consumers, breed and commercialise long chain omega-3 oils in plants and commercialise quality and nutrition traits.	Increase returns to Australia by \$550 million per annum through enhanced grain quality attributes and human health benefits.
Breed engineering	Animal management systems adopted and breeding technology developed with commercial partners.	Industry adoption of testes cell transfer techniques, success of aquatic breeds and novel feeds and optimal genetics in livestock and aquaculture.	Boost the value of Australia's animal-based food industries by \$350 million per annum for beef and \$550 million for seafood.
Quality biosensors	Development of test technology, odours predicting grape and wine quality identified.	Biosensor developed and adoption commenced in defence domain. Applications for food safety and quality in development. Flavour potential of wine grapes optimised.	Develop biosensors and improve current technology to optimise flavour in food and beverage value chain, adding \$750 million per annum.

▲
Current position

The Food Futures Flagship research portfolio was reduced from four themes to three due to the transfer of the Designed Food and Biomaterials theme to CSIRO Food and Nutritional Sciences in March 2010.

Future Manufacturing Flagship

Flagship goal: To create \$2 billion of additional annual value for Australia's manufacturing industry by 2025 through the development and application of resource efficient, clean and disruptive technologies.

Overview

Australian manufacturing faces significant challenges surrounding resource efficiency, increased international competition and the need to move to clean sustainable products and processes. Innovative science and technology are essential to address these issues and support our ongoing economic sustainability in an increasingly resource and emissions constrained world.

The Flagship is helping to address these challenges and secure Australia's global competitiveness by creating the advanced materials and manufacturing technologies needed to transform existing industries and build future manufacturing opportunities.

These technologies will support employment and deliver economic and social benefits by contributing to technical solutions across a number of industry sectors including aerospace, automotive, renewable energy, defence, textiles, building infrastructure and packaging.

Achievements 2010–11

Biodegradable shipping pallets



CSIRO scientists have been working with Australian company Biofiba Ltd to develop a sustainable alternative to timber shipping pallets targeted at the US\$90 billion global export pallet market.

Traditional timber export pallets are environmentally unsustainable as they are generally discarded after one use due to contamination risks and the high cost to treat and recycle them.

The revolutionary new bio-composite timber is derived from renewable resources that will break down at the end of the pallets' life to form mulch. The technology offers a sustainable alternative for pallet manufacture, freeing timber resources for high value-added uses.

Repainting aircraft with Paintbond SM-1



In collaboration with Boeing, CSIRO scientists have developed Paintbond SM-1; an innovative and effective solution to the complex ergonomic, safety and environmental challenge associated with both original equipment manufacturers painting and after-market repainting of aircraft. Traditional aerospace polyurethane topcoats become inert once they are cured and cannot form strong adhesive bonds to subsequent coating

layers without reactivation. The Paintbond SM-1 spray-on treatment reactivates the existing coating's surface chemistry to provide strong and durable bonds with fresh paint layers, eliminating the need for time consuming and hazardous manual sanding. The technology is being used on all Boeing's current generation single and twin aisle aircraft and has seen widespread deployment on 737 and 777 aircraft.

New Automotive Australia 2020 Roadmap



CSIRO, working with the Cooperative Research Centre for Advanced Automotive Technology, has developed the new Automotive Australia 2020 Roadmap – a program to drive and guide the future development of Australia's automotive industry. The team analysed and considered input from 160 organisations across industries, universities and government to chart the automotive industry's capabilities, needs and commercial potential. The Roadmap identifies four key directions for long-term opportunities: vehicle electrification, gaseous fuels, light-weighting and advanced data and communication systems. CSIRO's world-leading expertise in the field of green car technologies will be vital in achieving the Roadmap's objective of growing Australia's automotive industry and lowering its carbon footprint.

Olex fire resistant cables



CSIRO and Olex have partnered to develop an innovative ceramifiable insulation technology which has helped Olex secure a \$10 million contract to supply electric cables to the Brisbane Airport Link project. Olex's Alsecure fire resistant cables, which will be used in the project's road tunnels, contain ceramifiable polymers that form a solid protective and insulating ceramic layer at high temperature. In the event of a fire, this unique technology will significantly improve safety as the cable's ceramic shield maintains the integrity and continuity of circuits for essential tunnel services such as alarms, pumps and fans that are vital for safe evacuation and fire fighting.

Future Manufacturing Flagship Roadmap

Theme	Short term 1–3 years	Medium term 4–9 years	Long term 10+ years
Advanced engineered components	Materials and process development for sustainable transport solutions.	Commercialise emerging technologies.	Growth in the Australian advanced engineered components sector.
Advanced fibrous materials	Establish relationship clusters in filtration and defence, personal protection and environment sectors.	Commercialise first and second generation products.	Growth in the Australian advanced textiles manufacturing sector.
Flexible electronics	New materials discovery, device prototype optimisation and ruggedisation and scale-up.	Translate discoveries to create vibrant manufacturing industries based on flexible electronics.	Creation and growth of world-leading Australian companies in flexible electronics.
Sustainable materials	Develop technologies for economically and environmentally sustainable construction materials and processes.	Deploy new platform technologies in partnership with industry.	Sustainable environmentally conscious manufacturing in Australia.

▲
Current position

The Future Manufacturing research portfolio underwent major expansion in 2010–11. Advanced engineered components, Advanced fibrous materials, and Sustainable materials themes were transferred from CSIRO Materials Science and Engineering (CMSE), Biomedical manufacturing moved to CMSE and Cleantech manufacturing merged with the incoming Sustainable materials theme.

Light Metals Flagship

Flagship goal: To lead a global revolution in light metals, doubling export income and generating significant new industries for Australia by the 2020s while reducing environmental impact.

Overview

The Light Metals Flagship commenced in 2003, one of the original National Research Flagships set up by CSIRO to focus on National Research Priorities. The Flagship was established to further the goals of the Government's Light Metals Agenda. Its focus was the stimulation of new industries to add value to developments of Australian reserves of titanium and magnesium ores, and the growth of existing alumina and aluminium industries with efficient low-carbon footprint technologies.

In 2011, it was decided to merge the Light Metals Flagship research into two larger Flagships which serve the mining and manufacturing sectors. During its eight year lifetime, the Light Metals Flagship had many achievements. The Flagship engaged successfully in technology transfer to a wide range of businesses, from Australian small-to-medium size enterprises such as T-Mag Casting Pty Ltd and o.d.t Engineering, to initiating and growing the international relationship with GE, which last year culminated in the announcement of the CSIRO-GE alliance.

The Flagship successfully attracted funding from commercial partners for both its novel processes for titanium metal powder and carbothermic magnesium production. The Flagship initiated and led projects in residue remediation and high-silica bauxite processing, through the Aluminium Taskforce of the Asia-Pacific Partnership on Clean Development and Climate.

The Flagship has partnered with many of the major aluminium producers – Rio Tinto Alcan, Alcoa, Tomago and Hydro Aluminium – in contract projects and collaborative initiatives. The Breakthrough Technologies in the Aluminium Smelting Collaboration Cluster has brought together Australasian researchers to develop low energy solutions for the aluminium smelting industry. The Flagship also hosted ground-breaking research in the measurement and mechanisms of atmospheric emissions, both in the aluminium industry and in alumina refining.

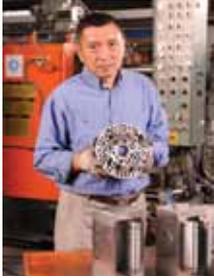
Some of the Flagship's most notable successes have been in support of the Australian car industry. Flagship technologies for lightweight die casting have been used in the manufacture of steering wheel armatures for Australian cars and recently Flagship die casting expertise was critical in determining the award of a global manufacturing contract by Nissan Motors (Japan) to Nissan Casting Australia.

The Flagship has received recognition within CSIRO, winning two CSIRO Medals for Business Excellence – for the commercialisation of T-Mag™ magnesium die-casting in 2007, and the novel titanium production technology, TiRO™, in 2009.

The Light Metals Flagship will be integrated into two other Flagships, Minerals Down Under and Future Manufacturing, from 1 July 2011.

Achievements 2010–11

CSIRO helps clinch global car component deal



In 2011, Nissan Casting Australia was successful in their bid to manufacture components for the Nissan Motor Company's new LEAF electric car. The success of the bid, which provides job security for 146 Victorian workers, was due in part to CSIRO's advanced casting technologies. Nissan Motors' Japanese engineers were impressed with CSIRO's die casting expertise and the potential for future access to a suite of CSIRO process-efficient technologies, helping to influence the Nissan Motor's decision to award the casting contract to Nissan Casting Australia.

Keeping pedestrians safe in industrial environments



A CSIRO system that alerts vehicle operators to oncoming pedestrians around blind corners has the potential to reduce fatal collisions between pedestrians and vehicles and make work in mining, materials handling and construction industries much safer. The technology uses software which tracks moving objects, identifies them as pedestrians or vehicles, and predicts the likelihood of a collision. A flashing light alerts vehicle operators, preventing accidents at dangerous 'black spots'.

CSIRO's Titanium Challenge



CSIRO's inaugural Titanium Challenge produced innovative design submissions from Australian undergraduates, developed during the competition's one week timeframe. Students were challenged to create and submit a design to be made in titanium using additive manufacturing, which capitalised on the superior material properties of titanium. The winner, a design for a novel radiator, was created by a Swinburne University industrial design student (see case study page 107).

Refiners can cut costs by recovering soda



CSIRO researchers have developed technology to recover and re-use caustic soda from Bayer process residues (red mud). The technology has the potential to provide significant cost savings for alumina refiners, as well as environmental benefits by enabling simpler storage options for the residues. This work evolved from high silica bauxite processing research for the Asia-Pacific Partnership on Clean Development and Climate (see: www.asiapacificpartnership.org/pdf/Projects/Aluminium/ATF-06-04.pdf).

Minerals Down Under Flagship

Flagship goal: To assist the Australian minerals industry exploit new resources with an in-situ value of \$1 trillion by the year 2030 and to more than double the size of the associated services and technology sector to \$10 billion a year by 2015.

Overview

The Minerals Down Under Flagship focuses on technical, social and environmental challenges facing Australia's minerals industry. This industry is central to the Australian economy, supplying raw materials, mining technologies and services around the world. However, Australia is facing mounting global competition while new deposits are not being found fast enough to replace those being extracted. Many of Australia's deposits are experiencing declining grades resulting in increased production costs, increased handling of ores with higher levels of impurities and increasing environmental pressure.

Working with numerous industry, government and research collaborators, the Flagship is helping to strengthen the economic and environmental performance of the Australian minerals industry and maximise the longer-term discovery and use of our national resource endowment. This research infrastructure positions Australia as a global leader of science and technology for this important industry.

Achievements 2010–11

New data network provides a multitude of geological information



A new data network of geoscientific information and its supporting infrastructure – the Spatial Information Services Stack – will enable users to explore Australia's geology on a national scale. Developed by CSIRO and AuScope in collaboration with research organisations around the country, the new online network will allow users to gain a greater understanding of climate change,

sustainable energy, water and mineral resources and extreme geological activity such as earthquakes. They can view and filter data on user specific queries from multiple organisations, share information and incorporate it into their workflow.

Using saline water at mine sites



Using saline water in mining and mineral processing could lead to significant financial savings and an environmentally sustainable future for the industry. CSIRO researchers examined the use of saline water in physical processes such as crushing and flotation. While saline water can cause corrosion to pumps, pipes and other components at mine and mill sites, the advantages outweigh the disadvantages where fresh water is unavailable. Potential savings due to recycling and reduced consumption of water would accumulate over the lifetime of the mine.

Processing nickel without sulfuric acid



A new process that will improve the economic viability of nickel laterite processing has been successfully demonstrated on a laboratory scale by CSIRO and industry partner Direct Nickel. The reagent recycle process that uses nitric acid instead of sulfuric acid provides the opportunity for lower grade ores to be profitably treated, potentially converting millions of tonnes of Australian nickel laterite ores into economically attractive

material. This new approach promises to secure major economic and environmental benefits for the Australian and global minerals industry. Direct Nickel and CSIRO are working together on several R&D projects aimed at enhancing the technology and Direct Nickel leads its commercialisation.

Using groundwater to find mineral resources



CSIRO scientists have developed a new cost-effective exploration technique that uses groundwater to map underground geology and target new regions of mineral deposits. It can also be used to locate gold, nickel, copper/zinc, uranium and other high-value resources. Known as hydrogeochemical exploration, the composition of groundwater is used to detect mineral deposits in the area – ground water displays a chemical halo when mineral

deposits are present. The technique is ideally suited to the Australian landscape and will provide the minerals industry with an effective exploration tool that is quick and easy to use.

Minerals Down Under Flagship Roadmap

Theme	Short term 1–3 years	Medium term 4–9 years	Long term 10+ years
Driving sustainability through systems innovation	Develop concepts to reduce greenhouse gas and water use. Assess the implications of plausible futures.	Proof of concept for new eco-efficient technologies. New planning tools to support social licence to operate.	Demonstration of whole system approach. Social negotiation tools embedded in technology and project development.
Discovering Australia's mineral resources	Identify new exploration tools. Enable data interoperability. Build multi-party collaborations.	New 3D exploration tools developed and applied to buried deposits and new Greenfield sites.	3D visualisation, modelling and targeting embedded as an industry standard leading to new discoveries.
Transforming the future mine	Engagement with industry to develop innovative mining concepts and establish investment.	Field trials of novel automated continuous selective mining systems and integrated light weight drill systems.	Adoption of new drilling, rock extraction and sorting systems. A vibrant mining technology services sector.
Securing the future of Australia's carbon steel materials industry	Develop infrastructure for precision iron ore and coke characterisation. Build relationships with industry.	Beneficiation and agglomeration process improvements being commissioned with resulting efficiency gains.	Low grade iron ores gaining traction in the Australian export market.
Creating wealth through advanced processing technologies	Laboratory testing of new ore characterisation, ore concentration and mineral/metal extraction techniques.	Continuous improvements of existing plant. Pilot plant and field trials of new techniques.	New ore reserves on-stream. In-situ leaching viable. Australian mineral processing technology preferred.
Transforming productivity through on-line analysis	Collaborative projects for concept development. Technology trials with industry.	Industry partnerships for platform development. Spin-offs and commercialisation.	On-line analysis embedded in Australian operations with significant efficiency gains and reduced cut-off grades.

Current position

Growing Australia's light metal industry will be a new theme for the Minerals Down Under Flagship effective from 1 July 2011. The theme will incorporate some of the research from the former Light Metals Flagship.

Preventative Health Flagship

Flagship goal: To improve the health and wellbeing of Australians and save \$2 billion in annual direct health costs by 2020 through the prevention and early detection of chronic diseases.

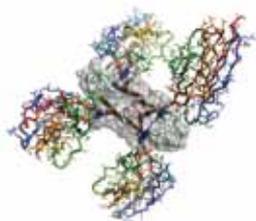
Overview

The Preventative Health Flagship's research addresses our national health challenges in areas such as colorectal cancer, gut health, neurodegenerative diseases, mental disorders and brain health.

In addressing these health challenges, the Flagship's research teams are focusing on the development of better screening methods and new techniques for the earlier detection of disease. They are also investigating the contribution of diet and lifestyle to disease and examining new approaches to disease prevention through the use of protective foods and personalised nutritional and lifestyle measures. Another area of research involves advanced methods for collecting and utilising health data to improve the way we monitor and measure our health.

Achievements 2010–11

Solving the structure of Alzheimer's protein



Alzheimer's disease is associated with the development of a toxic protein in the brain known as amyloid beta. In the brains of Alzheimer's sufferers, the amyloid beta protein rapidly 'self-assembles' and clumps together, producing toxicity and harmful plaques. CSIRO and collaborators have solved the first structure of amyloid beta providing a vital step towards understanding why

the protein accumulates and creates these toxic plaques. It is thought that these plaques disrupt connections within the brain, causing reduced neuron function and memory loss. There is no cure for Alzheimer's disease, but this knowledge could result in the development of new treatments.

Improving early detection of colorectal cancer



The Preventative Health Flagship and the Ludwig Institute for Cancer Research have used a sophisticated mathematical algorithm to identify a combination of proteins in blood, which shows promise as a screening test for the early detection of colorectal cancer. The team are working to validate the test with groups of colorectal cancer patients and healthy volunteers. If successful, a simple blood test will provide an alternative to existing faecal tests, which suffer from poor compliance.

Biobank to aid disease prediction and diagnosis



CSIRO and collaborators are building a biobank of blood samples in an effort to predict diseases such as colorectal cancer and Alzheimer’s disease in ageing Australians. Over a three year period, the ASPirin in Reducing Events in the Elderly (ASPREE) Healthy Ageing Biobank will collect, process and store blood samples from 10,000 participants in the clinical trail. When coupled with the matched clinical and lifestyle data being collected under the ASPREE trial, the biobank will enable researchers to conduct a broad range of biomedical research including biomarker discovery and validation for specific diseases.

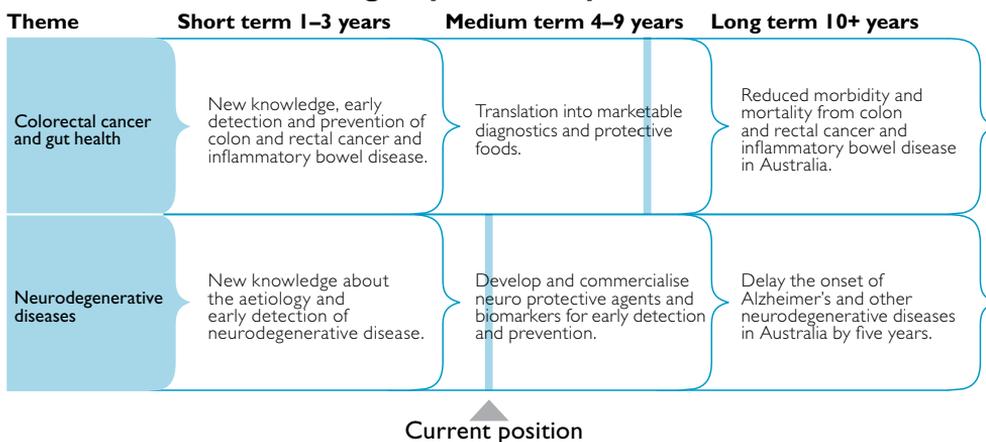
Novel strategies for stroke prevention



Launched in September 2010, the STroke, imAging, pRevention and Treatment (START) cohort study will integrate imaging and analysis of biomarkers (biological early warning signs) to more quickly and accurately identify patients at risk of stroke. The study will collect information derived from brain images

and blood samples from 200 Australian victims of acute ischaemic stroke, caused by an interruption of blood flow to the brain. The aim is to discover and validate new diagnostic biomarkers to enable the early identification of patients at risk of recurrent stroke and post-stroke depression and use these strategies in the development of new measures to prevent stroke.

Preventative Health Flagship Roadmap



The Preventative Health Flagship research portfolio was reduced from three themes to two due to the transfer of the Obesity and Health theme to CSIRO Food and Nutritional Sciences in July 2010.

Sustainable Agriculture Flagship

Flagship goal: To secure Australian agricultural and forest industries by increasing productivity by 50 per cent and reducing net carbon emissions intensity by at least 50 per cent by 2030.

Overview

A number of important challenges and opportunities face Australia's agriculture and forestry industries. The opportunities include the production of more food for a growing Australian and world population, the reduction of greenhouse gas emissions and the storage of carbon in rural soils and forests. Some of the challenges we face are increasing competition for Australia's water resources, the limited supply and rising cost of production inputs (such as water, fuels, fertilisers and chemicals) and competition from other land uses (such as mining and urban development) for agricultural land.

In partnership with industry, communities and government, the Sustainable Agriculture Flagship is addressing these opportunities and challenges by developing and implementing new and enhanced technologies and practices, delivering innovation in knowledge-based services, informing policy options, building capacity and supporting key institutions. Maintaining and enhancing soil health and agro-ecosystem function is fundamental to achieving the Flagship's goals.

Although research is primarily focused on national productivity and carbon, the Flagship is partnering with many countries across south-east Asia, Africa and the Pacific to contribute its science expertise as part of Australia's contribution to the global food and climate security challenges.

Achievements 2010–11

Using water efficiently increases crop yield



CSIRO and the Grains Research and Development Corporation are working to improve the water use efficiency of grain-based farming systems. As part of the National Water Use Efficiency Initiative, CSIRO's research in southern Australia highlights the importance of pre-cropping factors including management of weeds, stubble and livestock as well as in-crop decisions about selecting the right variety, sowing time and fertiliser use (see: www.csiro.au/science/Water-Use-Efficiency.html).

Increasing yields and reducing emissions from farming



CSIRO is working with research partners, industry and government to reduce greenhouse gas emissions and increase carbon storage in rural lands. Using a combination of improved land use, better management practices and technology, the Flagship is leading research to measure, model and mitigate emissions. A range of projects funded under Australian Government programs explore soil carbon and biochar, as well as methane emissions from livestock, savanna fire management and carbon forestry (see: www.csiro.au/science/Carbon-Australian-agriculture.html).

CSIRO leads Global Soil Map in Oceania



CSIRO is leading the Oceania Node of a global partnership to produce the first detailed, three-dimensional digital map of the world's soils. So far involving agencies from Australia, New Zealand, Indonesia and the Pacific Islands in Oceania, the *GlobalSoilMap.net* project will provide users around the world with vital information on key soil attributes critical to supporting agriculture, land use planning, biodiversity management and greenhouse gas abatement (see: www.csiro.au/partnerships/Global-Soil-Map.html).

Community-based forestry assists rural Vietnamese livelihoods



CSIRO has co-managed and created a community-based forest management system that provides sustainable livelihoods through agro-forestry while protecting the remaining native forests in remote regions of northern Vietnam. As a result of this research, four rural communities now own, manage and have responsibility for forest land. The outcome has been improved forest protection and elimination of illegal tree cutting. Farmers have also developed tree nurseries to diversify incomes (see: www.csiro.au/science/Indonesia-Vietnam-Sustainable-Plantations.html).

Sustainable Agriculture Flagship Roadmap

Theme	Short term 1–3 years	Medium term 4–9 years	Long term 10+ years
Reducing net greenhouse gas emissions while increasing storage of new carbon in our lands.	Assess mitigation practices and technologies in key industries, regions and systems.	Develop 'breakthrough' mitigation practices and technologies.	Profitable agricultural practices that contribute to greenhouse gas abatement are adopted by land managers.
	Develop greenhouse gas measurement, accounting and bio-sequestration support packages.	Total system greenhouse gas outcomes for different management, history, climate and soil combinations quantified with defined uncertainty and co-benefit assessment.	New carbon sinks created giving net increase in carbon sequestration with environmental and production benefits.
	Support national policy decisions and international frameworks on land use management for carbon storage and greenhouse gas mitigation.	Conduit for science and integration for industry and government.	National dialogue, policy and action are informed by robust science.
Advancing agricultural productivity and environmental health.	Identify challenges and prospects for food and fibre productivity increases in key industries, regions and systems.	Direct links between genetics, breeding and farming systems research underpin accelerated improvements in food and fibre productivity.	Step-change in productivity achieved via industry adoption of agro-ecological innovations for 'smart' food and fibre production systems.
	Characterise resource and labour-use, soil and water constraints to sustained productivity.	Integrated whole-farm analyses support diverse sustainable enterprise options for efficient resource management.	More sustainable production practices adopted with gap between farm and benchmark resources-use efficiency significantly narrowed.
	Evaluate agro-ecological tradeoffs in farming systems for potential to improve productivity and natural resource management outcomes.	Assess environmental impacts of emerging productivity and mitigation practices, technologies and policies.	New markets developed and in use for effective on-farm environmental and biodiversity stewardship schemes.
Informing land use planning, policy and natural resource management.	Observation of current status and historic change in key land management drivers.	Develop life-cycle based sustainability assessments for agri-food value chains.	Multi-scale temporal assessment of land use change.
	Enhance national soil and terrain data systems.	Triple bottom line modelling framework for land use systems.	International system for forest and carbon tracking.
Addressing global food and fibre security challenges through partners at home and abroad.	Deliver enhanced science and impact via an integrated approach to international project portfolio.	Deepen partnerships with international R&D institutions leading to enhanced capacity building.	Monitoring and evaluation confirm realised sustainable livelihood benefits in target regions.

▲
Current position

Water for a Healthy Country Flagship

Flagship goal: To provide Australia with solutions for water resource management, creating economic gains of \$3 billion per annum by 2030, while protecting or restoring our major water ecosystems.

Overview

The Water for a Healthy Country Flagship is addressing one of Australia's most pressing natural resource issues, the sustainable management of our water resources. The Flagship is Australia's largest research partnership focused on water in Australia. As demand for water increases, climate changes, and as economically and environmentally viable storage sites dwindle, Australia is looking to new strategies that manage demand, increase efficiency, re-use wastewater and allow water to be traded. Our science is informing the decisions on where and how to best invest in these options and is providing enabling technologies.

CSIRO's research is informing some of the major water policies and strategies at national and regional scales including the National Water Initiative, the Reef Water Quality Protection Plan, the Living Murray Initiative, the Water for the Future Program and the Murray-Darling Basin Plan.

Achievements 2010–11

Seasonal streamflow forecasts help manage water



Using CSIRO research, the Bureau of Meteorology has launched an online seasonal streamflow forecasting service. It will give water managers and planners a better idea of how much water is expected to flow into selected rivers and catchments up to three months ahead, allowing them to plan for irrigation or potentially mitigate floods. The forecasting service has been developed for 13 river sites and eight storages

in the south-east Murray-Darling Basin and will gradually expand to other locations in Australia over the next 12 to 24 months.

Changing climate in south-eastern Australia



Despite recent rainfalls on the east coast of Australia due to one of the strongest La Niña events on record, the findings of the South Eastern Australian Climate Initiative (SEACI) indicate long-term, below-average rainfall and runoff into streams, and drier conditions into the future in south-eastern Australia. Results from the SEACI are being used by water managers to make decisions about future water use and planning

and the research is being used in Victoria's approach to regional water planning including the Northern Victorian Sustainable Water Strategy.

Reducing the cost of desalination



In desalination, membranes are used as a barrier to separate unwanted particles including salt, organisms and other substances from the water. However, pollutants can foul membranes by attaching themselves to the membrane surface, blocking membrane pores and decreasing water flow. This reduces the life of the membrane and increases treatment costs. Coagulants are commonly used to prevent this occurring. CSIRO has developed a new coagulant that is more effective than conventional coagulants in ensuring residual pollutants do not attach to membranes, thereby reducing fouling. As membrane replacement, cleaning and use account for up to 70 per cent of operation and maintenance costs. The coagulant designed by CSIRO will deliver significant cost savings to desalination treatment plants.

Assessing water availability in major water systems



CSIRO has undertaken a comprehensive scientific assessment of current and future water availability in four major water regions across Australia: the Murray-Darling Basin, northern Australia, south-west Western Australia and Tasmania. The results are being used by governments and water managers to make decisions about future developments for these regions, including decisions on new irrigation schemes. The updated modelling for the Murray-Darling project has been used in developing the Basin Plan. In late 2010, CSIRO began assessing the water resources of the Great Artesian Basin, which underlies about one-fifth of the Australian continent.

Water for a Healthy Country Flagship Roadmap

Theme	Short term 1–3 years	Medium term 4–9 years	Long term 10+ years	
Urban water	Develop new tools and technologies for sustainable integrated management of water systems and infrastructure from city/regional to household level.	Inform state and national urban water policy through applied research of integrated urban water systems technologies.	Decision support systems, system performance knowledge, and new water management technologies to plan and deliver sustainable integrated urban water services.	To provide socially acceptable, affordable environmentally beneficial management solutions for Australia's urban water systems.
Integrated water information systems	In partnership with the Bureau of Meteorology, develop water reporting and forecasting tools. Develop sensor networks to improve real-time monitoring.	Enable water information interoperability through research investments in standards development, web service integration, semantic web and model interoperability.	Widely accessible national water information network based on open standards. Reporting and forecasting tools used in water demand regions.	Establish the platform for an Australia-wide network of integrated water information systems that deliver water accounts, assessments and forecasts.
Healthy water ecosystems	Establish a network of integrated models and evaluation tools and embed these in the adaptive management of high priority water ecosystems.	Inland and coastal water ecosystems managed through the use of integrated knowledge platforms.	Significantly reduced long-term impacts of pollutants and changed flow regimes in priority water ecosystems.	To provide the knowledge to protect or restore Australia's major water ecosystems while enabling sustainable use of water resources.
Regional water	Enable water savings in irrigation systems, and establish improved water efficiency and sustainability through improved surface and ground water management options.	Develop options for improved institutional water use arrangements and evaluation of their economic, social and environmental consequences.	Achieve greater water supply certainty, enhanced substitution options, and improved productivity through integrated management of river basins and aquifers.	To provide systems knowledge and analysis tools for river basins and aquifers to ensure water security for all users.

Current position

Wealth from Oceans Flagship

Flagship goal: To provide Australia with the knowledge and tools to protect coastal and ocean environments, increase their value to society and create a net economic benefit of \$3 billion per annum by 2020.

Overview

CSIRO's Wealth from Oceans Flagship focuses on understanding Australia's oceans and their biodiversity, resources and relationships with the climate system. The Flagship delivers practical science that enables governments, industries and communities to make informed decisions about the sustainable management of marine and coastal resources. It provides CSIRO's contribution towards national challenges where oceans play a central role.

The Flagship's core partners are government – federal, state and local – where our science informs policy development and assists policy implementation across various sectors, such as oceans, environment, energy, fisheries and tourism. The Flagship also partners with industry and national and international universities, and participates in global collaborations such as the Census of Marine Life and the Global Ocean Biodiversity Initiative.

During 2010–11, the Flagship has been working to refocus its science strategy, resulting in new goals for each of the Flagship's themes. This new direction will see CSIRO lead a transformation in ocean information management, which will enhance Australia's capacity to address national ocean-related information challenges and opportunities. Implementation of this ambitious initiative will commence in 2011–12.

Achievements 2010–11

One year on from the Gulf of Mexico oil spill



In May 2010, CSIRO scientists were deployed to the Gulf of Mexico to help monitor a massive oil spill. Using our prototype hydrocarbon sensor array to map the location and movement of the oil, CSIRO provided United States authorities with information about the quality of surface waters, which is helping them make important decisions about fisheries. Engaged by BP, the CSIRO team surveyed more than 8,000 nautical miles (see case study page 73).

First broad-scale maps of life on the sea-shelf



Marine scientists from five research agencies have compiled a directory of life on Australia's continental shelf. The new maps of biodiversity are guiding marine bioregional planning and the design and monitoring of marine reserves. The Commonwealth Environment Research Facilities Marine Biodiversity Hub mapped 1,868 square kilometres of seabed with multibeam sonar, recorded 171 km of underwater video, and collected nearly 1,000 samples. New statistical modelling approaches predicted and mapped biodiversity across two million square kilometres from survey records dating back to the 1960s. The maps highlight complex patterns of biodiversity and emphasise how much remains unknown.

The Census of Marine Life



For the past decade a network of 2,700 scientists in more than 80 nations has been involved in the world's first comprehensive stocktake of marine life in the global ocean. The Census of Marine Life was officially released on 4 October 2010. CSIRO contributed to the Australian section of the census along with the Australian Institute of Marine Science, museums, government agencies and universities. CSIRO played a significant role in the Australian section by developing approaches to predict life on the seabed and pioneering the genetic barcoding technique. Results of the census are already being used by government agencies to improve marine biodiversity management in Australia (see: www.coml.org).

Iceberg movements reveal new species of marine life



A CSIRO-led team of 40 Australian and international scientists visited east Antarctica after a 78-kilometre piece of Mertz Glacier tongue broke off, exposing a section of the Southern Ocean previously covered in hundred of metres of ice. Scientists deployed underwater cameras where the glacier tongue used to be. In addition to discovering new species of marine life, they found the salinity of the ocean around the glacier has decreased. Over time they hope to learn how this natural event will affect ocean currents and use that information to make predictions about climate change.

Robotic glider maps flood plume in Queensland



Research agencies joined together at short notice to track the massive flood plume that flowed from the Brisbane River in January 2011. Measurements from a robotic glider deployed by CSIRO were used to generate three-dimensional maps illustrating the impacts of the flooding. Initial results showed that flood waters travelled mostly northwards with a layer of freshwater evident to a depth of more than ten metres in surface waters off Caloundra. The exercise led to an improved capacity to predict the impacts of flood events.

Wealth from Oceans Flagship Roadmap¹

Theme	Short term 1–3 years	Medium term 4–9 years	Long term 10+ years
The dynamic ocean	Synoptic forecasting system for major marine industries delivered (BLUElink 3).	Deliver littoral zone forecasting system for defence and industry applications.	National, seamless near-real ocean prediction and forecasting system operationalised.
Our resilient coastal Australia	Coastal management strategy evaluation system implemented and operational in three regions nationally.	Integrated observation modelling and visualisation system (eReefs) guiding management of the Great Barrier Reef Marine Park.	National shelf-scale hydrodynamic model (BROWNlink) nationally implemented and used for oceanographic services.
Sustainable ocean ecosystems and living resources	CSIRO R&D underpinning marine bioregional plans and National Representative System of Marine Protected Areas.	Adoption of CSIRO marine incident emergency response system.	Operationalisation of a National Ocean and Coastal Information System, as part of Australia's National Environmental Information System.

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Current position

¹ As a result of the Flagship's impact review in 2010 – which found that the existing goal had been largely achieved – the Flagship has been working to refocus its science strategy, resulting in new goals for each of the Flagship's themes. Direct comparison of theme progress against last year's roadmap is therefore not possible.

Program 2 – Core Research and Services

Core Research and Services – objectives and deliverables

CSIRO's Core Research and Services Program covers a range of non-Flagship research portfolios which target improvements in industry, the environment and community wellbeing through the provision of advice, information and solutions.

In 2010–11, CSIRO's five Research Groups managed twelve such portfolios that delivered new and improved technologies, management systems, intermediate and final products, catalyst services for business, advice relevant to policy development, and new knowledge and skills. These twelve portfolios accounted for 44 per cent of total resources. The Research Groups are

also responsible for the development and nurturing of research capability, ensuring the excellence of CSIRO's science and its relevance to current and emerging needs.

The work and achievements of each Research Group is showcased on pages 52–61.

Core Research and Services – Program performance

The performance of CSIRO's Core Research and Services Program is assessed through four performance indicators. Table 3.3 provides a summary of progress. More detailed analysis and trend data are provided where indicated.

Table 3.3: Performance indicators for Program 2 – Core Research and Services

Key performance indicator	Target	Performance
Demonstrated adoption and impact of Research Group outputs.	Growing economic, social, environmental and intangible benefits	Recent achievements from each of the five Research Groups are reported on pages 52–61.
The number of refereed publications.	Maintain or increase	The number of journal articles produced by CSIRO increased by five per cent from 2,542 in 2009 to 2,679 in 2010. However, the total number of publications fell by 11 per cent from 4,659 to 4,140. See page 51 for details.
Customer satisfaction.	Maintain	Implementation of a formal customer satisfaction measurement program that had been planned for 2010–11 has been re-prioritised and deferred to 2011–12. See page 27 for details.
Proportion of research capabilities rated as benchmark or strong.	Maintain or increase	There was a small increase in the proportion of capabilities rated 'benchmark' or 'strong' in Round Two assessments compared with Round One. See page 11 for details.

Number of refereed publications

The nature of the Organisation's matrix structure means all publications by CSIRO Divisions are accounted for in Program 2 – Core Research and Services, and a subset is attributed to the National Research Flagships Program (see page 26). Table 3.4 shows the number of publications, by type, produced by CSIRO, for the past five years.

Table 3.4: CSIRO publications by type

Publication type ¹	2006	2007	2008	2009	2010
Journal articles	2,198	2,239	2,542	2,542	2,679
Books/chapters	227	234	363	237	184
Conference papers	1,830	1,525	1,911	1,664	1,034
Technical reports	676	613	145	216	243
Total	4,931	4,611	4,961	4,659	4,140

¹ See glossary page 205 for definition of publication types.

The total number of publications produced by CSIRO fell by 11 per cent in 2010, due to a fall in the number of conference papers and books/book chapters. Preliminary investigations suggest the decrease in conference papers is associated with the introduction of the new publication repository, ePublish and with an increased emphasis on producing journal articles rather than other types of publications (in line with recommendations from Divisional reviews). The number of journal articles increased by five per cent in 2010. The figures for 2010 are subject to revision.

The Thomson Reuters/ISI Essential Science Indicators database provides another view of CSIRO's publication performance. It shows a 12 per cent increase in the number of CSIRO-authored journal articles (based on a ten-year rolling total for journals indexed in the database). CSIRO is the eighth ranked

Australian institution in terms of journal articles and its world ranking is 185 of 4,381 institutions as at May 2011 (compared with 218 of 4,122 as at May 2010).

The new CSIRO strategy reaffirms the ongoing importance of scientific publications to the Organisation's future and we are committed to improving our performance in terms of quantity and quality across all publication types.

Energy¹

Research group aim: To develop and apply leading-edge energy research that reduces greenhouse gas emissions; ensures energy supply; maximises Australia's wealth from its energy resources; and derives increased, sustainable benefits from Australia's marine resources while ensuring conservation of our marine biodiversity and coastal habitats and settlements.

Overview

Australia is endowed with rich energy resources and a massive ocean territory. To help tackle Australia's energy and ocean opportunities and challenges, CSIRO is building nationally integrated carbon-pathways and ocean-management models. We are also working with industry, governments, the community and our research partners to demonstrate new low-emissions energy technologies that address unique Australian needs and advantages.

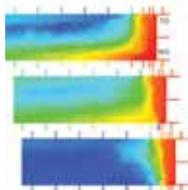
Our energy research portfolio aims to accelerate large-scale emission cuts while ensuring a smooth transition to a prosperous, low-carbon future. It covers emerging stationary and transport energy technology options including solar, geothermal, smart grids, energy storage and biofuels.

Our research also emphasises the importance of cleaner fossil energy – coal, gas and oil – in providing energy security and wealth, as well as supporting and enabling the path towards a clean energy future.

CSIRO's ocean research seeks to understand ocean systems, processes, biodiversity, resources and technologies, and the ocean's role in driving the climate system. We take a whole-of-system approach to marine science, focusing on national challenges where oceans play a central role. We deliver data, knowledge, tools and approaches that directly support sustainable ocean and coastal management.

Achievements 2010–11

Extinguishing the danger of coal mine fires



Gas and fire in underground coal mines are significant safety hazards for the mining industry. To prevent coal from heating, gas must be drained from the mine and inert (non-reactive) gas strategically injected. This lowers oxygen concentrations (shown in red) limiting the possibility of heating and fire. CSIRO, in collaboration with the Australian coal industry, has improved gas drainage by 50 to 100 per cent in different coal mines. By implementing optimum strategies to make the atmosphere inert, miners' safety has been greatly increased.

First carbon capture in Queensland



Low-emissions coal research has reached an important milestone in Queensland with the first capture of carbon dioxide (CO₂) using post-combustion capture (PCC) technology. In partnership with Tarong Power Station, the CSIRO pilot plant has successfully demonstrated the technology and shown it can capture more than 85 per cent of CO₂ emissions from coal-fired power stations. The research has reduced the energy required for the PCC process by ten per cent, an important step towards making the technology more efficient and affordable.

¹ See Appendix 6, page 198 for the structure of each Research Group.

Cleaner, synthetic transport fuels



Industry, in collaboration with CSIRO, is creating cleaner synthetic transport fuels through Australia's first fully automated, around-the-clock, synthetic fuels research facility, SynCat. The new facility is developing less costly, more efficient processes with lower environmental impact, to convert natural gas, biomass and coal into liquid fuels. Reducing the costs and carbon footprint of these processes will provide Australia with an alternative to importing oil, increasing our energy security. These processes add value to our conventional and unconventional gas resources, while producing cleaner fuels.

Repairing subsea pipelines with PIPEASSURE™



CSIRO and PETRONAS, Malaysia's international oil and gas company, have developed and completed comprehensive laboratory testing on a new composite material that will rejuvenate damaged risers (vertical pipelines), reduce production downtime and enable industry to perform safer maintenance and repairs. The lightweight and flexible product that functions like a bandage, named PIPEASSURE™, can be applied to complex shapes and has been trialled in Malaysia to restore damaged risers on a remote petroleum platform.

Detecting oil in the Perth Basin



CSIRO has helped local exploration companies find evidence of former oil accumulations in the underexplored offshore northern Perth Basin. Using CSIRO's fluid inclusion and quantitative fluorescence techniques, researchers examined tiny droplets of oil trapped within mineral grains of rocks, giving clues for oil exploration and drilling targets. This will greatly assist companies in their bids for recently released acreage and improve future success rates for oil discoveries in the Perth Basin.

Turning methane emissions into energy



CSIRO's Ventilation Air Methane Catalytic Turbine (VAMCAT) technology can capture and burn fugitive methane emissions from underground mining operations and harness them as an energy source. A 25 kilowatt prototype unit has been tested successfully in CSIRO laboratories and is being installed at a coal mine in China for a series of field trials. CSIRO is leading research into increasing the accuracy of measuring fugitive methane emissions and their contribution to Australia's greenhouse footprint.

Environment¹

Research group aim: To develop and apply leading-edge environmental research that will underpin the economic, environmental and social future of Australia.

Overview

Australians have stewardship of a beautiful, diverse and unique environment. The cumulative consequences of the last 200 years of development of natural resources leave us with a legacy of environmental challenges. The future of Australia, the Asia-Pacific region, and indeed the whole world, is also being re-shaped by the forces of climate change and variability, natural resource quality and security, technological revolution, trade reform, poverty alleviation and national security concerns.

CSIRO's response to these challenges and opportunities involves the application of enhanced systems understanding as well as the development and deployment of new technologies, processes and services. CSIRO's Environment Group is doing this by boosting our understanding of the operation and interaction of entire ecosystems, regional economies, and societies. We aim to deliver the highest quality scientific research that will result in a more internationally competitive and sustainable Australia.

Achievements 2010–11

Latest climate change information captured in new CSIRO book



Climate Change: Science and Solutions for Australia highlights the importance of climate change as a matter of significant economic, environmental and social concern in Australia. The new book from CSIRO draws on the latest peer-reviewed literature contributed by thousands of researchers in Australia and internationally. It provides a bridge from the peer-reviewed scientific literature to a broader audience of society, while providing the depth of science that this complex issue demands. It provides the latest information

on climate change science and potential adaptation and mitigation responses in non-technical language. *Climate Change: Science and Solutions for Australia* can be downloaded for free at: www.csiro.au/Climate-Change-Book.

Testing air quality in Australian homes



A CSIRO study of the quality of air inside the typical Australian home is the most comprehensive examination to date of air pollutants in Australian houses. Fine particles, carbon monoxide, carbon dioxide, formaldehyde, benzene, nitrogen dioxide, ozone, fungi and mould were measured inside and outside 40 Melbourne households.

There were no surprise results in the study, which reflects the way Australians live – how we cook and warm the home, the cleaning agents, building materials and finishes in the home, and the proximity to roadways and parklands. The project establishes a benchmark against which future changes in the mix of chemicals and pollutants can be measured, and can improve house design and air flow-through.

¹ See Appendix 6, page 198 for the structure of each Research Group.

Old diving tank air extends greenhouse gas record



CSIRO maintains an archive at its Melbourne laboratory of air collected at the Australian Bureau of Meteorology's site at Cape Grim in Tasmania. The Cape Grim Air Archive, from which CSIRO has produced the longest direct record of greenhouse gases in the Southern Hemisphere, dates from 1978 to the present. This record has been extended back to 1968 using a recent find of a very old air sample contained in a long-disused SCUBA compressed air tank. Analysis of the air sample has generated new trace gas data on aerosol propellants, refrigerants and aluminium smelter emissions present in the global background atmosphere of 1968, but not widely used

in Melbourne at that time. Following publicity about the new air source several people contacted CSIRO offering old containers sealed with air.

Investigating Asian bee threat



CSIRO-led research is investigating the scale of the threat posed by Asian honeybees and associated varroa mites. Scientists are studying whether a new deadly strain of varroa mite that has jumped from Asian to European honeybees in Papua New Guinea could also enter Australia on new incursions of Asian Bees. So far Asian honeybee outbreaks in Australia have been free of varroa mites. If bees carrying this new mite break into Australia they will decimate wild and managed populations of

European honeybees and significantly affect growers of crops such as almonds, stone fruit, avocados, pumpkins and melons which rely on managed-honeybee pollination.

Identifying exotic pests through new technologies



New digital technologies have been developed by CSIRO and partners to enable the easy, rapid identification of damaging exotic pests and diseases such as mealy bugs or myrtle rust. Users are able to access our network of experts by utilising existing hand-held microscopes and new mobile devices to make identifications. The technology is a leap forward for Australia's efforts to rapidly identify and respond to exotic

pests and diseases, potentially reducing the need to implement expensive eradication and control programs.

The Atlas of Living Australia engages citizen scientists



The Atlas of Living Australia is a national initiative focused on making biodiversity information about Australian species more discoverable and useable online. The Atlas has developed its core tools in support of research, policy and management and will continue to develop more tools and datasets, improve the existing tools and complete key projects. By June 2012, the Atlas will deliver the most comprehensive, current and authoritative checklist of Australian species ever produced. It is collaborating

with 60 biological collections around Australia to digitise and mobilise their information. In addition, the Atlas has developed software to enable citizen scientists to record, share and analyse sightings of species.

Food, Health and Life Science Industries¹

Research group aim: To achieve outcomes for Australia along the value chain of food and fibre production, from 'paddock to plate', for economic, social and environmental benefits. The Group strives for excellence in animal, plant and microbial sciences to deliver profound impact in agriculture, food, health and the environment.

Overview

The problems and issues facing Australia and the world are directing our research focus towards science-based solutions for major global challenges such as food security, increased agricultural productivity and sustainability, human disease prevention, biosecurity and the development of sustainable sources of energy and bio-materials.

Through the application of our life sciences research capability across CSIRO, the Group is delivering key outcomes in four important areas for Australia and the world.

We are significantly and sustainably enhancing food and agricultural yield and productivity in the face of increasing constraints on natural resources and carbon. Our research is helping improve the health and wellbeing of Australians throughout life via the prevention, early detection and treatment of serious diseases, combined with comprehensive modelling of the health system. We are also creating an inclusive and integrated national biosecurity system to respond to new challenges from increasing global interconnectivity, open access trade and climate change.

In the course of achieving these outcomes, our fourth goal is to enhance Australia's economy by building new industries based on the life sciences and increasing the competitiveness of existing industries in this domain.

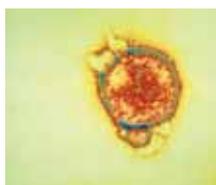
Achievements 2010–11

The low methane Tammar wallaby



CSIRO scientists have discovered gut microbes unique to Australia's Tammar wallaby that may be responsible for its remarkable 'low methane' digestion of plant material. Compared with cattle and sheep, Australian kangaroos and wallabies produce very little of the greenhouse gas methane when digesting plants because they have fewer methane-producing microbes in their digestive system. One of the ultimate aims of this research is to help develop novel technologies that will enable agriculture to reduce its environmental footprint, while maintaining animal health and productivity.

Experimental vaccine stops Hendra virus in horses



Researchers at the Australian Animal Health Laboratory have shown that a new experimental vaccine will help protect horses against the deadly Hendra virus. Trials have found the vaccine prevents horses developing the disease, thereby reducing the likelihood of transmission to humans. A horse vaccine is crucial to breaking the cycle of Hendra virus transmission from flying foxes to horses to humans.

¹ See Appendix 6, page 198 for the structure of each Research Group.

Reducing production costs for the prune industry



The Australian prune industry is the first industry to benefit from CSIRO research that leads to a 60 per cent reduction in the energy required for prune processing. Using power sourced from solar and other alternative energy sources, combined with sophisticated computational modelling techniques, major environmental benefits and cost savings for food companies have been achieved. The techniques greatly reduce energy, money and greenhouse gas emissions while, at the same time, increase production rates. This work can be applied across a wide range of food and other processing industries.

Breeding the horns out of cattle



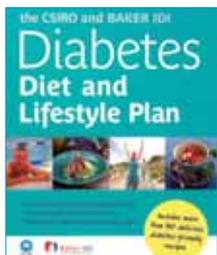
CSIRO scientists discovered a genetic marker that has been developed into a new DNA test to help the cattle industry end the painful practice of dehorning beef cattle. Australian beef cattle are routinely dehorned to prevent major injuries caused by horns. However, this procedure is labour intensive and has implications for animal welfare. Under the leadership of the Beef Cooperative Research Centre, a DNA marker for the absence of horns, identified by CSIRO researchers, has been developed into a commercial test that has proved to be accurate in trials involving several Australian cattle breeds.

Genetic archetype of sheep revealed



An International Sheep Genomics Consortium, co-led by CSIRO, has revealed the genetic archetype, or reference genome for sheep. This will help scientists develop tools for breeding sheep with more efficient production of meat, milk and wool. The results will allow researchers to start answering the question ‘What makes a sheep a sheep and not a cow?’ The answer, from a genetic viewpoint, is not as obvious as it might first appear because sheep and cattle have very similar genomes.

Diabetes Diet and Lifestyle Plan



To assist Australians living with diabetes, CSIRO, the Baker IDI Heart and Diabetes Institute and Penguin Publishing have released a book covering every aspect of type 2 diabetes prevention and control. *The CSIRO and Baker IDI Diabetes Diet and Lifestyle Plan* explains what diabetes is, how people develop it and how its severity can be reduced. It also includes comprehensive plans to support a healthy lifestyle, expert advice on optimal diets and ideas for increased physical activity.

Controlling when grapes ripen



CSIRO has discovered a way to control when grapes ripen without affecting wine style. Grapes are ripening earlier and the harvest season is becoming shorter, possibly due to climate change. This causes wineries considerable difficulty in accurately scheduling harvest time to maximise the wine-making potential of some grape varieties. By applying particular plant-growth regulators, berry ripening can be delayed to enable more timely and cost-efficient harvesting.

Information Sciences¹

Research group aim: To work with partners to solve national challenges, drive the productivity of Australian industries, and deliver public good outcomes through the innovative application of mathematical, statistical, information and communication sciences and technologies, and to build Australia's role in developing the next generation of space sciences.

Overview

The Information Sciences Group contains the core of CSIRO's research focus in the data-intensive sciences and services. It provides Australia with world-class capabilities in Information and Communication Technologies (ICT), mathematical sciences, and astronomy and spacecraft tracking that are deployed through a collaborative partnering approach. The Group plays a key role in enabling CSIRO's multidisciplinary science across Flagship programs and other portfolios.

The Group is the national leader for e-enabling scientific research endeavours through a data-intensive approach. Through implementation of the eResearch Strategy, the way we conduct research at CSIRO is changing, enabling researchers to actively collaborate and share resources globally, and engage in cross-disciplinary research. The eResearch strategy supports research tackling 'big science' challenges and associated data management requirements.

The Group operates world-class national facilities in astronomy and spacecraft tracking on behalf of the Australian Government.

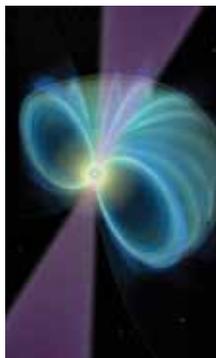
Achievements 2010–11

Wireless broadband for rural Australia



CSIRO is developing wireless broadband technology for people living in rural and regional Australia. CSIRO's Ngarra technology aims to bring wireless broadband access to people living beyond Australia's planned fibre network using existing broadcasting infrastructure, such as that left behind after the switch-over to digital TV. The technology uses devices attached to existing broadcasting towers and slightly modified ordinary TV antennas to 'beam' broadband to and from homes, offering people in the bush the benefits of 21st century services. It can operate using barely a quarter of the number of transmission towers required by current systems.

Astronomers unravel how pulsars work



CSIRO and international colleagues are close to solving a 30-year-old puzzle as to why 'cosmic clocks' called pulsars are not perfect. Pulsars are small spinning stars that emit a beam of radio waves and are often used as clocks given their highly regular rotation. When the beam sweeps over the Earth we detect a 'pulse' of radio waves. Scientists observed 366 pulsars over several decades and found that a pulsar's magnetosphere (its 'cocoon' of magnetic fields) switches back and forth between two different states, subtly affecting the pulsar spin.

Armed with this understanding, astronomers will find it easier to compensate for errors in their pulsar 'clocks' when used as tools – for instance, in trying to detect gravitational waves.

¹ See Appendix 6, page 198 for the structure of each Research group.

Improving communication for animal disease experts



Responding to outbreaks of deadly animal-borne diseases is now quicker and easier with new CSIRO-developed technology. Installed at the Australian Animal Health Laboratory in Geelong, Victoria, the interactive system provides high-definition video conferencing and a shared workspace that offers secure, real-time access to critical technology such as microscopy, pathology and software applications. The

technology allows disease experts both inside and outside a high security biocontainment area to work in real-time with chief veterinary officers across Australia.

This will greatly improve the management of emergency animal disease outbreaks in Australia.

Exercising while playing computer games



CSIRO has developed software that aims to encourage children to be more active when playing computer games. It works by exploiting the children's desire to win. Using the game 'Neverball', that is usually played sitting down, players must guide a ball through a maze within a time limit. Researchers modified the game by shortening the time allowed and making players get up and jump around before being able to proceed to the next level. Every jump earns a second of game time.

Modified and unmodified versions of the game were tested on 270 primary school children, and found that children playing modified games spent 25 per cent of their gaming time being active, whereas those playing unmodified games were active for just three per cent of the time. Physical activity is an essential part of a healthy lifestyle, and CSIRO is now investigating if programs such as this can improve children's health.

Helping Centrelink respond to customer needs



CSIRO is developing sophisticated technologies to help Australia's largest human services provider Centrelink understand and respond to trends in demand for social worker services. Figuring out how and where to invest social worker resources is difficult. Not only are there huge demands, but as customers' needs change over time, resource allocation must

also change in response to where services are needed most. The project will allow early detection of unexpected increases or decreases in demand for social worker services, identify where current services are not meeting needs, and help Centrelink respond to changing issues and demographics of customers.

Manufacturing, Materials and Minerals¹

Research group aim: To help grow Australia's wealth by fostering increased efficiency and supporting business and job creation in an environmentally and socially responsible manner.

Overview

The focus of the Manufacturing, Materials and Minerals Group is to assist industry become more sustainable. We innovate in partnership with local and multinational organisations to deliver technologies, products and processes for their sustainable competitive advantage. We work with companies in aerospace, automotive, renewable energy, defence, textiles, building infrastructure, health, chemicals, plastics, packaging, mineral exploration, mining, mineral processing, and metals production market segments.

The Group delivers major initiatives in: sustainable and fibrous materials; flexible electronics and advanced engineered components; innovative technologies for advanced mineral processing; mineral exploration; improvements to mining productivity; systems innovation; and works across the entire light metals value chain from aluminium, titanium and magnesium production to manufactured products and components.

The Group's research will deliver economic benefits including the development of new and improved products processes and services, new companies and employment opportunities; environmental benefits as we create new products and services which have a lighter environmental footprint; and social benefits through increased employment and wealth creation for Australia.

Achievements 2010–11

LANDTEM™ finding difficult-to-detect ores across the globe



LANDTEM™, is a portable exploration tool that uses highly sensitive magnetic sensors known as SQUIDS (Superconducting Quantum Interference Devices). Licensed to Australian start-up company Outer-Rim Exploration Services, the LANDTEM™ system enables the minerals industry to 'see through the ground' in search of the next generation of resources to underpin the future of our minerals industry. It represents a major innovation in our ability to unearth mineral deposits worth hundreds of millions

of dollars. In the past eight years, ten LANDTEM™ systems have been built and deployed successfully on four continents helping to unearth around \$6 billion of new mines worldwide. The underpinning SQUIDS technology has been applied to oceanography, security and defence applications, and is a great example of science teams working across boundaries to deliver impact to multiple industry sectors.

¹ See Appendix 6, page 198 for the structure of each Research Group.

Repairing flood damaged buildings



In response to the 2011 floods in Australia, CSIRO developed extensive documents and interactive tools to provide information and advice to the Australian public dealing with flood damaged buildings. Information on the effects on different building materials and how they should be repaired was widely referenced and republished throughout the national media. Details about extreme weather events and the causes and impacts of floods and tropical cyclones formed part of the rich package of information.

GE-CSIRO Research Alliance



GE and CSIRO have signed a \$20 million strategic Research Alliance that will allow the organisations to benefit from complementary capabilities and achieve mutual long-term objectives. The alliance, which is a five-year commitment to collaborative research and development, will include projects around the key themes of energy, healthcare, materials and water. The partnership with GE will link CSIRO to the global innovation system, position Australia as a development market for new innovations with global potential and will enable CSIRO to create impact both within Australia and on a global scale.

International Centre of Excellence to open in Chile



CSIRO has been selected by the Chilean Government to develop the *International Centre of Excellence in Mining and Minerals Processing*. The world-class centre will address current and future challenges common to both the Australian and Chilean mineral industries, including processing lower grade and complex ores, improving mining safety and efficiency and reducing energy and water use. It will also tackle the chronic global skills shortage by opening up postgraduate training opportunities and it will support greater linkages between the vital mining equipment, technology and services sectors.

Program 3 – Science Outreach: Education and Scientific Publishing

Science Outreach – objectives and deliverables

Communicating scientific research helps raise the profile of science and CSIRO within the community. CSIRO conducts a range of science education programs for primary and secondary school students and their teachers and the public, and hosts the CSIRO Discovery Centre in Canberra.

CSIRO operates **CSIRO PUBLISHING** as an independent science and technology publisher with a global reputation for quality products and services covering a wide range of scientific disciplines, including agriculture, chemistry, the plant and animal sciences, and environmental management. **CSIRO PUBLISHING** operates within CSIRO on a commercial basis on behalf of authors and customers in Australia and overseas.

CSIRO also runs an honours and postgraduate scholarship program which provides opportunities in science and engineering for outstanding graduates who enrol at Australian tertiary institutions as full-time postgraduate students for research leading to the award of a PhD. PhD students at CSIRO are co-supervised by a university, allowing students to maintain and develop their university connections while being exposed to research in a working environment. The number of students fluctuates due to uneven intakes each year and a reduction in student numbers is often seen when a cohort moves through the program (see Table 3.5).

Some CSIRO Divisions have collaborative arrangements with universities to foster PhD studies in particular areas – for example, CSIRO Marine and Atmospheric Research and the University of Tasmania run a joint PhD Program.

Table 3.5: Science outreach – CSIRO's postgraduate students

	2006–07	2007–08	2008–09	2009–10	2010–11
Sponsored postgraduates^(a)					
PhD	256	241	338	375	333
Masters	4	18	9	13	24
Honours	16	13	17	25	19
Total	276	272	364	413	376^(b)
Supervised postgraduates^(a)					
PhD	582	523	629	733	655
Masters	31	48	56	47	59
Honours	61	63	58	60	77
Total	674	634	743	840	791
Postdoctoral Fellows					
	294	301	304	330	333

^(a) As at 31 May each year. A student may be either sponsored, supervised or both. The total number of individual students sponsored and/or supervised as at 31 May 2011 was 815, including more than 53 supervised in collaboration with CRCs and 57 through the Flagship Collaboration Fund. See glossary page 205 for definition of sponsorship and supervision.

^(b) Includes 121 students fully sponsored and 255 students partially sponsored by CSIRO.

Science Outreach – Program performance

The performance of CSIRO's Science Outreach Program is assessed through six performance indicators. Table 3.6 provides a summary of progress. More detailed analysis and trend data follow the Table.

Table 3.6: Performance indicators for Program 3 – Science Outreach

Key performance indicator	Target	Performance
Utilisation of science outreach programs.	Increasing	Overall participation in CSIRO Education Programs increased. The Canberra Deep Space Communication Complex and the CSIRO Parkes radio telescope continue to attract large numbers of visitors.
Awareness of science by CSIRO stakeholders.	Increasing	Data not available. ¹
Success of participants in the Science Outreach Programs.	Evidence of success	Independent evaluations and surveys confirm the success of CSIRO's Science Outreach Programs and visitor centres.
International reach and impact of published journals.	Increase	International submissions increased by 15 per cent and global readers downloaded over 2.6 million papers. Journal impact factors as measured by the Institute for Scientific Information are generally increasing.
New book titles.	50	48 new book titles were published during the year.
Net profit from CSIRO PUBLISHING .	Positive	A net profit of \$624,000 was delivered.

¹ The community awareness survey was not undertaken in 2010–11.

Utilisation of science outreach programs

CSIRO Education continues to offer a range of valued programs to teachers and students. Table 3.7 shows there was a small increase in the number of visitors to CSIRO's Science Education Centres and Science by Email continued

to increase its readership. In 2010, the Maths by Email program was launched, with the number of subscribers reaching 9,255 by December 2010. The Scientists in Schools program reached 1,850 teacher-scientist partnerships and the number of Mathematicians in Schools partnerships reached 163. *SCOPE*, the national weekly science TV program broadcast on Saturday

mornings, continues to reach an increasing number of viewers. However, participation in the Double Helix Science Club dropped by 20 per cent. A new program of promotion is being undertaken to address decline in membership. After the success of the pilot program reported last year, CarbonKids gained funding to expand its reach.

CSIRO's Discovery Centre had great success with their National Science Week event, 'The Canberra Family Science Spectacular', which drew 11,000 guests in three days. The national science film festival SCINEMA, run by CSIRO Discovery, played to an audience of 30,000 at 300 venues across Australia. The SCINEMA Jury awarded the Festival's Directors Award to *Honeybee Blues*, a film which highlighted the work of CSIRO's Denis Anderson.

The Canberra Deep Space Communication Complex (CDSCC) has attracted significant public and education interest in a year highlighted by significant space exploration activities and the expansion of the Complex which has new antennas under construction. The complex welcomed over 70,000 visitors, including a record 12,000 school students and the CDSCC Space Open Day was well attended by the public.

The CSIRO Parkes radio telescope remains extremely popular with visitors. Visitor experience has been improved through the installation of a new astronomy and space science exhibition and increase in summer vacation student presentations. The Pulse@Parkes program allowed 200 high school students to observe pulsars using the Parkes telescope remotely. The program increased its international reach with twenty students in the Netherlands participating.

Table 3.7: Science outreach

Program	2006	2007	2008	2009	2010
CSIRO Education Programs					
CSIRO Science Education Centres (visitors)	369,919	383,499	390,947	386,500	389,287
CSIRO Discovery Centre (visitors)	60,581	73,772	80,555	94,365	100,920
Double Helix Science Club (members)	18,945	19,545	20,253	19,656	15,821
Science by Email (subscribers)	20,689	28,516	29,560	34,933	38,156
Maths by Email* (subscribers)					9,255
Creativity in Science and Technology (CREST) (participants)	6,509	5,999	8,355	8,801	9,668
BHP Billiton Science Awards (participants)	2,677	4,103	2,568	3,114	3,658
Other Visitor Centres					
Parkes radio telescope (visitors)	94,305	104,783	92,369	112,342	95,104
Canberra Deep Space Communication Complex (visitors)	65,467	62,162	67,538	67,582	70,044

* Launched in 2010

Awareness of science by CSIRO stakeholders

No formal survey of community awareness was undertaken in the reporting year. However, CSIRO continues to reach a wider audience through its expanding online presence.

Podcast downloads increased by over 40 per cent with CSIROpod holding the number one spot in the iTunes Natural Science category on more than one occasion. Downloads of CSIRO's video podcasts 'CSIROvod' also increased by 63 per cent and for the first time, captured the number one position on iTunes in the Natural Sciences video podcast category in June.

CSIRO expanded its social media portfolio to include a Twitter account, @csironews, which attracted 3,028 followers by June 2011.

Fans of CSIRO's Facebook Fan page increased by 136 per cent. During the year, CSIRO launched the inaugural Titanium Challenge, which aimed to engage fans in understanding titanium, additive manufacturing and CSIRO's titanium research (see case study on page 107).

CSIRO added 20 videos to its YouTube channel and views of its channel increased by 58 per cent.

Evidence of success in the Science Outreach Programs

CSIRO uses a variety of methods to demonstrate the success of its Science Outreach Programs, including independent evaluations and surveys. An external evaluation of Maths by Email was highly complimentary of the difference it was making to students in its target 9–12 age group. An evaluation of Science by Email is underway. Reader surveys are regularly undertaken of *The Helix* and *Scientrific*

magazines with content and style being modified in response. Two student finalists from the BHP Billiton Science Awards attended the Intel Science and Engineering Fair in the USA with one student receiving an award from the United States Patent and Trademark Office Society.

'[Maths by Email] is desperately needed and I am delighted to have it as a teaching tool. It gets kids interested in maths, as they still discuss its ideas and their findings outside the classroom!' Teacher

CSIRO's Discovery Centre supports science communication and education activities by promoting an understanding and appreciation of research. School children from every state and territory in Australia visit the centre – the number is growing annually, as many schools make multiple repeat visits. Discovery's unique and very popular 90 minute minds-on, hands-on program gives students an insight into CSIRO's work and the value of research to Australian society. During 2010–11, a major new exhibition was completed to showcase our research into functional foods.

'I love *The Helix*! It is a perfect way to see the many current science discoveries and science events. *The Helix* also has contests which is a great way to get kids excited about science. Plus all the experiments *The Helix* explains to everyone are great. Without *The Helix* I would be lost in science.' Cassidy, Double Helix Science Club member

Feedback from visitors to the CDSCC's Visitor Outreach Centre was positive regarding the exhibition, narrative and level of information provided. Schools were extremely eager to ensure they rebooked for future years.

Visitor experience at the CSIRO Parkes radio telescope improved through 2010. Visitor feedback collected in exit surveys highlighted the quality of the astronomy and space science exhibition, the science garden and the enthusiastic staff as the contributing factors. Visitors' comments included:

'Inspirational – leading edge information.'

'One of Australia's best kept secrets – truly inspiring.'

'Makes me proud to be Australian. Keep up the good work CSIRO.'

International reach and impact of published journals

The reach and impact for the 25 Journals published by **CSIRO PUBLISHING** in partnership with the Australian Academy of Science and other societies continues to grow. International submissions increased by 15 per cent and global readers downloaded over 2.6 million papers (see Table 3.8). The drive for quality was generally rewarded with positive impact factor trends, as measured by the Institute for Scientific Information. The market expectation that we should open our print archives was met with *AJ Biological Sciences* and *AJ Physics* archives dating from 1948 digitised and published under an open access model.

ECOS, CSIRO's 'science for a sustainable future' magazine shifted to a digital only magazine, enabling it to reach a wider audience in a more timely fashion and to open more quality content to a mainly Australian readership by digitising archives back to 1974.

Table 3.8: CSIRO PUBLISHING

	2006	2007	2008	2009	2010
CSIRO PUBLISHING journal (downloads)	1,143,573	1,432,024	1,686,320	2,092,283	2,633,703
<i>ECOS</i> story (downloads)	101,267	168,262	204,225	200,740	241,525

New book titles

Forty-eight new book titles were published, highlighted by *Climate Change: Science and Solutions for Australia* released in hard copy and as an open access eBook. Other key titles included *Capturing the Essence*, a book for artists, *Scientific Writing = Thinking in Words* and the critically acclaimed *Living Architecture: Living Roofs and Walls*. While eBook versions of new books are now standard practice, **CSIRO PUBLISHING** continued to digitise backlist, out-of-print titles with over 300 eBooks now available on a variety of platforms.

Net Profit from CSIRO PUBLISHING

The business was able to withstand market challenges including economic pressures faced by international research libraries and a strong Australian dollar that reduced export income. While revenue was down at \$10.3 million, the bottom line profit target of \$624,000 was achieved.

Scientists in Schools

It's not often that teachers and their students have the opportunity to use the latest technology when devising their experiments. But thanks to CSIRO's Scientists in Schools program, the staff and students at The Hutchins School in Hobart, Tasmania are using a CSIRO-developed sensor network to conduct research into plant water usage.

With CSIRO's assistance, Year 8 students set up a mini Sensor Web in a small plot of land at the school to measure soil water tension. The students developed a mobile telephone sensor network to read the water meters.

With the plot established, Years 11 and 12 environmental science students used the Sensor Web to monitor water usage. They measured how plants reacted to different soil moisture conditions and irrigation treatments in near real-time. They gained valuable insight into plant physiology, soil properties, the influence of weather/climate on evaporation-transpiration, and how sensor networks can help conserve water.

The environmental science teacher saw this as an invaluable opportunity to engage students in real-world science and capture their imagination by using emerging technology.

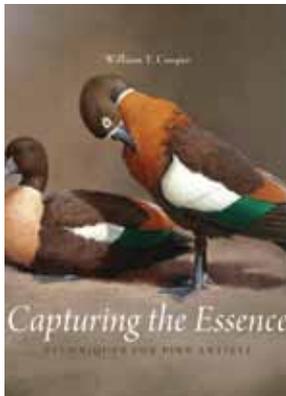
The Scientists in Schools program creates and supports long-term partnerships between scientists and teachers. It makes science appealing to students, especially those who are considering their career options. CSIRO also benefits from this deployment as it serves as another test bed for trialling its ideas.

Scientists interested in becoming involved can register at www.scientistsinschools.edu.au



Student from The Hutchins School examines the sensor technology. Credit: CSIRO

'I am keen to use this technology to reduce the school's ecological footprint....' Peter Crofts, teacher



ECOS, after 37 years of print, evolves to become an online magazine.

Cover design by James Kelly et al.

Capturing the Essence offers techniques for a broad audience of bird artists.

Cover design Andrew Weatherill based on artwork from William Cooper.

Climate Change: Science and Solutions for Australia reaches out to readers through hand-held devices. Credit: Robert Kerton. Cover design Andrew Weatherill using photos from Gregory Heath, Willem van Aken and Nick Pitsas.

Program 4 – National Research Infrastructure: National Facilities and Collections

National Research Infrastructure – objectives and deliverables

CSIRO manages two types of national research infrastructure on behalf of the nation; National Research Facilities and National Biological Collections. In addition, CSIRO hosts 30 other research facilities, such as the Australian Resources Research Centre (Perth) and the High Resolution Plant Phenomics Centre (Canberra) and over thirty national reference collections, including the National Tree Seed Collection, the National Soil Archive and the Cape Grim Air Archive.

National Research Facilities

CSIRO operates a range of specialised laboratories, scientific and testing equipment, and other research facilities which are available for use by both Australian and international researchers. The three major National Research Facilities, classified as landmark facilities, are:

- The Australian Animal Health Laboratory (AAHL)** – located in Geelong, Victoria, is a national centre of excellence in disease diagnosis, research and policy advice in animal health and human diseases of animal origin (zoonoses). It is Australia's front line defence, helping to protect Australia from the threat of these exotic and emerging animal diseases. In recent years, CSIRO has been managing engineering upgrades, the provision of expanded facilities to support the work in zoonotic diseases and expansion of new microscopy capability.
- The Australia Telescope National Facility (ATNF)** – operated and managed by CSIRO's Division of Astronomy and Space Science, is made up of radio telescopes at three observatories, near the towns of Parkes, Coonabarabran and Narrabri in New South Wales. A fourth telescope, the next generation Australian Square Kilometre Array Pathfinder (ASKAP) is currently being built at the Murchison Radio-astronomy Observatory in Western Australia and will consist of 36 antennas. Once fully complete, the ASKAP will also be operated by CSIRO as part of the Australia Telescope National Facility.
- The Marine National Facility (MNF)** – is made up of a 66 metre blue-water research vessel, *Southern Surveyor*, a package of unique scientific equipment and instrumentation, and a collection of 26 years of marine data. It has the scientific, technical and administrative expertise required to safely and effectively manage an ocean-going research platform. The *Southern Surveyor* is particularly suited to multidisciplinary research projects in the deep oceans surrounding Australia. CSIRO is managing a major project to design and build a new state-of-the-art research vessel, *Investigator*, to replace the *Southern Surveyor* and is scheduled to be operational in 2013.

National Biological Collections

CSIRO is the custodian of several collections of animal, plant, fungal and microbial specimens that contribute to the discovery, inventory, understanding and conservation of Australia's plant and animal biological diversity. These include the:

- Australian National Insect Collection (ANIC), specialising in Australian terrestrial invertebrates. The ANIC also supports a remote microscopy service to enable virtual identification of species for the Australian Quarantine Service.
- Australian National Wildlife Collection (ANWC), specialising in land vertebrates
- Australian National Fish Collection (ANFC), specialising in marine fishes
- Australian National Herbarium (ANH), specialising in native plants and weeds.

Together, these collections support an important part of the country's taxonomic, genetic, agricultural and ecological research. These vital resources provide correct identification of species for biosecurity, conservation and the development of sustainable land and marine management systems.

National Research Infrastructure – Program performance

The performance of CSIRO's National Research Infrastructure Program is assessed through seven key performance indicators. Table 3.9 provides a summary of progress. More detailed analysis and trend data follow the Table.

Table 3.9: Performance indicators for Program 4 – National Research Infrastructure

Key performance indicator	Target	Performance
Utilisation of the National Research Infrastructure.	Variable	Availability and use of the National Research Infrastructure by Australia and the international scientific community has been maintained at the target levels for National Research Facilities and increased for National Biological Collections.
Maintenance and operation of National Research Infrastructure.	International standard	Management arrangements are progressively being strengthened to ensure they continue to be maintained and operated to relevant international standards.

Key performance indicator	Target	Performance
Proportion of National Biological Collections digitised and available to the public.	Increase	The proportion of specimen level material digitised in the four collections is highly variable across collections and little changed from last year. Public availability has been enhanced with the launch of <i>The Atlas of Living Australia (ALA)</i> (see: www.ala.org.au), which provides open and free access to biodiversity data held by the collections.
Coverage of National Biological Collections.	Increase	The coverage of Australian species increased marginally in the year, with coverage of fish species increasing by five per cent.
Response to national events.	Timely response	AAHL continues to respond to national events in a timely manner. All 39,000 tests on 25,000 samples sent for diagnostic testing for exotic diseases were completed in 24 hours or less.
The AAHL Collaborative Biosecurity Research Facility.	Facility built and operated in accordance with the NCRIS*/CSIRO agreement.	The collaborative Biosecurity Research Facility was completed this year. However, hand over was delayed until June 2011, due to refinements and modifications to one of the main laboratories (the PC4 laboratory for microbiological containment).
Scientific contributions in support of research.	Demonstrated high-quality contributions.	CSIRO's National Research Infrastructure continues to provide significant support to Australian and international scientific communities. Achievements this year are described on pages 78–81.

* NCRIS is the National Collaborative Research Infrastructure Strategy.

Utilisation of National Research Infrastructure

Statistics relating to the use of the National Research Facilities are provided in Table 3.10. Use of the facilities has been relatively steady in recent years but is expected to increase as each expands its operation with the introduction of new laboratories for AAHL, new telescopes for ATNF and a new research vessel for MNF.

Table 3.10: Utilisation of National Research Facilities

Access to National Research Infrastructure	2008–09	2009–10	2010–11
Australian Animal Health Laboratory			
Hours operating per day	24	24	24
Days operating per week	7	7	7
Australia Telescope National Facility¹			
Time allocated to observations (%)	76	75.3	72.4
Time lost to equipment failure (%)	3	2.9	3.1
Time allocated to CSIRO staff (%)	20	24	24
Time allocated to other Australian researchers (%)	30	23	25
Time allocated to international researchers (%)	50	53	51
Marine National Facility			
Ship time grants (days)	99	177	158

¹ More information can be found in the ATNF's Annual Report (see: www.atnf.csiro.au/AR2010).

During the financial year, the **Australian Animal Health Laboratory** (AAHL) installed a new PC4 laboratory, which provides the highest level of microbiological containment. This additional laboratory will enable AAHL to undertake research on serious diseases that affect both animals and humans and for which there is no current vaccines or treatment, such as the Hendra virus, which can be fatal for both horses and humans.

Another new laboratory, the PC3 insectary, which is for use with animal or human pathogens that pose a medium risk to the environment, is expected to be operational in October 2011. This additional facility within AAHL will enable both diagnosis of and research into those emerging diseases transmitted by insects and that affect both animals and humans. For example, this year saw a significant increase in Murray Valley Encephalitis and Ross River Fever associated with heavy rains throughout eastern Australia. The facility will enhance our ability to both understand and respond

to such outbreaks. Work also continued on the development of a horse vaccine for the Hendra virus.

The **Australia Telescope National Facility** (ATNF) continues to be the most productive and powerful radio astronomy facility in the Southern hemisphere. Demand for its use from internationally prominent astronomers within and outside Australia remains high. The ATNF exceeded its target of 70 per cent of time allocated for astronomical observations on the Australia Telescope Compact Array and Parkes Telescope. Time lost during scheduled observations due to equipment failure was below five per cent. Performance targets were also met on the Mopra Telescope and Long Baseline Array.

The **Marine National Facility** (MNF) provided 158 days of ship time out of 240 days requested by scientists, and a further 11 research charter days. Participants included scientists from 29 Australian institutions including CSIRO, the University of Western



Tracking the Gulf of Mexico oil spill

CSIRO scientists have been playing an important role in monitoring the extent of the oil spill in the Gulf of Mexico. In May 2010, researchers from CSIRO's Wealth from Oceans Flagship were engaged by BP Exploration and Production Inc on behalf of the Unified Area Command (UAC), to help map the oil's location and movement.

A team of scientists worked around the clock using CSIRO's new hydrocarbon sensor array system to build a picture of the surface water's hydrocarbon composition. Researchers onboard the vessel *Ryan Chouest* surveyed over 8,000 nautical miles of surface waters in the Gulf, gathering data about the water conditions just below the slick.

The hydrocarbon sensor system detects and analyses different types of hydrocarbons, including oil and gas. The original application of the hydrocarbon sensor was for petroleum exploration. The deployment of the sensors to the Gulf is a new, innovative application that enables real-time environmental monitoring.

The data obtained helped BP and the UAC to better understand the movement of the oil and assisted them to make important decisions, such as when fisheries should be closed. It also provided the CSIRO team with the opportunity to trial their technology and systems in a real life scenario, while making a valuable contribution to understanding the surface water's hydrocarbon content and composition.

Preliminary results showed that the condition of the Gulf water was better than anticipated. Contamination was not as severe as first thought, and did not exceed the United States Environmental Protection Agency limits. The team is currently in the final stages of verifying the results.



CSIRO scientists taking oil mousse samples from a water hose used on the underway hydrocarbon sensor system. Credit: Andrew Ross, CSIRO

Australia, the South Australian Research and Development Institute, the Antarctic Climate and Ecosystem Cooperative Research Centre, the University of New South Wales, the Australian National University, the University of Sydney and the Bureau of Meteorology and collaborating scientists from institutions in Canada, France, Germany, New Zealand, South

Africa and the USA. The MNF fostered the development of next generation marine researchers by enabling 17 students to experience scientific work at sea.

Use of the **National Biological Collections** has increased over the last three years (see Table 3.11).

Table 3.11: Combined utilisation of National Biological Collections

Use of National Biological Collections	2008–09	2009–10	2010–11
Number of specimens dispatched	7,800	29,300	25,925
Outward going loans	138	147	193
Tissue samples sent	3,300	3,800	4,447
Tissue sample grants	79	44	40
Number of visitors hosted	155	186	336
Total visitor research days	403	713	551
Number of tours hosted	47	57	70
Total number of visitors on tours	535	597	1,266

Maintenance and operation of National Research Infrastructure

During 2010–11, **AAHL** completed a four year engineering upgrade with a refocus on routine maintenance and preventative activities. AAHL continues to operate at the highest level of biosecurity and biosafety, ensuring the physical containment of highly pathogenic organisms. The safety of staff is paramount at all times. The laboratory has retained full national accreditation for laboratory services (ISO 17025), and environmental management (ISO 14001). In keeping with the previous year, compliance with the Australian Quarantine Inspection Services, the Office of the Gene Technology Regulator and those regulations concerning Security

Sensitive Biological Agents has been achieved. Many of these regulations have been enhanced and expanded in response to maximising effective risk management in these areas. Auditing of the new facilities (the PC4 laboratory and the insectary) by the various regulators has been successful with only minor modifications required to ensure full compliance.

The **ATNF** is installing new instrumentation to maintain performance at the standard of comparable international facilities. A high rate of availability for astronomy was maintained despite undertaking several significant performance and reliability upgrades of the Parkes Telescope and the Australia Telescope Compact Array during the year, demonstrating the excellent

maintenance and operation of the facility. Over one hundred papers using ATNF data were published in refereed journals in the last year. In 2008, (the latest year for which the analysis has been made) the ATNF ranked second internationally for radio astronomy papers in major journals.

CSIRO is overseeing the building of a new state-of-the-art research vessel, *Investigator*, to replace the current **MNF** research vessel, *Southern Surveyor*. The new vessel will be 89 metres in length, and represents a step-change in blue-water research capability available to the Australian marine research community. With accommodation for up to 40 scientists, *RV Investigator* will undertake multidisciplinary voyages up to 60 days duration to the further reaches of Australia's marine estate, from the Antarctic sea ice to the equator. The added capability will allow marine scientists to address national research challenges in ways not possible previously. Activities will include deploying and servicing deep water moorings systems to monitor ocean-atmosphere interactions, mapping and characterising the ocean floor out to deep waters, geological sampling, oceanic water sampling for physical, chemical and biological characteristics and deploying

meteorological sampling systems. Work has also commenced to facilitate the transition of support systems in readiness for commissioning of *RV Investigator* in 2013. Until then, the 40-year-old *Southern Surveyor* is being maintained to international standards with \$1.8 million allocated in 2010–11 for enhanced maintenance work. More information can be found at: www.csiro.au/science/Future-Research-Vessel

All **National Biological Collections** are housed in purpose-built facilities and are stored, curated and managed according to international standards. CSIRO's Information Management and Technology Group is building a data management system to support the storage, discovery and access of research data, including the natural history collections. As part of this, the ANIC is trialling in 2011 a new open-source product especially designed for natural history collections. The ANIC began a program to expedite curation through high-quality images of specimen drawers.

Proportion of collections digitised and available to the public

The proportion of specimen level material digitised in the four collections ranges from five to 100 per cent, (see Table 3.12).

Table 3.12: Digitisation of the National Biological Collections

Collection	Proportion of collection digitised (%)	
	2009–10	2010–11
Australian National Herbarium	76	76
Australian National Fish Collection	100	100
Australian National Insect Collection	2.9	5
Australian National Wildlife Collection (excluding sound collection)	86	91

Overall, the majority of specimens are available through a range of internal or externally run databases. A concerted effort is focused on making all the collections available online through a single portal, *The Atlas of Living Australia* (ALA).

Efforts to increase availability in the past year have focused on adjunct material such as images, sounds and genetic information. The sound library of Australian birds is being transferred to digital recordings and images of collection drawers in the ANIC are being provided as digital meta-data records. DNA barcodes and images for most Australian moths have been released on-line this year.

The majority of Australian specimen records in the ANH are digitised, other than a small proportion of recent acquisitions. All digitised material is available through Australia's Virtual Herbarium (www.ersa.edu.au/avh/) and soon through the ALA (www.ala.org.au). Images of Australian plants are also available via the Australian Plant Image Index (www.cpbr.gov.au/photo/), a comprehensive collection of over 65,000 images. Undatabased collections are predominantly of non-Australian origin.

The ANFC specimen data (48,669 records) is 100 per cent digitised and approximately 60 per cent is available publicly through the Online Zoological Collections of Australian Museums (www.ozcam.org.au/) and is searchable through the Australian National Data Service (ANDS) (www.ands.org.au/), the ALA and the Ocean Biogeographic

Information System (www.obis.org.au) part of the Census of Marine Life. The Photographic Index of Australian Fishes is the largest collection of images of Australasian fishes, and more than 2,000 images covering about 1,600 species or 33 per cent of the described Australian species, are available to the public via Scienceimage (www.scienceimage.csiro.au/) and through ANDS.

Approximately five per cent of the ANIC invertebrate collection is digitised (about 500,000 records out of a possible 12 million). Of these, around two per cent are currently available for use and download through the ALA. However, all are still publicly available through the ANIC specimen database, OZCAM, the Global Biodiversity Information Facility (GBIF) (www.gbif.org) and Zipcode Zoo (www.zipcodezoo.com).

Ninety-one per cent of the ANWC vertebrate collections have been digitised, although this falls to 60 per cent when the sound collection is included. All specimens can be accessed through OZCAM on a manual provision basis, while around seven per cent have become available through the ALA.

Coverage of National Biological Collections

The National Biological Collections provide a moderately high-level of coverage of Australian Species (see Table 3.13).

Table 3.13: Coverage of the National Biological Collections

Collection	Proportion of diversity covered (%)
Australian National Herbarium	70
Australian National Fish Collection	54
Australian National Insect Collection	70
Australian National Wildlife Collection	Vertebrate – 55 Birds – 100

Two projects, based on material held by the ANIC, have increased the list of known Australian moths: a recent book by a Finnish author has identified and named 137 new species of Australian leaf-mining moths. A new DNA study of all Australian moth species as part of the Barcode of Life Initiative (www.biolinfonet.org) has revealed the possibility of other new, as yet unnamed, species.

Demonstrated response to national events

During 2010–11, AAHL responded to a major outbreak of equine encephalitis in horses in a number of eastern states that resulted in an increase in the number of samples from horses being tested for Hendra virus. Whilst all cases were negative for Hendra virus, many tested positive to the mosquito born virus infections (Murray Valley virus, Kunjin virus and Ross River Fever virus). Most of this was associated with an increase in vector populations due to heavy rains. Following this, major outbreaks of Hendra have occurred in Queensland and New South Wales. AAHL has been involved in confirmatory diagnosis activities, in causative agent isolation and identification and in undertaking further research to assist decision-making in the face of this significant outbreak.

Research continued on a range of viral infections of animals and humans. Work on a horse vaccine against Hendra virus infection progressed well and it is hoped that a vaccine will be available within two years. Studies on viral infection in bats had focused on a deeper understanding of the bat immune system and how this may have adapted to allow virus infection without any clinical manifestations in the bat. Early indications are that the bat's innate immune system may have some unique characteristics that allow for this non clinical co-existence.

Work commenced overseas on studies with live foot and mouth disease virus to better understand the infection in cattle, sheep and pigs that is specifically relevant to Australia.

The AAHL Collaborative Biosecurity Research Facility

Further refinements and modifications to the new Biosecurity Research facility delayed hand over of this capability to scientists at AAHL until June 2011. Whilst this has postponed the occupation of this facility under the National Collaborative Research Infrastructure Strategy/CSIRO agreement, it has ensured that maximum use can be made of the space once operational.

A particularly challenging component of the refinement and modification to the PC4 laboratory for microbiological containment is the remote management of the live-cell imaging capabilities that will be established at PC4. This is a world first that requires some innovative technical solutions. Arrangements for training, for priority setting and for access arrangements and fees have all been completed. All the above have provided a timely capability to respond to the national call for additional work on the Hendra virus, most of which must be done at PC4 level.

Scientific contributions in support of research

This section highlights some of the high-quality scientific contributions made by the National Facilities and Collections in 2010–11, in support of the National Research Flagships, CSIRO's core research portfolios and external users.

Achievements 2010–11

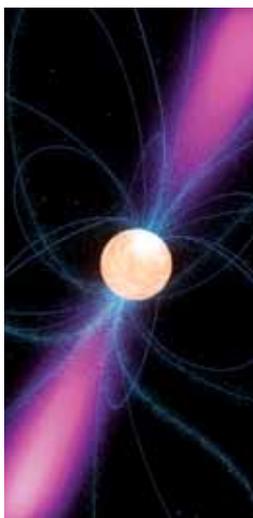
Australian Animal Health Laboratory



Recent investments in AAHL by the National Collaborative Research Infrastructure Strategy are ensuring that cutting-edge technologies linked to effective bio-containment attract scientists worldwide to partner with AAHL. Further investments in data management and communications are ensuring that research conducted within the secure area of AAHL can be effectively shared with collaborators worldwide. The development of the

Biosecurity Collaborative Platform is now being routinely used to conduct meetings across the secure barrier at AAHL. As an example, new research partnerships with scientists at Deakin University and the new Medical School in Geelong have utilised the new live cell imaging capabilities at AAHL to visualise the processes of viral entry into cells. In the case of the recent outbreaks of Hendra in Australia, these capabilities have been used to confirm outbreaks of the disease, further characterise the causative agent, harmonise testing across various States and territories, undertake targeted studies in close contact colonies of bats and estimate risks from affected species (horses and dogs). These activities have been crucial in providing science based decision-making in the face of an unprecedented level of disease, and the occurrence in a new species.

Australia Telescope National Facility



During 2010–11, pulsar astronomy research data from the Australia Telescope National Facility (ATNF) was made public in conjunction with the Australian National Data Service (ANDS). A key outcome of the project is to make large research datasets easily accessible. This will enable researchers to easily discover, download and reuse research data from anywhere in the world. Among the many benefits are the opportunities for collaboration and the potential for increased citation of associated publications.

Original data from 4,500 observations of pulsars (small stars that produce a regular train of radio pulses) observed with the ATNF's Parkes radio telescope is now available to researchers worldwide as a part of this initiative. This substantial new archive enhances over twenty years' of observations with ATNF telescopes already available through the Australia Telescope Online Archive (<http://atoa.atnf.csiro.au/>).

Notably, more than half of all currently known pulsars, including the only binary pulsar system, have been discovered via the Parkes Telescope, which continues to be a front-rank instrument in the field of radio astronomy.



The Atlas of Living Australia

The Atlas of Living Australia (ALA) is a national initiative between the CSIRO, over sixty museums, herbaria and other biological collections, the Australian Government, and the community. The ALA project brings together a huge array of information on Australia's biodiversity, accessible through a single website.

The ALA launched its website in November 2010. During 2010–11, it has developed new software for recording and managing biodiversity data and photos in the field. The software is being used in research projects, urban biodiversity surveys, museum outreach activities, science education, biosecurity monitoring, natural resource management and reporting.

The ALA and its partners have made significant progress on digitising the information held in biological collections and delivered a suite of powerful mapping tools with national data for more than 350 environmental measures. The ALA has established national databases for identification keys, images and biodiversity literature, and has made substantial progress on a national species names list. Through these capabilities, the ALA is helping to make Australia a world leader in biodiversity informatics.



A Praying mantis, found during a Bushblitz survey in south-western Victoria. Credit: Julian Finn, Museum Victoria

Marine National Facility



During 2010–11, the Marine National Facility (MNF) supported a diverse range of science. The MNF was used to research the sustainability of a significant but declining rock lobster fishery and to improve the understanding of the Leeuwin Current off Western Australia which impacts marine productivity and the climate experienced in Australia. Researchers investigated the diversity of animal communities on the Park's ocean floor to inform the management of the Great Australian Bight Marine Park.

Deep water moorings in the Southern Ocean were serviced to ensure robust empirical data are available to improve the understanding of climate change and evaluate model projections. Ocean productivity in eastern Australian waters and the Tasman Sea was also investigated. More information can be found at www.marine.csiro.au/nationalfacility.

Australian National Insect Collection



A major revision of the ecologically dominant Australian meat ants (*Iridomyrmex*) was released. This was based on over 30,000 examined specimens of 79 recognised species. A collaborative DNA-sequence based study of relationships of the world's Dipterans (flies) has clarified the evolutionary history of this economically important group. As part of its digitisation efforts, ANIC has imaged more than 250 drawers of specimens and made them available for web-based viewing. The Remote Microscope Diagnostic Network has continued to grow and was recently recognised in 2011 with an Excellence in Innovation

Award presented by the Australian Research Council. The Network aids speed and accuracy of biosecurity decision-making and on-the-spot quarantine decisions are possible in 80 per cent of cases.

Australian National Wildlife Collection



The ANWC has continued to provide innovative linkages between present-day ecology and longer-term evolution of the Australian biota. This enhances our understanding of conservation significance and management needs. An example is in our improved understanding of the complexity of the evolutionary history of the iconic Australian and New Guinean parrots. We better appreciate now that the birds we so often simply call 'Australian parrots' are several distinct lines of evolution that all need conservation planning. Acquisition of a Micro CT scanner has contributed to a revolution in our understanding of native Australian mammal diversity and the names we need to apply to those mammals. This in turn helps the fundamental planning or conservation of this newly appreciated mammal diversity.

Australian National Fish Collection



The ANFC has provided major contributions to the worldwide knowledge of the marine fishes of our region through the Wealth from Oceans Flagship and international initiatives including the recently completed ten-year international Census of Marine Life by providing information, taxonomic identification of new specimens and analytical information to the marine research conducted in Australia as part of the Census (www.coml.org/).

ANFC data contributed to research in the Wealth from Oceans Flagship developing a new hierarchical framework to classify seabed biodiversity. The framework used in Australia's Regional Marine Planning is a significant step towards the ecosystem based management of marine systems. Its use in Australia and application in a global context is reported in a paper published in *Biological Conservation* (2010, 143, 1675-1686).

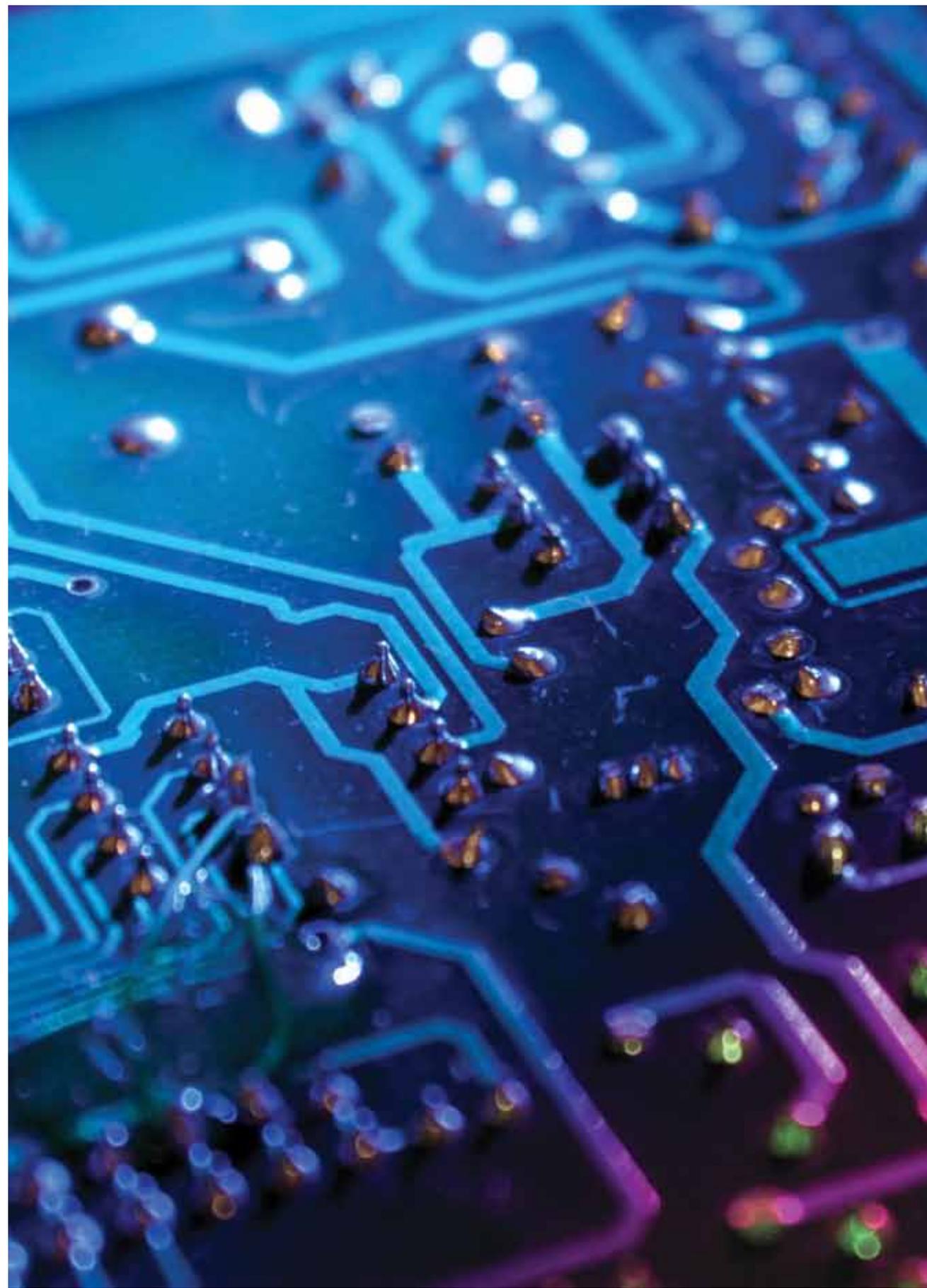
The ANFC's historical data were essential in the Climate Adaptation Flagship's research assessing the impact of climate change on the marine biodiversity of south-eastern Australia – a known climate change hot spot. A paper in *Global Ecology and Biogeography* (2011, 20, 58-72) demonstrated major distributional shifts in 45 species of fishes thought to be climate related.

Australian National Herbarium



The ANH coordinates and manages the *Australian Plant Census* (www.anbg.gov.au/chah/apc/about-APC.html), a national, collaborative census of Australia's flora, aimed at providing a unified, agreed list of scientific names for all native and naturalised Australian flowering plants. Over 50,000 plant names have been considered and treated for the project, with another

13,000 to be treated before completion of the first stage of the project in late 2011. Along with the *Australian Plant Name Index* and the *Australian Faunal Directory*, the APC forms the 'taxonomic backbone' of another important, authoritative biodiversity information resource, *The Atlas of Living Australia* (www.ala.org.au).





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PART FOUR: OUR ORGANISATION

Management and accountability

Operating Model

CSIRO's Operating Model is designed to support the successful execution of our strategy and delivery of our goals. The Model underpins the governance of the Organisation by defining the roles, relationships and accountabilities of leaders and operating units. It includes our processes for planning, investment, review and reporting, and outlines CSIRO's Policy Framework. The Model is documented in *CSIRO – the way we work* and is available to everyone who works in CSIRO and to the general public at www.csiro.au/resources/CSIRO-the-way-we-work.html.

Further information on CSIRO's governance arrangements can be found at: www.csiro.au/governanceoverview.

Code of Conduct

In 2010, CSIRO revised and simplified its Code of Conduct. The revised Code now sets the standard for behaviour expected of CSIRO and of everyone working in CSIRO.

Through the consistent application of our Code of Conduct, we can ensure that CSIRO continues to be a trusted advisor, respected collaborator, and a great place for us all to work.

Megan Clark, Chief Executive

The Code complements the Operating Model and forms a key component of our induction programs. All staff members and CSIRO affiliates must comply with the Code of Conduct, which can be viewed at: www.csiro.au/resources/Code-of-Conduct.html.

It is aligned with our Values Compass, which guides our interactions with colleagues and external partners and stakeholders. More information on CSIRO's Values Compass can be found on page i.

Legislation and government policy

CSIRO is an Australian Government statutory authority constituted and operating under the provisions of the *Science and Industry Research Act 1949* (SIR Act).

CSIRO's **primary functions** are to:

- carry out scientific research to:
 - assist Australian industry and to further the interests of the Australian community
 - contribute to national and international objectives and responsibilities of the Commonwealth
- to encourage or facilitate the application and use of the results of CSIRO scientific research.

Our **secondary functions** include international scientific liaison, training of research workers, publication of research results, technology transfer of other research, provision of scientific services and dissemination of information about science and technology.

Reporting, accountability and other rules for CSIRO's operations are set out in the *Commonwealth Authorities and Companies Act 1997* (CAC Act).

Pursuant to a service agreement, CSIRO provides administrative support services to the Trustee of the Science and Industry Endowment Fund consistent with the *Science and Industry Endowment Fund Act 1926*. The Fund has its own governance structure.

In October 2010, CSIRO submitted an annual Compliance Report to the Australian Government regarding the Organisation's compliance with the CAC Act and its financial sustainability.

General policies of the Australian Government that applied to CSIRO in 2010–11 under Section 28 of the CAC Act are: Commonwealth Fraud Control Policy; Australian Government Foreign Exchange Risk Management Guidelines; and Outsourcing of IT Infrastructure Services. In addition, CSIRO has complied with the Commonwealth Procurement Guidelines as they apply to CSIRO.

In the May 2011 Federal Budget the Government announced a new 2011–12 to 2014–15 Quadrennium Funding Agreement with CSIRO. The Agreement will include the principles of quadrennium funding, resourcing of outputs, performance reporting and other matters agreed by the parties.

Responsible Minister

In 2010–11, the Minister responsible for CSIRO was Senator the Hon Kim Carr, Minister for Innovation, Industry, Science and Research.

Under the SIR and CAC Acts, the Minister has power to:

- add to the purposes for which CSIRO may carry out scientific research (SIR Act, section 9)
- 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 (SIR Act, section 13).

The Minister's Statement of Expectations and the Board's Statement of Intent can be found at: www.csiro.au/resources/Statement-of-Expectations.html.

The Public Research Agency Charter, signed by the Minister and the Board, provides guidance to CSIRO and its researchers on providing scientific advice and engaging in public debate. The Charter can be found at: www.csiro.au/resources/pf11c.html.

Ministerial directions and notifications

No new directions were received in 2010–11. The CSIRO 2011–14 Enterprise Agreement was developed in accordance with the Minister's direction regarding compliance with the Australian Government Employment Bargaining Framework.

Eleven notifications of significant events under Section 15 and 16 of the CAC Act were made to the Minister during 2010–11. These related to participation in research centres and alliances, licence agreements, equity transactions and major research and infrastructure projects.

CSIRO Board

CSIRO is governed by a Board which is responsible to the Australian Government for the overall strategy, governance and performance of the Organisation.

The CSIRO Board comprises nine part-time, non-executive members including the Chairman and a full-time Chief Executive. All non-executive members are appointed by the Governor-General. The Chief Executive is appointed by the CSIRO Board, in consultation with the Minister.

The CSIRO Board operates partly through four standing committees:

- Board Audit Committee
- Board Commercial Committee
- Board Nominations and Remuneration Committee
- Board Endowment Committee.

Newly appointed Board members are informed of their responsibilities and rights through a formal induction process. In the pursuit of their duties, Board members may take such independent professional advice as is considered necessary, and have complete access to senior management. A performance review of the Board and its Committees was conducted in early 2011 by an independent consultant commissioned by the Board.

Disclosure of interests by Board members and the Chief Executive are made in accordance with the SIR Act and CAC Act, as appropriate.

Details of the 2010–11 Board members, including qualifications and terms of appointment are on page 90–91. Details of remuneration, membership of Board Committees and attendance at meetings are shown on pages 155–159 in the Financial Statements. The Board Charter and membership profiles are available at: www.csiro.au/boardoverview.

CSIRO Executive Management

The Chief Executive conducts the affairs of the Organisation in accordance with the strategy, plans and policies approved by the Board and the Board Directions to the Chief Executive.

The Chief Executive is supported by the Executive Team. As a team and through their individual roles, the members lead, direct, coordinate and control CSIRO's operations and performance. Details of the members are on page 91–92.

The Executive Team is assisted by the Science Sub-committee, Flagship Oversight Committee and Commercial Executive Committee. The CSIRO Health, Safety and Environment Committee is accountable to the Chief Executive.

The Executive Management Council of senior managers provides a forum for sharing and discussing issues relating to the management and future strategy for CSIRO.

Policies, standards and procedures

CSIRO conducted an extensive review of its policy material as part of the implementation of a new Policy Framework, which comprises:

- Policies:** Define CSIRO's commitment and responsibilities in an area.
- Standards:** Define minimum mandatory performance requirements for all CSIRO staff, sites and operations.
- Procedures:** Define the minimum mandatory actions or processes that must be followed by CSIRO staff in performing a particular task or activity.

The aim is to improve compliance by clarifying performance requirements, roles and accountabilities. Documents will be easier to follow and access from a user perspective.

Access to policy material has also been enhanced through the implementation of a Policy Portal on the MyCSIRO intranet site launched in May 2011. When fully developed, the Policy Portal will be a one-stop shop for staff to access information on CSIRO's practices and minimum requirements.

The Policy Framework is supported by the CSIRO Delegations and Authorities Framework. The Commercial Delegations were amended in August 2010 to include a threshold based on an assessment of enterprise risk. Further changes are being implemented to improve the flexibility of the Framework, support the CSIRO Operating Model and reduce administration.

Policies

The CSIRO Board has five major policy statements on the Organisation's commitment in relation to:

- Science and Delivery
- People
- Governance
- Risk
- Health, Safety, Environmental Sustainability and the Community.

The policy statements are available at: www.csiro.au/org/Key-policy-statements.html.

Standards and procedures

CSIRO's Health, Safety and Environment (HSE) group has completed a comprehensive review of CSIRO's HSE procedures and guidelines, as part of the CSIRO's commitment to the goal of *Striving for Zero Harm* and the implementation of CSIRO's new Policy Framework.

In December 2010, HSE released a new HSE Management standard, 11 new procedures and 22 revised procedures, many with revised guidelines.

The HSE Management standard sets down for the first time a consolidated and approved list of the minimum mandatory HSE management performance requirements for all CSIRO staff, sites and operations.

The new HSE procedures cover:

- Biological Safety
- Confined Space Safety
- Diving Safety
- HSE Induction for New Starters
- Isolation of Plant
- Laboratory Safety
- Nanotechnology Safety
- Occupational Health and Hygiene Management
- Permit to Work
- Safe Work on Seagoing Vessels
- Vehicle Use Safety

Further information on CSIRO's health and safety can be found on pages 94–97.

The other standards and procedures introduced or amended this year include:

Standard

- CSIRO Code of Conduct
- Commercial engagement
- Project management

Procedure

- Adjunct appointments
- Anti-bribery and facilitation payments
- Travel (revised)

Planning and monitoring performance

2010–11 was the final year of CSIRO's 2007–11 strategic planning period and of the associated four-year funding agreement with the Australian Government. Consequently, an important focus of activity during the reporting year was a major review of CSIRO's performance and the development of a new Strategic Plan for the period 2011–15.

The Program Review of CSIRO was established to demonstrate accountability for past investment in CSIRO, inform the development of CSIRO's future strategy and operations, and inform the decision to enter into a new multi-year funding agreement. The Review was conducted between June and September 2010¹.

Development of the new Strategic Plan was led by the CSIRO Board and Executive Team with extensive input from CSIRO's broad range of stakeholders in industry, government and the research community.

The Strategic Plan (see: www.csiro.au/org/Our-Strategy-Overview.html) conveys broad objectives for the Organisation, and sets out the broad policies and strategies to be pursued to achieve those objectives. In brief, the strategy emphasises CSIRO's intent to maintain its focus on addressing national challenges and opportunities through an enhanced program of National

Research Flagships, and to continue developing Australia's scientific capability and preparedness by investing in the people and infrastructure required to meet current and future challenges. Priority actions required for successful implementation of the strategy are described in the annual CSIRO Operational Plan (see: www.csiro.au/operational-plan).

Within the context provided by the Strategic Plan, CSIRO's portfolio of research is decided through a rigorous science investment process that is guided by the twin imperatives of seeking relevance and impact for Australia. Our Divisions and Flagships are subject to regular review by panels chaired by independent experts who assess the strength of our capability as well as the relevance and impact of our research. In addition, the quality of our research is subject to the normal scientific peer review mechanisms and the Chief Executive conducts an annual review of all research portfolios, Divisions and functional areas.

Advisory mechanisms

CSIRO's primary advisory mechanisms are Sector Advisory Councils and Flagship Advisory Committees, which comprise representatives from industry and other stakeholders.

Sector Advisory Councils provide strategic advice on the national challenges and opportunities of a broad sector of the Australian economy, society or environment. There are Councils for the energy and transport; environment and natural resource management; health; information, communication and services; manufacturing; and mineral resources sectors.

The Flagship Advisory Committees, established for each Flagship, provide advice on how to maximise the effectiveness of the Flagship portfolio to achieve its goals.

¹ The review was conducted by an interdepartmental committee with representatives from: Treasury; Finance and Deregulation; Prime Minister and Cabinet; Innovation, Industry, Science and Research; and CSIRO. The terms of reference addressed the six 'expenditure review principles' (appropriateness, effectiveness, efficiency, strategic alignment, integration and performance measurement) as well as two special issues, namely matters related to CSIRO's funding model and revenue mix, and the case for a multi-year funding agreement.

CSIRO's advisory mechanisms were reviewed in early 2011. In 2011–12, the Sector Advisory Councils will be replaced by Strategic Advisory Committees, which will provide advice on CSIRO's longer-term strategic directions and research and development priorities and on how CSIRO can meet the research, technical and business needs of customers or communities.

Details of the Sector Advisory Councils and Flagship Advisory Committees can be found at: www.csiro.au/SAC and www.csiro.au/FAC.

Risk management

CSIRO is committed to the effective management of risks. The CSIRO Risk Policy recognises that the identification and management of risk is central to delivering the functions of CSIRO and delivering benefits to Australia.

CSIRO's risk management framework sets out the responsibilities of all individuals across CSIRO, including the Board and management for identifying and managing risk. This includes understanding scientific, financial, commercial and legal, health and safety, environmental, and reputational risks. It also provides the methodology by which CSIRO's risk profile is articulated and regularly updated.

Risks are managed on an enterprise basis through mitigation strategies that include, in appropriate circumstances, insurance to transfer the financial impact of risk.

General insurance including General Liability and Professional Indemnity insurance and Directors and Officers Liability insurance is through Comcover. CSIRO's workers compensation liability is covered by a premium paid to Comcare.

External audit and internal controls

Assurances about the Organisation's financial state of affairs, compliance issues and control environment are provided through a comprehensive range of processes including the internal Risk Assessment, Audit, Fraud Control and Security functions. External audit is provided by the Australian National Audit Office.

CSIRO maintains a Whistleblower Scheme and uses mechanisms such as Control Self-Assessment Questionnaires signed by senior managers to provide additional assurance.

CSIRO complies with Commonwealth Fraud Control Guidelines (revised 2011). The Fraud Risk Assessment was completed in February 2010 and an updated Fraud Control Plan incorporating guideline amendments is planned for release in August 2011.

The CSIRO Strategic Protective Security Risk Assessment was updated in February 2009 and reviewed in February 2011. As a result of the release of the Commonwealth Protective Security Policy Framework in June 2010, a review of current security standards and procedures is underway and expected to be completed by March 2012.

Administrative law

CSIRO is bound by a range of administrative laws including the *Freedom of Information (FOI) Act 1982* and the *Privacy Act 1988* (see Appendix 3, p 176).

In May 2011, CSIRO implemented initiatives to comply with the FOI provisions relating to the Information Publication Scheme (IPS). The IPS is designed to promote open and transparent communication of government information. For information on how to access information under the FOI Act, and CSIRO's plan to implement and administer the IPS, see: www.csiro.au/org/FOI.html.

Board membership 2010–11



Chairman
Mr Simon McKeon
 BCom LLB FAICD
 F FIN
 Company Director
 28 June 2010 –
 27 June 2015



Deputy Chairman
Dr Terry Cutler
 BA(Hons) PhD
 Hon DUniv FAHA
 FIPA
 Principal
 Cutler and
 Company Pty Ltd
 25 July 2002 –
 24 July 2012



Chief Executive
Dr Megan Clark
 BSc(Hons) PhD
 HonDSc (UWA)
 Hon DApSc
 (RMIT) FTSE
 GAICD
 1 January 2009 –
 31 December 2013

Members



Ms Mary Boydell
 BCom FCA
 Company
 Director
 26 June 2009 –
 25 June 2014



Professor Ian Chubb AC
 MSc DPhil Oxon,
 Hon DSc (Flinders)
 Chief Scientist of
 Australia
 7 August 2008 –
 6 August 2012



Dr Eileen Doyle
 BMath(Hons)
 MMath PhD
 FAICD
 Company Director
 15 February 2006
 – 14 February
 2016



The Hon John Kerin AM
 BA BEc Hon
 DScAgr (UNE)
 Hon DSc (UWA)
 Hon DLitt (UTas)
 Company
 Director
 3 October 2008 –
 2 October 2011



Ms Deborah O'Toole
 LLB
 Company
 Director
 16 April 2003 –
 15 April 2008
 1 May 2008 –
 30 April 2011



Mr Mark Paterson AO
BBus, FAICD,
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Secretary
Department
of Innovation,
Industry, Science
and Research
9 February 2011 –
31 May 2011



Mr Hutch Ranck
BSc, Economics
Company
Director
1 May 2011 –
30 April 2016



Mr Douglas Rathbone AM
DipChemEng
BCom
Managing Director
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Nufarm Ltd
26 September
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September 2010



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FRACI FTSE
Research
Professor
Swinburne
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Technology
1 May 2008 –
30 April 2012

Executive Team membership 2010–11



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HonDSc (UWA)
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(RMIT) FTSE
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Chief Executive



Mr Craig Roy
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Executive,
Science Strategy
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Ms Hazel Bennett
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Chief Finance
Officer (from
November 2010)



Dr Calum Drummond
BSc(Ed)
BSc(Hons) PhD
Group Executive,
Manufacturing,
Materials and
Minerals (from
January 2011)



Dr Andrew Johnson
BAgrSc(Hons)
PhD MPA
(Harvard)
Group Executive,
Environment



Dr James Bradfield Moody
BInfoTech(Hons)
BEng (Elec) PhD
Executive Director,
Development



Dr Steve Morton
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Group Executive,
Manufacturing,
Materials and
Minerals (to
December 2010)



Mr Nigel Poole
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FAICD
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Director,
Commercial (to
December 2010)



Dr Alastair Robertson
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FRSC CChem
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Group Executive,
Food, Health
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Dr Beverley Ronalds
BE(Civil)(Hons)
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Mr David Toll
BA,
MAccounting,
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Acting Chief
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2010)



Dr Alex Zelinsky
BMaths(Hons)
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Group Executive,
Information
Sciences

Executive Team profiles
are available at:

www.csiro.au/executiveteam



CSIRO's research being used to make Australian water policy decisions

CSIRO has undertaken a comprehensive scientific assessment of current and future water availability in several regions of Australia and the results of these assessments are being used by water managers and governments to make water policy decisions.

The first project conducted was in the Murray-Darling Basin in 2008, and which has been used to inform decisions about future management of the Murray-Darling Basin, including using updated Murray-Darling Basin Sustainable Yields models in the development of the Murray-Darling Basin Plan.

The Northern Australia Sustainable Yields project, completed in late 2009, provided a major component of the Northern Australia Taskforce report on the Sustainable Development of Northern Australia and has been used by the West Australian Government to make decisions on water management in northern Western Australia.

In Tasmania, the sustainable yields assessment, completed in early 2010, has been used by the commonwealth and state governments to inform decisions on new irrigation schemes (including approval of four new schemes).

In south-west Western Australia, project results released in early 2010 have been used to calibrate new groundwater models for the region. The project modelled current water yield and future water yields with respect to climate change, water resource development and other risks.

In late 2010, CSIRO began assessing the water resources of the Great Artesian Basin, which underlies about one-fifth of the Australian continent. The assessment will improve understanding of available groundwater resources in the Basin's

aquifers, at a time of increasing water demand and heightened concerns about the potential impact of coal seam gas development. It will also help water managers meet National Water Initiative commitments, providing greater certainty for investment and for the environment.



Blackwood River, south-west Western Australia.
Credit: Robert Garvey, CSIRO

Health and safety

CSIRO is committed to the health and safety of its staff and recognises the importance of positive interventions aimed at improving staff health and safety. CSIRO acknowledges its responsibilities under Section 74 of the *Occupational Health and Safety Act 1991*.

Health, Safety, Environmental Sustainability and Community Policy

CSIRO's Health, Safety, Environmental Sustainability and Community Policy reflects our commitment to ensuring the safety and wellbeing of our staff, visitors and the communities in which we work. It reinforces our Health, Safety and Environmental (HSE) strategic goal of 'Striving for Zero Harm' to our people, the environment and the communities in which we operate.

A summary of CSIRO's performance and its compliance with Section 74 of the *Occupational Health and Safety Act 1991* is provided below.

Health and safety management arrangements

Health and safety management arrangements are documents concerning the management of health and safety in CSIRO. They are one of the mechanisms by which CSIRO demonstrates commitment to meeting its duty of care under the Act.

In recognition of this duty, CSIRO has developed these health and safety management arrangements in consultation with our staff and their representatives. The Act emphasises consultation and cooperation between employers and employees in regard to occupational health and safety issues by requiring the establishment of a framework incorporating:

- health and safety management arrangements (HSMAs)
- designated work groups
- health and safety representatives
- health and safety committees
- dispute resolution processes.

These structures and arrangements are in place and effective within CSIRO. A review of the HSMAs in line with the expected changes to Workplace Health and Safety laws and the new CSIRO Enterprise Agreement commenced in June 2011, with a planned delivery of updated and approved arrangements in September 2011.

Initiatives undertaken during the year to ensure the health, safety and welfare at work of staff members and affiliates

- A new HSE Policy Framework has been implemented that simplifies and streamlines organisational HSE requirements to ensure that requirements are easier for staff to access, understand and comply with. The new HSE Policy Framework comprises a new policy, management standard, procedures and guidelines providing improved safe systems of work and risk tools. An additional level has been established for Business Units and sites to create specific operating instructions and local teams to establish safe work instructions.
- A restructure of the HSE function to improve efficiency and effectiveness of our HSE service delivery across the Organisation has been implemented. This has provided an improvement in local site coverage.
- Implementation of CSIRO's health, safety and environment leadership training continued. This will equip the next level of leaders to take a higher profile in growing the Organisation's *Zero Harm* culture.
- The Contractor HSE Management Training program for scientific managers who manage or engage contractors continued. The program highlights the specific HSE requirements necessary for safe completion of contracted works within CSIRO. HSE staff also attended specific training on supporting scientific managers in their responsibilities relating to contractor management.
- Upgrades were undertaken to our HSE Management System to improve hazard and incident reporting.
- Increased emphasis was placed on the reporting of incidents, near misses and any incident involving lost time and medical treatment.
- Following feedback from regular international travellers, several system upgrades have been implemented in our Staff International Travel System.

Health and safety outcomes

- An increased awareness of requirements and responsibilities for safe systems of work and risk management processes was achieved through enterprise-wide implementation of the new HSE Policy Framework.
- An improvement in the visible interest and demonstration of HSE leadership behaviours and staff engagement was made through the ongoing HSE leadership training course and the conduct of site observations in the Safety Contacts Program and the HSE Review Program.
- An increased awareness of serious HSE incidents by senior managers was achieved following the implementation of serious HSE incident procedures.
- An overall improvement in health and safety performance is recognised in reduced injuries, illnesses and the workers' compensation premium.
- An increased awareness and better understanding of how HSE staff can better support managers who manage contractors to ensure positive HSE outcomes in contracts was achieved.
- Accuracy in the reporting of incident information was improved.
- Following two emergency situations in Queensland, Site Emergency Management Plans were centrally located on an HSE Share Point to increase staff accessibility.
- Continued counselling support for staff and their immediate families.

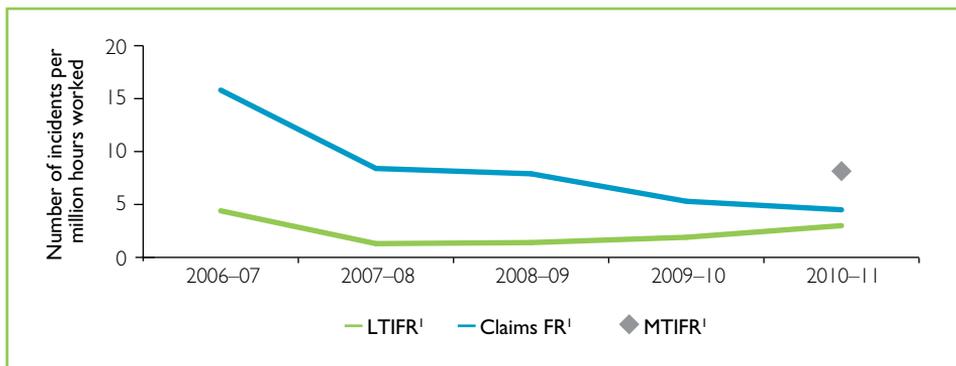
Statistics of any accidents or dangerous occurrences during the year that arose out of the conduct of undertakings by CSIRO that required the giving of notice under section 68 (see Figure 4.1)

- The number of workers' compensation claims with injury dates in the reporting period shows a continued reduction from 63 in 2009–10 to 50 in 2010–11. Improved incident prevention and an early injury intervention program contributed to the reduction.
- A focused initiative to improve the reporting and correct internal classification of injury has seen an increase in the lost time injury frequency rate (LTIFR) that now accurately reflects the actual performance of the Organisation. The LTIFR for 2010–11 was 3.0 compared to 1.9 for 2009–10.
- Historically, the reported medical treatment frequency rate (MTFR) was based on the rate of claims accepted by Comcare. With our ability to now report MTFR based on our own data, the previously reported data has been re-characterised as a claims frequency rate (Claims FR). CSIRO's Claims FR has decreased from 5.3 in 2009–10 to 4.5 in 2010–11.
- Commencing with the 2010–11 reporting period, any injury requiring defined medical treatment is classified as a medical treatment injury (MTI) and captured in the medical treatment frequency rate (MTFR). In this first MTFR reporting period, CSIRO's MTFR was 8.1.
- The reporting of near misses has decreased from 464 in 2009–10 to 337 in 2010–11, but hazard reporting has increased with the introduction of an improved reporting system reflecting a growing awareness among supervisors and staff of the value of reporting and rectifying risks before injuries occur.
- The number of Comcare Notifiable Incidents has decreased from 50 in 2009–10 to 31 in 2010–11.
- CSIRO reported one environmental incident to regulatory authorities during 2010–11. This related to a release of water from a glasshouse at the Black Mountain site (ACT). This was certified with the Australian Quarantine and Inspection Service and the Office of the Gene Technology Regulator. The release occurred because of flooding in the facility from watering operations.
- CSIRO reported one event to the Australian Radiation Protection and Nuclear Safety Agency during 2010–11 relating to a radiation source incident during transportation for disposal.
- CSIRO's premium for 2010–11 was 0.33 per cent of payroll compared to the rate for all premium-paying agencies of 1.20 per cent.

Details of any investigations conducted during the year that relate to undertakings carried on by the employer, including details of all notices given to the employee under sections 29, 46 or 47 during the year

- In November 2010, Comcare issued a letter of warning as an alternative to civil proceedings following the investigation of Incident Number 4221 – Serious Personal Injury – superficial burns to face, neck and arms resulting from a reaction following the mixing of hazardous substances on 17 July 2009.
- Comcare conducted a series of Dangerous Goods Audits on sites in the ACT and on the Dutton Park site in Queensland.
- Two Forklift Safety Audits were conducted by Comcare. One at a site in Queensland and one in the ACT, as part of a national campaign on forklift safety. Both audits were completed to the satisfaction of Comcare.
- Comcare requested a compliance monitoring program be implemented at one of our sites in Western Australia following a Notifiable Incident on the use of a mobile hoist.
- No Provisional Improvement Notices were served on CSIRO by Health and Safety Representatives.
- No Prohibition Notices were served on CSIRO.
- No Improvement Notices were served on CSIRO.

Figure 4.1: CSIRO's injury frequency rates



¹Definitions:

- *Claims FR is the number of compensation claims per million hours worked (may include medical treatment and or lost time injuries). Previously reported as MTR.*
- *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. (A major focused effort in ensuring reporting of serious incidents and correct internal classification of these has resulted in the apparent increase in the LTIFR).*
- *MTR is the number of incidents requiring medical treatment (beyond first aid) per million hours worked.*

CSIRO's health and safety performance compares favourably with other Australian Government agencies. This is reflected in our workers' compensation premium. CSIRO's premium rate, determined on four year injury and claims performance, is ranked by Comcare in the first quartile (good performance) compared against other agencies. This is also reflected by the reduction in the actual rate charged.

Environmental performance

Contribution to Ecologically Sustainable Development

CSIRO upholds the principles of ecologically sustainable development (ESD) outlined in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) through both its operations and research activities.

To meet its research goals, CSIRO operates offices, laboratories, pilot bays, machinery, glasshouses and significant information communication and technologies infrastructure, as well as managing plants and livestock. These activities require significant quantities of energy and water and produce waste.

CSIRO Business Units manage most of the environmental impacts of CSIRO's research activities, with support from centralised property, information technology and other groups.

Table 4.1: Examples of CSIRO's contribution to ESD principles

Principle	CSIRO's activities
Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.	CSIRO's Values Compass identifies safety and sustainability as key values that guide the way CSIRO undertakes its business activities. In 2010–11 CSIRO reviewed its Health, Safety, Environmental Sustainability and Community (HSESC) Policy, Standards and Procedure Framework and conducted staff training on HSESC aspects of contractor management.
If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	As an example of our commitment to preventing environmental damage, CSIRO and Australia Pacific LNG launched the Gas Industry Social and Environmental Research Alliance in July 2011. With its breadth and depth including social, economic and ecological sciences, CSIRO is able to provide impartial and integrated research to the gas industry, regulators and the wider Australian community.



Canola plants: a new source of omega-3

CSIRO scientists have discovered a way to produce beneficial long-chain omega-3 oils in canola plants, providing a new high-value crop for Australian farmers.

Traditionally sourced from ocean-based algae and the fish that eat it, long-chain omega-3 fatty acids are necessary for human health, playing an important role in heart and brain function, as well as child and infant development. These oils have also been found to reduce the risk of heart disease and may also play a role in mental health, depression and various inflammatory diseases.

CSIRO scientists, based in the Food Futures Flagship, have proved it is possible to produce commercially viable quantities of long-chain omega-3 oils in canola plants. Because the body can only make very small amounts of omega-3 fatty acids, they need to be obtained mostly from the foods we eat. Some land-based plants, such as flaxseed, can produce short-chain omega-3 oils, but are unable to produce the more beneficial long-chain omega-3

docosahexaenoic acid (DHA). Fish obtain their long-chain omega-3 oils from the microalgae they eat in the ocean. CSIRO scientists are taking the components of marine microalgae that produce long-chain omega-3 oils and adding them to land-based canola plants.

As demand for omega-3 DHA oils continues to increase to meet the needs of our growing world population, the race is on to find sustainable and reliable new sources that can satisfy this burgeoning consumer demand.

CSIRO is playing a leading role in a \$50 million dollar research collaboration with Nuseed and the Australian Grains Research and Development Corporation. This partnership aims to trial these new canola crops as early as 2013 and have seeds commercially available by 2016.



Long-chain omega-3 oil from marine plants can now be sourced from land-based canola crops
Credit: Carl Davies, CSIRO

Principle	CSIRO's activities
<p>The principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.</p>	<p>As an example, through our Sustainable Agriculture Flagship, CSIRO conducts research to improve agricultural productivity while maintaining environmental health.</p> <p>CSIRO has an on-going program of building improvements that target building management and energy and water efficiency. During 2010–11, CSIRO replaced inefficient chillers, installed variable speed drives on various plant and equipment and funded upgrades of building management systems at six major sites that will reduce costs and greenhouse gas emissions (GHG) and enhance staff comfort. In addition, CSIRO has increased its utilisation of desktop videoconferencing, with the progressive deployment of web cameras to staff that undertake significant travel.</p> <p>CSIRO also ran a national e-waste collection and zero office waste trials in two states.</p>
<p>The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.</p>	<p>In divesting CSIRO's Yalanbee site in Western Australia (WA), 320 hectares were preserved as a Bushland Conservation Park under the control of the WA Government.</p>
<p>Improved valuation, pricing and incentive mechanisms should be promoted.</p>	<p>CSIRO contributed to the Garnaut Climate Change Review through its Energy Transformed and Climate Adaptation Flagships and the Division of Marine and Atmospheric Research. CSIRO contributed through climate change and emissions modelling in areas such as climate model uncertainties, carbon cycle dynamics, economic modelling, carbon trading, climate scenarios, agricultural and other impacts, and the costs of electricity generation technologies. CSIRO also made submissions to issue papers on topics such as land use for agriculture and forestry; climate change science; low-emissions technologies; emissions trading, and transport, planning and the built environment (see www.garnautreview.org.au/CA25734E0016A131/pages/all-reports--resources.html).</p>

Effects of CSIRO's activities on the environment

The Environmental Sustainability Strategy (ESS) outlines CSIRO's key organisational goals of: carbon neutrality; halving mains water use; and halving waste to landfill by 2015. A comprehensive report of our performance against the ESS can be found in the Health, Safety and Environment Annual Report which is available at www.csiro.au/resources/HSEReport.html. A summary of our environmental performance in 2010–11 follows.

Over the last five years, total electricity and gas consumption have remained relatively constant, despite the transfer of operational management of the Canberra Deep Space Communications Complex (ACT) to CSIRO in early 2010. During 2010–11, CSIRO consumed an estimated 682 Terajoules (TJ) of electricity and gas (see Table 4.2).

A number of sites recorded decreased energy use, including the Australian Animal Health Laboratories (AAHL, Vic) and Newcastle (NSW). Energy consumption at AAHL has decreased by six per cent, attributed to the gradual implementation of new plant and energy efficiency measures over several years.

Table 4.2: Purchases of electricity and gas

Indicator	2006–07	2007–08	2008–09	2009–10 ¹	2010–11 ²
Electricity (TJ)	445	431	438	438	439
Natural gas (TJ)	227	234	245	229	243
Accredited GreenPower (TJ)	40	43	56	74	77

¹ Electricity consumption reported last year has been revised following the resolution of metering issues at the Black Mountain site (ACT).

² Data are best available at time of publication.

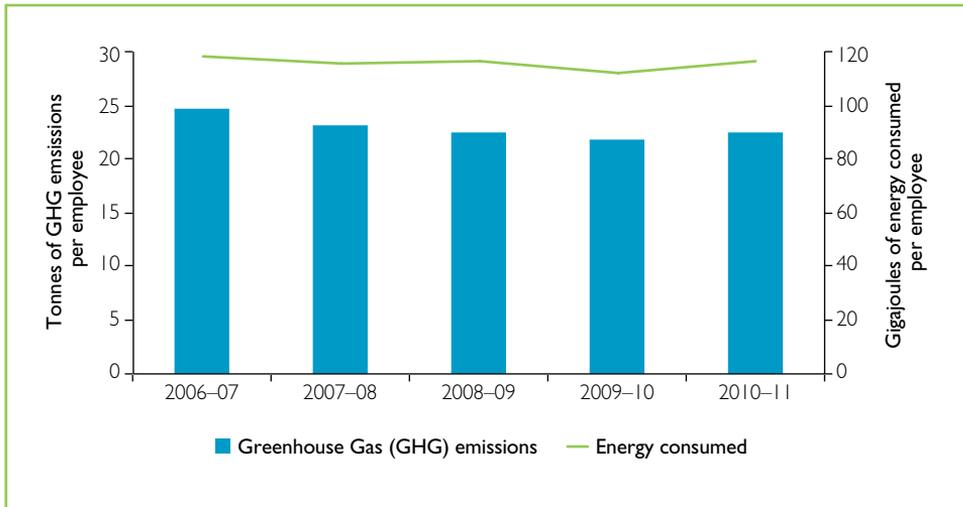
CSIRO's 2010–11 electricity and gas consumption generated an estimated 131 kilotonnes of GHG emissions¹ (see Table 4.3). This figure does not take into account that CSIRO procures 18 per cent GreenPower equivalent to an emissions reduction of approximately 22 kt CO₂-e this year.

Table 4.3: Greenhouse gas emissions from electricity and gas consumption

Indicator	2006–07	2007–08	2008–09	2009–10	2010–11
Greenhouse gases produced (kt)	140	134	132	130	131
Greenhouse gases produced, adjusted for GreenPower (kt)	Not available		116	109	109

CSIRO's emissions and energy intensity increased slightly in 2010–11 (see Figure 4.2). With energy consumption comparable to last year, a slight fall in the number of full-time equivalent employees resulted in the increased intensity in greenhouse gas emissions and energy consumption.

¹ Expressed as kt CO₂-e – carbon dioxide equivalent.

Figure 4.2: Greenhouse gas emissions and energy use per employee

Water consumption has been reduced through activities such as the implementation of water-efficient fixtures and improved operation and maintenance of plant such as cooling towers. During 2010–11, CSIRO sites consumed approximately 392 megalitres (ML) of mains water (see Table 4.4).

In alignment with the Environmental Sustainability Strategy, CSIRO currently reports on its mains water consumption

only. CSIRO is actively improving its data on non-mains water usage and intends to report on total water consumption next year. CSIRO is increasing its use of non-mains water by harvesting rainwater, reverse osmosis reject water and other alternative water sources for reuse in flushing toilets and irrigation of heritage-listed trees and other landscaping (see case study on page 103).

Table 4.4: CSIRO mains water consumption

Indicator	2006–07	2007–08	2008–09	2009–10 ¹	2010–11
Purchased mains water (ML)	Not available	427	406	426	392

¹ Revised from 415 ML to 426 ML because of missing invoice data that was later found.

CSIRO commenced waste trials at its sites in South Australia and Western Australia with a focus on significantly reducing waste to landfill. Waste and recycling stations were installed at strategic locations across the sites that allow staff to sort waste at source into recyclable materials, compostable wastes and wastes that can be used for alternative fuel production.

In further efforts to reduce waste to landfill, an e-waste recycling program was undertaken in early 2011 that resulted in the collection and recycling of around 70 tonnes of obsolete computers, televisions, fridges and other electronic waste.



CSIRO's rainwater harvesting system

As part of CSIRO's goal to reduce its reliance on mains water, significant rainwater tank systems were installed at its sites in Werribee (Victoria) and the Waite campus (South Australia) by the CSIRO Property Services team.

At Werribee, rainwater will be captured from approximately 2,000 square metres of the roof area, which totals 5,500 square metres. The tanks are capable of holding 160,000 litres of water, which will be used to supply the toilet cistern on site.

Initially three buildings, the main office/laboratory complex, the Process Engineering Centre and the Conference Centre, were connected to the tanks. It is estimated that nearly 900,000 litres of drinking water will be saved each year (assumptions: 36 cisterns; ten flushes/day; five days/week; 50 weeks/year; ten litres/flush).

In addition, the toilets were upgraded with slimline cisterns and fittings and the tanks were switched from the mains supply to

the rainwater from the tanks. As required by the local water authority, the tank waterlines were setup with a mains supply cut-over system.

Another significant rainwater capture system was installed at CSIRO's Waite campus in Adelaide. The total tank capacity is approximately 128,000 litres which collects rainwater from a number of buildings and from a reverse osmosis purifying unit.

The tank system is important for the irrigation of heritage trees on the nature strip at the front of the CSIRO buildings at the Waite campus. In addition, the tanks will serve the toilet facilities in selected buildings.



Some of the rainwater tanks located at CSIRO's Werribee – Sneydes Road site. Credit: Murray Brown

Heritage protection

The CSIRO Heritage Strategy is used as the basis for the management of actions and activities associated with CSIRO's heritage places. The heritage program provides for recording and reporting of management, maintenance and expenditure on CSIRO's heritage assets. Heritage values are assessed and incorporated into the development proposal prior to any development activity occurring on CSIRO owned or controlled property.

During 2010–11, heritage assessments were undertaken at a number of CSIRO sites, including Hobart and Sandy Bay sites in Tasmania and four New South Wales sites that are used for radio astronomy purposes (Marsfield, Parkes, Narrabri and Mopra). Heritage values were identified at Parkes and Narrabri. The radio telescope at Parkes has Commonwealth significance and Narrabri has both Commonwealth and Indigenous cultural values. In 2011–12, heritage assessments and further work will occur at Floreat (WA), Parkville (Vic), Pullenvale (Qld), and Black Mountain (ACT).

Westridge House in Canberra, a Commonwealth listed heritage property, was sold during the year. A heritage management plan and covenants were established for the ongoing protection of the property's heritage values.

Our people

CSIRO looks to its staff to support its values and to work in a collaborative and positive way to achieve the Organisation's mission and purpose. CSIRO seeks to attract the best minds and to be a place where creativity and innovation can flourish. We provide the environment, facilities and opportunities people need to respond to national challenges.

CSIRO's People Policy confirms our commitment to developing and supporting our staff, and CSIRO's Human Resources function provides support and leadership on people issues to leaders and staff across CSIRO. The goal is to develop high-performing teams working across the Organisation's boundaries. Two key themes are:

- nurturing CSIRO's innovative culture by fostering a safe environment where innovation, collaboration, flexibility and performance flourish
- working effectively and efficiently by using common systems, structures and improved processes to support CSIRO's operations.

Enterprise agreement

Enterprise Agreements set the terms and conditions of employment for CSIRO staff. The CSIRO Enterprise Agreement 2011–14 was negotiated with relevant unions and staff bargaining agents. It came into operation on 7 July 2011 following formal approval processes and a staff vote. This new Agreement will reach its nominal expiry date in August 2014.

Throughout 2010–11, CSIRO has used focus groups, reference groups and other qualitative methodologies to engage with staff in a focused, topic specific way. These activities provided valuable insights to support the development of CSIRO's 2011–15 Strategy and the finalisation of the new Enterprise Agreement.

Learning and development

CSIRO believes that all officers should have the opportunity to participate in relevant learning, development and training activities aimed at improving individual and team performance, skills and knowledge, and the effectiveness of CSIRO. Under our new Enterprise Agreement, all staff will have the opportunity to participate in at least five days learning, development and/or training each year.

A new national orientation and induction program was introduced this year, providing significant improvements in supporting new employees transitioning into CSIRO. An introductory project management program was also introduced and an advanced module is in production.

Twenty-three high potential leaders participated in CSIRO's senior leadership program, *'Leading the Research Enterprise'*. The leadership credentials of the program have been recognised by the Australian Graduate School of Management (AGSM). Successful participants are now awarded an AGSM Certificate in Executive and Management Development. Fifty emerging leaders participated in the CSIRO *'New People Leader Program'* to support their transition into leadership roles.

The first program in the new *Impact from Science* stream, *Publishing with Impact*, was delivered in partnership with CSIRO PUBLISHING. There have been 41 participants to date. A further series of programs addressing communication and statistical analysis has been developed and will commence in 2011–12.

Equal employment opportunity

CSIRO is developing a new Workplace Diversity Plan to build on the 2009–11 Workplace Plan. The new Plan will

seek to capture the full benefits of a broadly diverse workforce and will include awareness raising on diversity issues, and promotion of the suite of family friendly work arrangements.

CSIRO's Indigenous Engagement Strategy, which aims to increase Indigenous participation in CSIRO's research and development agenda and activities, continues to be progressed (see page 17). The Indigenous Employment Strategy aims to increase the employment of Indigenous peoples through the implementation of several new employment programs and targeted approaches. CSIRO's commitment is reflected in the CSIRO Enterprise Agreement.

Commonwealth Disability Strategy

Since 1994, Commonwealth departments and agencies have reported on their performance as policy adviser, purchaser, employer, regulator and provider under the Commonwealth Disability Strategy. In 2007–08, reporting on the employer role was transferred to the Australian Public Service Commission's *State of the Service Report* and the *APS Statistical Bulletin*. These reports are available at www.apsc.gov.au. From 2010–11, departments and agencies are no longer required to report on these functions.

Staff demographics

CSIRO staff are employed under section 32 of the *Science and Industry Research Act 1949*. At 30 June 2011, CSIRO had a total of 6,514 staff, which has an equivalent full-time (EFT) of 5,780.

Table 4.5 shows the number of staff employed in different functional areas and Table 4.6 shows staff by state. Overall, as planned, the total number of staff decreased by 2.5 per cent (166) over the last 12 months. The largest decline (13 per cent) was in the

number of Communication and Information Services staff. Voluntary staff turnover remains low with a three year average of 4.35 per cent. The proportion of female staff in CSIRO remained stable at 39 per cent but the proportion of female research staff increased from 23 to 24 per cent (up from 19 per cent in 2005–06).

Table 4.5: Staff numbers (headcount) as at 30 June

Principal enterprise functions	2006–07	2007–08	2008–09	2009–10	2010–11	% Female for 2010–11
Research Scientists	1,688	1,727	1,837	1,907	1,865	24
Research Project Staff	2,199	2,246	2,215	2,241	2,166	41
Senior Specialists	25	13	13	15	12	25
Research Management	188	194	176	161	165	8
Research Consulting	28	29	26	34	40	18
Technical Services	581	542	545	630	643	12
Communication and Information Services	384	402	407	429	375	63
General Services	75	66	51	48	56	46
Administrative Support*	1,046	1,082	1,112	1,075	1,048	75
General Management	117	122	128	140	144	28
Total headcount	6,331	6,423	6,510	6,680	6,514	39
EFT	5,695	5,768	5,866	5,956	5,780	36

* *Administrative Support includes: Staff who provide science-based administrative and management services and systems.*

Table 4.6: Staff numbers by state as at 30 June

State	Metropolitan	Regional	Total
ACT	1,407	0	1,407
NSW	794	327	1,121
NT	26	10	36
QLD	724	131	855
SA	387	0	387
TAS	382	0	382
VIC	1,348	456	1,804
WA	516	6	522
Grand total	5,576	938	6,514



Facebook fans take on titanium challenge

Social media provided an effective means of driving interest in the inaugural CSIRO Titanium Challenge.

The Titanium Challenge aimed to stimulate awareness in Australian university undergraduates about titanium, the potential for additive manufacturing, and CSIRO's work in this area.

A series of posts on the CSIRO Facebook Fan page engaged with fans and encouraged them to visit the CSIRO Challenge webpage. Cross posting on CSIRO's Twitter account @csironews as well on the Facebook Fan Page of Engineers Australia helped spread the word.

Social media proved effective in directing traffic to the Challenge webpage – two thirds of the 800-odd hits on the page came via Facebook, and about 150 via Twitter.

The Challenge attracted entries from students of industrial design and mechanical and materials engineering in three Australian states.

A multidisciplinary judging panel from government, industry, and academia assessed the entries for appropriate use of titanium and of additive manufacturing, innovativeness and a supporting business case. The judges applauded the creativity and sophistication of the entries.

Callaghan Forsyth, from Swinburne University, won the challenge (and an Apple MacBook Pro) with his design for an advanced radiator. A prototype of his design will be produced by Formero Pty Ltd, an Australian product development and manufacturing service provider.

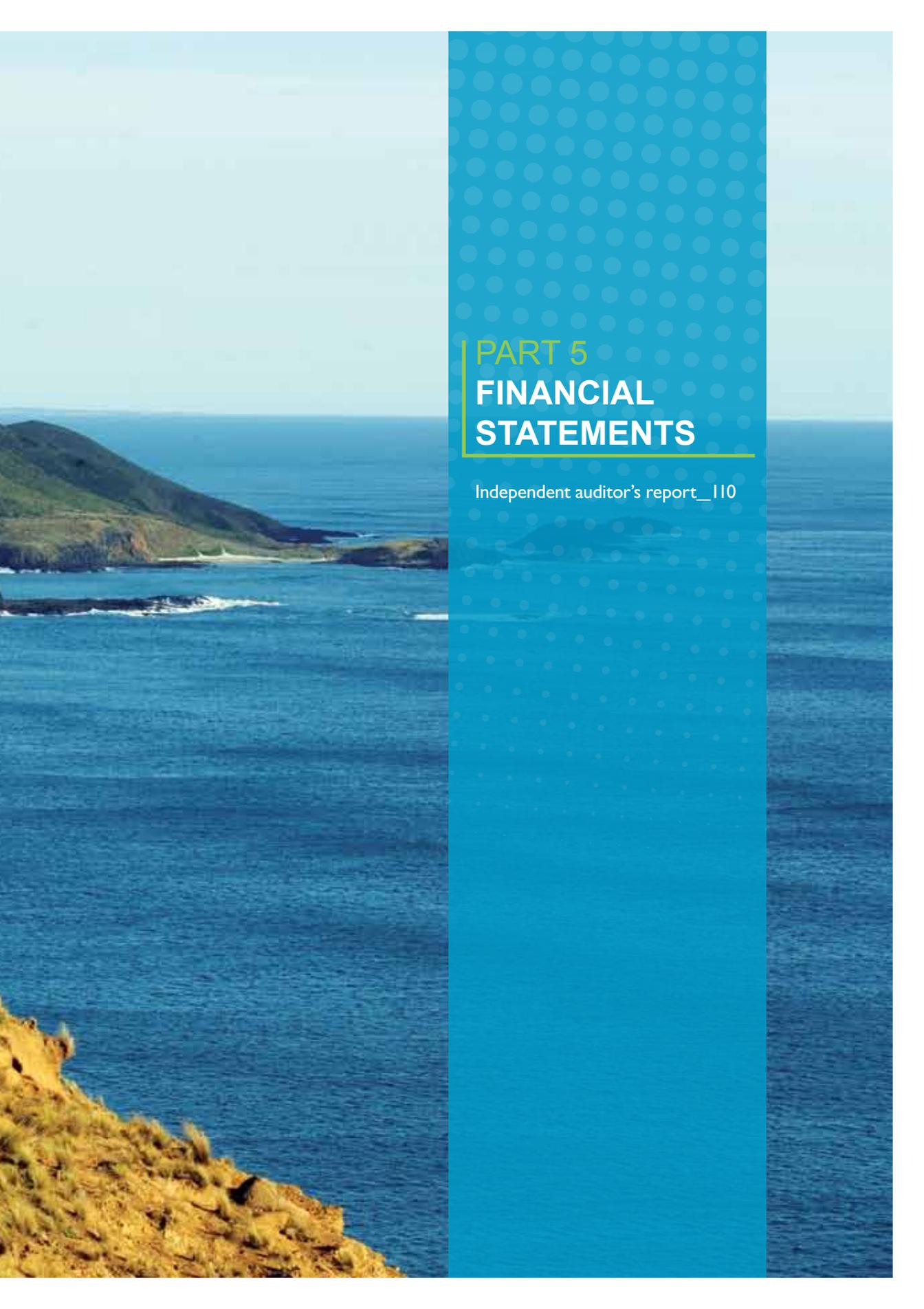
The runner-up, a design for a Prandtl-attack tube, was developed by Michael Bowen, a mechanical engineering student from The University of Adelaide.

CSIRO will run the Titanium Challenge again in 2012.



The winning design of an advanced radiator; created by industrial design student Callaghan Forsyth.
Credit: Callaghan Forsyth





PART 5
FINANCIAL
STATEMENTS

Independent auditor's report__110



INDEPENDENT AUDITOR'S REPORT

To the Minister for Innovation, Industry, Science and Research

I have audited the accompanying financial statements of the Commonwealth Scientific and Industrial Research Organisation and consolidated entity for the year ended 30 June 2011, which comprise: a Statement by the Chairman of the Board, Chief Executive and Chief Financial Officer; the Statement of Comprehensive Income; Balance Sheet; Statement of Changes in Equity; Cash Flow Statement; Schedule of Commitments; Schedule of Contingencies; Schedule of Asset Additions; and Notes to and Forming Part of the Financial Statements, including a Summary of Significant Accounting Policies and other explanatory information. The consolidated entity comprises the Commonwealth Scientific and Industrial Research Organisation and the entities it controlled at the year's end, or from time to time during the financial year.

The Board Members' Responsibility for the Financial Statements

The members of Board of the Commonwealth Scientific and Industrial Research Organisation are responsible for the preparation of the financial statements that give a true and fair view in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*, including the Australian Accounting Standards, and for such internal control as the directors determine is necessary to enable the preparation of the financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

My responsibility is to express an opinion on the financial statements based on my audit. I have conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. These auditing standards require that I comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Commonwealth Scientific and Industrial Research Organisation's preparation of the financial statements that give a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not

for the purpose of expressing an opinion on the effectiveness of the Commonwealth Scientific and Industrial Research Organisation's internal control. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made by the members of the Board, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Independence

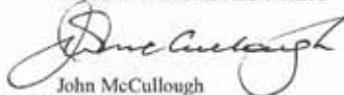
In conducting my audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate the requirements of the Australian accounting profession.

Opinion

In my opinion, the financial statements of the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity:

- (a) have been prepared in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*, including the Australian Accounting Standards; and
- (b) give a true and fair view of the matters required by the Finance Minister's Orders including the Commonwealth Scientific and Industrial Research Organisation's and the consolidated entity's financial positions as at 30 June 2011 and of their financial performance and cash flows for the year then ended.

Australian National Audit Office



John McCullough
Executive Director
Delegate of the Auditor-General

Canberra
24 August 2011

**COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
STATEMENT BY THE CHAIRMAN OF THE BOARD, CHIEF EXECUTIVE AND CHIEF FINANCIAL OFFICER**

In our opinion, the attached financial statements for the year ended 30 June 2011 are based on properly maintained financial records and give a true and fair view of the matters required by the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*, as amended.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Group will be able to pay its debts as and when they become due and payable.

This Statement is made in accordance with a resolution of the Board Members.



Simon McKeon
Chairman of the Board
24 August 2011



Megan Clark
Chief Executive and Board Member
24 August 2011



Hazel Bennett
Chief Finance Officer
24 August 2011

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF COMPREHENSIVE INCOME
For the period ended 30 June 2011

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
EXPENSES					
Employee benefits	3.1	728 874	685 600	728 670	685 330
Supplier expenses	3.2	369 759	383 662	369 403	533 939
Depreciation and amortisation	3.3	101 728	95 659	101 728	95 659
Finance costs	3.4	3 266	3 463	3 266	3 463
Write-down and impairment of assets	3.5	25 601	4 476	25 601	4 476
Net foreign exchange losses	3.6	2 448	5 433	2 448	5 433
Net loss from sale of assets	3.7	-	4 813	-	4 813
Other expenses	3.8	-	31	-	-
Total expenses		1 231 676	1 183 137	1 231 116	1 333 113
LESS:					
OWN-SOURCE INCOME					
Own-source revenue					
Sale of goods and rendering of services	4.1	409 676	377 919	418 077	380 422
Interest	4.2	15 174	10 422	8 729	7 222
Rental income	4.3	7 826	8 562	7 826	8 562
Royalties	4.4	29 237	42 985	29 237	42 985
Other revenues	4.5	30 766	15 587	31 457	16 149
Total own-source revenues		492 679	455 475	495 326	455 340
Gains					
Net gain from sale of assets	4.6	4 940	-	4 940	-
Realisation of fair value gain reserve	4.7	140	3 866	140	3 866
Total gains		5 080	3 866	5 080	3 866
Total own-source income		497 759	459 341	500 406	459 206
Net cost of service		(733 917)	(723 796)	(730 710)	(873 907)
Revenues from Government	4.8	720 415	704 884	720 415	704 884
Share of net operating surplus/(deficit) of joint venture accounted for using the equity method	8	(184)	30	(184)	30
Surplus on continuing operation		720 231	704 914	720 231	704 914
Surplus/(Deficit) attributable to the Australian Government		(13 686)	(18 882)	(10 479)	(168 993)
OTHER COMPREHENSIVE INCOME					
Increase/(decrease) in asset revaluation reserves	5.1	227 503	-	227 503	-
Increase/(decrease) in other reserves	5.2	14 352	16 754	14 352	16 754
Total other comprehensive income		241 855	16 754	241 855	16 754
Total comprehensive income/(loss) attributable to the Australian Government		228 169	(2 128)	231 376	(152 239)

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
BALANCE SHEET
As at 30 June 2011

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Financial Assets					
Cash and cash equivalents	6	308 478	231 293	161 490	132 722
Trade and other receivables	7	88 988	102 138	88 488	100 546
Investments accounted for using the equity method	8	389	573	389	573
Other investments	9	31 969	32 641	31 969	32 641
Total financial assets		429 824	366 645	282 336	266 482
Non-Financial Assets					
Land and buildings	10	1 598 603	1 366 747	1 598 603	1 366 747
Plant and equipment	11	381 145	330 317	381 145	330 317
Investment properties	12	50 950	50 665	50 950	50 665
Intangibles	13	28 346	26 806	28 346	26 806
Inventories	14	1 010	1 153	1 010	1 153
Other non-financial assets	15	40 862	42 037	40 862	42 037
Total non-financial assets		2 100 916	1 817 725	2 100 916	1 817 725
Properties held for sale	16	11 865	47 913	11 865	47 913
TOTAL ASSETS		2 542 605	2 232 283	2 395 117	2 132 120
LIABILITIES					
Payables					
Suppliers	17	84 195	93 742	83 750	93 742
Other payables	18	153 148	157 755	153 531	208 225
Total payables		237 343	251 497	237 281	301 967
Interest Bearing Liabilities					
Leases	19	65 200	69 256	65 200	69 256
Deposits	20	6 472	2 462	6 472	2 462
Total interest bearing liabilities		71 672	71 718	71 672	71 718
Provisions					
Employee provisions	21	205 564	189 111	205 564	189 111
Total provisions		205 564	189 111	205 564	189 111
TOTAL LIABILITIES		514 579	512 326	514 517	562 796
NET ASSETS		2 028 026	1 719 957	1 880 600	1 569 324
EQUITY					
Contributed equity		116 690	36 790	116 490	36 590
Assets revaluation reserves		1 321 215	1 093 712	1 321 215	1 093 712
Other reserves		775	(13 577)	775	(13 577)
Retained surplus		589 346	603 032	442 120	452 599
TOTAL EQUITY		2 028 026	1 719 957	1 880 600	1 569 324

The above Balance Sheet should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF CHANGES IN EQUITY – CONSOLIDATED
For the period ended 30 June 2011

	Retained Surplus		Asset Revaluation Reserves		Other Reserves		Contributed Equity/Capital		Total Equity	
	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Opening balance	603 032	621 914	1 093 712	1 093 712	(13 577)	(30 331)	36 790	7 870	1 719 957	1 693 165
Comprehensive income										
Other comprehensive income	-	-	227 503	-	14 352	16 754	-	-	241 855	16 754
Surplus/(deficit) for the period	(13 686)	(18 882)	-	-	-	-	-	-	(13 686)	(18 882)
Total comprehensive income	(13 686)	(18 882)	227 503	-	14 352	16 754	-	-	228 169	(2 128)
Transactions with owners										
Contributions by owners	-	-	-	-	-	-	79 900	28 920	79 900	28 920
Equity injection	-	-	-	-	-	-	-	-	-	-
Closing balance	589 346	603 032	1 321 215	1 093 712	775	(13 577)	116 690	36 790	2 028 026	1 719 957

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF CHANGES IN EQUITY – CSIRO

For the period ended 30 June 2011

	Retained Surplus		Asset Revaluation Reserves		Other Reserves		Contributed Equity/Capital		Total Equity	
	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Opening balance	452 599	621 592	1 093 712	1 093 712	(13 577)	(30 331)	36 590	7 670	1 569 324	1 692 643
Comprehensive income	-	-	-	-	-	-	-	-	-	-
Other comprehensive income	(10 479)	(168 993)	227 503	-	14 352	16 754	-	-	241 855	16 754
Surplus/(deficit) for the period	(10 479)	(168 993)	-	-	-	-	-	-	(10 479)	(168 993)
Total comprehensive income	(10 479)	(168 993)	227 503	-	14 352	16 754	-	-	231 376	(152 239)
Transactions with owners	-	-	-	-	-	-	-	-	-	-
Contributions by owners	-	-	-	-	-	-	79 900	28 920	79 900	28 920
Equity injection	-	-	-	-	-	-	-	-	-	-
Closing balance	442 120	452 599	1 321 215	1 093 712	775	(13 577)	116 490	36 590	1 880 600	1 569 324

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
CASH FLOW STATEMENT
For the period ended 30 June 2011

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
OPERATING ACTIVITIES					
Cash received					
Receipts from Government		720 415	704 884	720 415	704 884
Goods and services		568 704	564 444	527 574	566 828
Interest		16 463	9 841	8 946	8 484
Net GST received		10 579	14 289	9 802	14 407
Deposits		3 794	-	3 794	-
Total cash received		1 319 955	1 293 458	1 270 531	1 294 603
Cash used					
Employees		709 218	680 354	708 816	679 163
Suppliers		478 303	453 760	477 699	554 136
Finance costs		3 094	3 275	3 093	3 275
Deposits		-	2 966	-	2 966
Total cash used		1 190 615	1 140 355	1 189 608	1 239 540
Net cash from operating activities	22	129 340	153 103	80 923	55 063
INVESTING ACTIVITIES					
Cash received					
Proceeds from sale of property, plant and equipment		46 407	2 279	46 407	2 279
Proceeds from sale of equity investments and intellectual property		6 690	49 941	6 690	49 941
Total cash received		53 097	52 220	53 097	52 220
Cash used					
Purchase of property, plant and equipment		168 477	155 957	168 477	155 957
Purchase of equity investments		7 745	6 016	7 745	6 016
Other selling costs		4 874	735	4 874	735
Total cash used		181 096	162 708	181 096	162 708
Net cash used by investing activities		(127 999)	(110 488)	(127 999)	(110 488)
FINANCING ACTIVITIES					
Cash received					
Contributed equity		79 900	28 920	79 900	28 920
Total cash received		79 900	28 920	79 900	28 920
Cash used					
Other cash used		4 056	4 929	4 056	4 929
Total cash used		4 056	4 929	4 056	4 929
Net cash from financing activities		75 844	23 991	75 844	23 991
Net increase/(decrease) in cash held		77 185	66 606	28 768	(31 434)
Cash and cash equivalents at the beginning of the reporting period		231 293	164 687	132 722	164 156
Cash and cash equivalents at end of the reporting period	6	308 478	231 293	161 490	132 722

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
SCHEDULE OF COMMITMENTS
As at 30 June 2011

	Consolidated		CSIRO	
	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
BY TYPE				
Capital commitments payable				
Land and buildings ¹	12 010	14 095	12 010	14 095
Plant and equipment ²	108 560	7 912	108 560	7 912
Investments ³	5 471	2 907	5 471	2 907
Total capital commitments payable	126 041	24 914	126 041	24 914
Other commitments payable				
Operating leases ⁴	277 994	308 164	277 994	308 164
Research and development commitments ⁵	663 405	524 217	663 405	524 217
Other commitments ⁶	38 597	28 813	38 597	28 813
Total other commitments payable	979 996	861 194	979 996	861 194
Commitments receivable				
Research and development commitments ⁵	(411 454)	(357 519)	(411 454)	(357 519)
Other receivables ⁶	(15 823)	(7 117)	(15 823)	(7 117)
Total commitments receivable	(427 277)	(364 636)	(427 277)	(364 636)
Net commitments by type	678 760	521 472	678 760	521 472
BY MATURITY				
Capital commitments payable				
One year or less	64 254	18 020	64 254	18 020
From one to five years	61 787	6 894	61 787	6 894
Total capital commitments payable	126 041	24 914	126 041	24 914
Operating lease commitments payable				
One year or less	32 655	34 864	32 655	34 864
From one to five years	123 309	127 765	123 309	127 765
Over five years	122 030	145 535	122 030	145 535
Total operating lease commitments payable	277 994	308 164	277 994	308 164
Other commitments payable				
One year or less	397 739	348 582	397 739	348 582
From one to five years	304 263	204 448	304 263	204 448
Total other commitments payable	702 002	553 030	702 002	553 030
Commitments receivable				
One year or less	(267 087)	(232 879)	(267 087)	(232 879)
From one to five years	(159 224)	(130 322)	(159 224)	(130 322)
Over five years	(966)	(1 435)	(966)	(1 435)
Total commitments receivable	(427 277)	(364 636)	(427 277)	(364 636)
Net commitments by maturity	678 760	521 472	678 760	521 472

SCHEDULE OF COMMITMENTS (cont)

1. Land and building commitments are outstanding contractual payments for buildings under construction.
2. Plant and equipment commitments are for the purchase of plant and equipment.
3. Investment commitments are for additional contributions to equity investments.
4. Operating leases are effectively non-cancellable and comprise:

Nature of lease	General description of leasing arrangement
Leases for office and scientific research accommodation	Lease payments are subject to an annual increase in accordance with the terms of agreement, e.g. upward movements in the Consumer Price Index. The accommodation leases are still current and each may be renewed at the Group's option following a once-off adjustment of rentals to current market levels.
Leases for motor vehicles	No contingent rentals exist. There are no purchase options available to the Group.
Leases for computer equipment	The lessor provides computer equipment designated as necessary in the supply contract for a general period of 2–3 years.

5. Research and development commitments payable and receivable are Agreements Equally Proportionately Unperformed for research and development contracts.
6. Other commitments payable and receivable are for services and property leases respectively.
7. Commitments are GST inclusive where relevant.

SCHEDULE OF CONTINGENCIES

As at 30 June 2011

	Consolidated		CSIRO	
	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Contingent assets				
Claims for damages or costs	-	-	-	-
Total contingent assets	-	-	-	-
Contingent liabilities				
Claims for damages or costs	300	250	300	250
CSIRO has a financial guarantee on a bank loan	17	-	17	-
Total contingent liabilities	317	250	317	250
Net contingent assets/(liabilities)	(317)	(250)	(317)	(250)

Details of each class of contingent liabilities and contingent assets listed above are disclosed in Note 23:

Contingent Liabilities and Assets, along with information on contingencies that cannot be quantified.

No contingent liabilities were reported by the CRCs in which the Group is a participant.

CONSOLIDATED FINANCIAL STATEMENTS
SCHEDULE OF ASSETS ADDITION – CSIRO
 For the period ended 30 June 2011

The following non-financial non-current assets were added in 2010–11:

	Land \$'000	Buildings \$'000	Investment Properties \$'000	Plant & equipment \$'000	Intangibles \$'000	Total \$'000
By purchase - Government funding	-	64 001	-	94 622	4 656	163 279
By purchase - donated funds	-	-	-	-	-	-
By purchase - other	-	-	-	-	-	-
By finance lease	-	-	-	-	-	-
Assets received as gifts/donations	-	-	-	-	-	-
Total additions	-	64 001	-	94 622	4 656	163 279

The following non-financial non-current assets were added in 2009–10:

	Land \$'000	Buildings \$'000	Investment Properties \$'000	Plant & equipment \$'000	Intangibles \$'000	Total \$'000
By purchase - Government funding	145	79 313	-	72 594	3 276	155 328
By purchase - donated funds	-	-	-	-	-	-
By purchase - other	-	-	-	-	-	-
By finance lease	3 340	6 960	-	-	-	10 300
Assets received as gifts/donations	-	-	-	-	-	-
Total additions	3 485	86 273	-	72 594	3 276	165 628

CONSOLIDATED FINANCIAL STATEMENTS
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS
For the period ended 30 June 2011

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Other investments	9	139
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Plant and equipment	11	141
Investment properties	12	144
Intangibles	13	144
Inventories held for sale	14	146
Other non-financial assets	15	146
Properties held for sale	16	146
Suppliers	17	147
Other payables	18	147
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CONSOLIDATED FINANCIAL STATEMENTS
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS
For the year ended 30 June 2011

Note 1 Summary of significant accounting policies

1.1 Objective of the Organisation and its Subsidiaries (the Group)

CSIRO is an Australian Government controlled entity. It is a research enterprise that aims to deliver great science and innovative solutions for industry, society and the environment.

CSIRO is structured to meet the following outcome:

Outcome: Innovative scientific and technology solutions to national challenges and opportunities to benefit industry, the environment and the community, through scientific research and capability development, services and advice.

The continued existence of CSIRO in its present form and with its present programs is dependent on Government policy and on continuing funding by Parliament for the CSIRO's administration and programs.

For the purposes of AASB 127 *Consolidated and Separate Financial Statements* consolidated accounts are prepared to include subsidiaries (refer Note 1.5).

1.2 Basis of Preparation of the Financial Statements

The financial statements are required by Clause 1(b) of Schedule 1 to the *Commonwealth Authorities and Companies Act 1997* and are general purpose financial statements.

The Commonwealth Scientific and Industrial Research Organisation and the Group's Consolidated Financial Statements have been prepared in accordance with:

- Finance Minister's Orders (FMOs) for reporting periods ending on or after 1 July 2010; and
- Australian Accounting Standards and Interpretations issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period.

The financial statements have been prepared on an accrual basis and in accordance with the historical cost convention, except for certain assets and liabilities at fair value. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

The financial statements are presented in Australian dollars and values are rounded to the nearest thousand dollars unless otherwise specified.

Unless an alternative treatment is specifically required by an Accounting Standard or the FMOs, assets and liabilities are recognised in the balance sheet when and only when it is probable that future economic benefits will be required and the amounts of the assets or liabilities can be reliably measured. However, assets and liabilities arising under Agreements Equally Proportionately Unperformed are not recognised unless required by an accounting standard. Liabilities and assets that are unrecognised are reported in the schedule of commitments or the schedule of contingencies.

Unless alternative treatment is specifically required by an Accounting Standard, income and expenses are recognised in the statement of comprehensive Income when, and only when, the flow, consumption or loss of economic benefits has occurred and can be reliably measured.

1.3 Significant Accounting Judgements and Estimates

In the process of applying the accounting policies listed in this note, CSIRO has made the following judgements that have the most significant impact on the amounts recorded in the financial statements:

- The fair value of properties classified as 'properties held for sale' and 'investment properties' has been taken to be the market value of similar properties as determined by an independent valuer and CSIRO registered valuer.

- The fair value of land which will continue to be used for research activities, and buildings held for specialised purposes and where there is no readily available market price, fair value has been taken to be 'existing use value' and 'depreciated replacement cost' respectively, as determined by an independent valuer and CSIRO's registered valuer.
- The fair value of plant and equipment has been taken to be the 'depreciated replacement cost' as determined by an independent valuer.
- The fair value of investments in unlisted companies is based on the generally accepted valuation guidelines 'International Private Equity and Venture Capital Valuation Guidelines'.
- Gains or losses arising from changes in fair value are recognised in reserves or equity with the exception of impairment. Investments in listed companies have been assessed for impairment and the decline in fair value does not represent impairment. Hence, the total decline in fair value is recognised directly in reserves or equity.

1.4 New Australian Accounting Standards

Adoption of new Australian Accounting Standard requirements

No Accounting Standard has been adopted earlier than the application date as stated in the standard.

CSIRO has reviewed new standards, revised standards and interpretations/amending standards issued prior to the signing of the financial statements and considers that none of these have had a material financial impact.

Future Australian Accounting Standard requirements

The following new standard was issued by the Australian Accounting Standards Board prior to the signing of the financial statements, which may have a financial impact on CSIRO for future reporting periods:

- AASB9 *Financial Instruments* released in December 2009 includes requirements for the classification and measurement of financial assets resulting from the first part of Phase 1 of the International Accounting Standards Board's project to replace IAS 39 *Financial Instruments: Recognition and Measurement* (AASB 139 *Financial Instruments: Recognition and Measurement*). These requirements are intended to improve and simplify the approach for classification and measurement of financial assets compared with the requirements of AASB 139. The main changes in AASB 9 relevant to CSIRO are:
 - Financial assets are classified based on (a) the objective of the entity's business model for managing the financial assets; and (b) the characteristics of the contractual cash flows. This replaces the numerous categories of financial assets in AASB 139, each of which had its own classification criteria.
 - AASB 9 allows an irrevocable election on initial recognition to present gains and losses on investments in equity instruments that are not held for trading in other comprehensive income.
 - Financial assets can be designated and measured at fair value through profit or loss at initial recognition if doing so eliminates or significantly reduces a measurement or recognition inconsistency that would arise from measuring assets or liabilities, or recognising the gains and losses on them, on different bases.
- The effective date for the application of AASB 9 is for annual reporting periods beginning on or after 1 January 2013. Early adoption of the standard is not permitted for CSIRO in 2010-11.

Other new standards, revised standards and interpretations/amending standards that were issued prior to the signing of the financial statements and are applicable to the future reporting period are not expected to have a future financial impact.

1.5 Consolidation

AASB 127 (Consolidated and Separate Financial Statements) requires a parent entity that is in a group to present consolidated financial statements that consolidate its investments in controlled entities in accordance with AASB 127. The parent and controlled entities apply consistent accounting policies and the effects of all transactions and balances between the entities are eliminated in full. The financial statements of the controlled entities are prepared for the same reporting period as the parent entity.

The consolidated financial statements incorporate the assets and liabilities of all entities controlled by CSIRO as at 30 June 2011 and the results of the controlled entities for the year then ended.

1.6 Revenue

Revenue from sale of goods is recognised when:

- the risks and rewards of ownership have been transferred to the buyer
- the entity retains no managerial involvement or effective control over the goods
- the revenue and transaction costs incurred can be reliably measured
- it is probable that the economic benefits associated with the transaction will flow to the entity.

Revenue from rendering of services is recognised by reference to the stage of completion of contracts at the reporting date. The revenue is recognised when:

- the amount of revenue, stage of completion and transaction costs incurred can be reliably measured
- it is probable that the economic benefits associated with the transaction will flow to the entity.

The stage of completion of contracts at the reporting date is determined by reference to the proportion that costs incurred to date bear to the total costs of the transaction. The balances of contract research and development activities in progress are accounted as either contract research work in progress (Note 15), being the gross unbilled amount expected to be collected from clients for contract research and services performed as at 30 June 2011, or contract research revenue received in advance (Note 18), where revenue for contract research and services received and/or billed exceeded revenue earned.

Receivables for goods and services, which have 30 day terms, are recognised at the nominal amounts due less any impairment allowance. Collectability of debts is reviewed as at end of reporting period. Allowances are made when collectability of the debt is no longer probable.

Interest revenue is recognised using the effective interest method as set out in AASB 139 *Financial Instruments: Recognition and Measurement*.

Resources 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.

Royalty revenue is recognised on an accrual basis in accordance with the substance of the relevant royalty agreements.

Revenue from legal settlements related to intellectual property is recognised on an accrual basis in accordance with the substance of the relevant licensing agreements.

Revenues from Government

Funding received from the Australian Government Department of Innovation, Industry, Science and Research (appropriated to CSIRO as a CAC Act body payment item) is recognised as Revenue from Government unless they are in the nature of an equity injection or a loan.

1.7 GainsResources Received Free of Charge

Resources received free of charge are recognised as revenue when and only when the 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.

Resources received free of charge are recorded as either revenue or gains depending on their nature.

Contributions of assets at no cost of acquisition or for nominal consideration are recognised as gains at their fair value when the asset qualifies for recognition, unless received from another Government agency or authority as a consequence of a restructuring of administrative arrangements.

Sale of Assets

Gains from disposal of non-current assets are recognised when control of the asset has passed to the buyer.

1.8 Transactions with the Government as OwnersEquity Injections

Amounts that are designated as equity injections for a year are recognised directly in contributed equity in that year.

1.9 Research and Development Expenditure and Intellectual Property

All research and development costs, including costs associated with protecting intellectual property (e.g. patents and trademarks), are expensed as incurred.

1.10 Employee Benefits

Liabilities for short-term employee benefits (as defined in AASB 119) and termination benefits due within twelve months of the end of reporting period are measured at their nominal amounts. The nominal amount is calculated with regard to the rate expected to be paid on settlement of the liability.

Other long-term employee benefit liabilities are measured at the present value of the estimated future cash outflows to be made in respect of services provided by employees up to the reporting date.

Leave

The liability for employee benefits includes provisions for annual leave, long service leave and severance payments. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken in future years by employees is estimated to be less than the annual entitlement for sick leave.

The leave liabilities are calculated on the basis of employees' remuneration at the estimated salary rates that will apply at the time the leave is taken, including the employer superannuation contribution rates to the extent that the leave is likely to be taken during service rather than paid out on termination.

The liability at 30 June 2011 for long service leave has been determined by the short hand method and reference to the work of an actuary. The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

Separation and redundancy

Provision is made for separation and redundancy benefit payments. CSIRO recognises a provision for termination when it has developed a detailed formal plan for the terminations and has informed those employees affected that it will carry out the terminations.

Superannuation

Employees of CSIRO are members of the Commonwealth Superannuation Scheme (CSS), the Public Sector Superannuation Scheme (PSS), or the PSS accumulation plan (PSSap). The CSS and PSS are defined benefit schemes for the Australian Government. The PSSap is a defined contribution scheme.

The liability for defined benefits is recognised in the financial statements of the Australian Government and is settled by the Australian Government in due course. This liability is reported by the Department of Finance and Deregulation as an administered item.

CSIRO makes employer contributions to the employee superannuation schemes at rates determined by an actuary to be sufficient to meet the cost to the Government of the superannuation entitlements of the Group's employees. CSIRO accounts for the contributions as if they were contributions to defined contribution plans.

The liability for superannuation recognised as at 30 June represents outstanding contributions for the final fortnight of the year.

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 Australian Government's insurable risk managed fund 'Comcover'.

1.13 Cash

Cash and cash equivalents includes cash on hand and demand deposits in bank accounts with an original maturity of four months or less that are readily convertible to known amounts of cash and subject to insignificant risk of change in value. Cash is recognised at its nominal amount.

1.14 Financial Assets

CSIRO classifies its financial assets in the following categories:

- available for sale financial assets; and
- loans and receivables.

The classification depends on the nature and the purpose of financial assets and is determined at the time of initial recognition.

Financial assets are recognised and derecognised upon trade date.

Effective Interest Method

The effective interest method is a method of calculating the amortised cost of a financial asset and of allocating interest income over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash receipts through the expected life of the financial asset or, where appropriate, a shorter period.

Income is recognised on an effective interest rate basis.

Available-for-Sale Financial Assets

Available-for-sale financial assets are non-derivatives that are either designated in this category or not classified in any of the other categories.

Available-for-sale financial assets are recorded at fair value. Gains and losses arising from changes in fair value are recognised directly in the reserves (equity) with the exception of impairment losses. Interest is calculated using the effective interest method and foreign exchange gains and losses on monetary assets are recognised directly in profit or loss. Where the asset is disposed of or is determined to be impaired, part (or all) of the cumulative gain or loss previously recognised in the reserve is included in the operating result for the period.

CSIRO has investments in a number of unlisted start-up companies over which it has significant influence or control. These companies have been established for the purpose of commercialisation of CSIRO's intellectual property.

CSIRO also has some investments in companies which have since initial start-up been sold to third parties and subsequently listed on the Australian Stock Exchange.

CSIRO's investments in listed and unlisted companies are accounted for in accordance with AASB 139 *Financial Instruments: Recognition and Measurement*, and have been designated as 'available-for-sale' financial assets.

Fair value of investments in listed companies

The fair value of investments in listed companies has been determined by reference to their closing bid price at the reporting date.

Fair value of investments in unlisted companies

For investments in unlisted companies where there is no readily available market pricing for the equity instruments, the fair value has been determined by applying valuation techniques in line with the generally accepted valuation guidelines 'International Private Equity and Venture Capital Valuation Guidelines (AVCAL)'.

Where recent transactions for the unlisted companies' equity have taken place, these equity transaction prices are used to value CSIRO's investment.

For unlisted companies that have not had any recent equity transactions, other AVCAL valuation techniques are used such as discounted cash flows and share of net assets.

In addition, independent valuations are performed as at reporting date for unlisted companies that are considered to have a material impact on CSIRO's investment portfolio.

Investments in special purpose entities are either valued at cost or share of net assets since a reliable estimate of fair value cannot be established. These entities have been set up primarily to gain access to research facilities/networks, or to provide services to owners. Hence, there is no 'active market' for these equity investments. CSIRO is a long-term shareholder and is unlikely to dispose of its interest in these investments.

Loans and Receivables

Trade receivables, loans, and other receivables that have fixed or determinable payments that are not quoted in an active market, are classified as 'loans and receivables'. Loans and receivables are measured at amortised cost using the effective interest method less impairment. Interest is recognised by applying the effective interest rate.

Impairment of Financial Assets

Financial assets are assessed for impairment at each balance date.

Financial assets held at amortised cost – if there is objective evidence that an impairment loss has been incurred for loans and receivables, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the asset's original effective interest rate. The carrying amount is reduced by way of an allowance account. The loss is recognised in the statement of comprehensive income.

Available-for-sale financial assets – if there is objective evidence that an impairment loss on an available-for-sale financial asset has been incurred, the amount of the difference between its cost, less principal repayments and amortisation, and its current fair value, less any impairment loss previously recognised in expenses, is transferred from equity to the statement of comprehensive income.

Available-for-sale financial assets (held at cost) – if there is objective evidence that an impairment loss has been incurred the amount of the impairment loss is the difference between the carrying amount of the asset and the present value of the estimated future cash flows discounted at the current market rate for similar assets.

1.15 Financial liabilities

Financial liabilities are recognised and derecognised upon trade date.

Supplier and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

1.16 Acquisition of Assets

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken. Financial assets are initially

measured at their fair value plus transaction costs where appropriate.

Assets acquired at no cost or for nominal considerations are initially recognised as assets and revenues at their fair value at the date of acquisition.

1.17 Property, Plant and Equipment

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost in the balance sheet, except for purchases costing less than \$3 000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total).

The initial cost of an asset includes an estimate of the cost of dismantling and removing the item and restoring the site on which it is located.

Revaluations

Following initial recognition at cost, property, plant and equipment, including assets under finance leases are carried at fair value less accumulated depreciation and accumulated impairment losses. Valuations are conducted with sufficient frequency to ensure the carrying amount of assets do not differ materially from the assets' fair value as at reporting date. The regularity of valuation depends upon the volatility of movements in the market values for the relevant assets.

Revaluation adjustments are made on a class basis. Any revaluation increment is credited to equity under asset revaluation reserve, except to the extent that it reverses a previous revaluation decrement of the same asset class that was previously recognised in the surplus/deficit. Revaluation decrements for a class of assets are recognised directly through surplus/deficit except to the extent that they reverse a previous revaluation increment for that class.

Any accumulated depreciation as at the revaluation date is restated proportionately with the change in the gross carrying amount of the asset so that the carrying amount of the asset after revaluation equals its revalued amount.

Fair value for each class of asset is determined as follows:

- Land, which will continue to be used for research activity, is valued by independent valuers at 'existing use value'. Existing use contemplates the continued use of the asset for the same application as at the date of valuation.
- Buildings and leasehold improvements, which will continue to be used for research activities, are valued by the Group's registered valuer at their depreciated replacement cost using current building prices to arrive at current gross replacement cost less accumulated depreciation having regard to the age, condition and suitability for research and development activities. Building valuations include plant, fit-outs, fixtures and fittings, which form an integral part of buildings.
- Properties held or identified for sale and investment properties are valued by independent valuers as at reporting date.
- Property, plant and equipment which are purchased from contract research funds and where the control and subsequent sale proceeds are refunded to 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 25.

Depreciation and Amortisation

Depreciable property, plant and equipment assets are written-off to their estimated residual values over their estimated useful lives using, in all cases, the straight-line method of depreciation. Leasehold improvements are depreciated on a straight-line basis over the lesser of the estimated useful life of the improvements or the unexpired period of the lease. Land is not depreciated.

Depreciation/amortisation rates (useful lives), residual values and methods are reviewed at each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

Depreciation rates applying to each class of depreciable asset are based on the following useful lives:

	2011	2010
Buildings on freehold land	30 to 50 years	30 to 50 years
Leasehold improvements	Lease term	Lease term
Passenger vehicles	7 years	7 years
Agricultural and transport equipment	3 to 20 years	3 to 20 years
Computing equipment	2 to 5 years	2 to 5 years
Scientific equipment	5 to 20 years	5 to 20 years
Furniture and office equipment	5 to 15 years	5 to 15 years
Workshop equipment	20 to 25 years	20 to 25 years
Research vessel	25 years	25 years
Australia Telescope	15 to 58 years	15 to 58 years

Impairment

All assets were assessed for impairment at 30 June 2011. Where indications of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

The recoverable amount of an asset is the higher of its fair value less costs to sell and its value in use. Value in use is the present value of the future cash flows expected to be derived from the asset. Where the future economic benefit of an asset is not primarily dependent on the asset's ability to generate future cash flows, and the asset would be replaced if the entity were deprived of the asset, its value in use is taken to be its depreciated replacement cost.

Derecognition

An item of property, plant and equipment is derecognised upon disposal or when no further future economic benefits are expected from its use or disposal.

1.18 Investment Properties

Investment properties are measured initially at cost, including transaction costs. Subsequent to initial recognition, investment properties are stated at fair value, which is based on active market price, adjusted if necessary, for any difference in nature, location or condition of the specific asset at the balance sheet date. Gains or losses arising from changes in the fair values of investment properties are recognised in the profit or loss in the year in which they arise.

Investment properties are derecognised either when they have been disposed or when the investment property is permanently withdrawn from use and no future economic benefit is expected from its disposal. Any gains or losses on disposal of an investment property are recognised in profit or loss in the year of disposal.

1.19 Intangibles

Intangibles comprise internally developed and acquired software for internal use. These assets are carried at cost, less accumulated amortisation and impairment losses, except where the estimated cost of software is less than the \$250 000 threshold and expensed in the year of acquisition.

Software is amortised on a straight-line basis over its anticipated useful life. The useful lives of software are 2 to 10 years (2009–10: 2 to 10 years).

All software assets were assessed for indications of impairment as at 30 June 2011.

1.20 Inventories

Inventories held for sale represent books, CD-ROMs and videos of publishing and media products. They are valued at the lower of cost and net realisable value.

1.21 Consumable Stores

Stocks of consumable stores, which are not held for resale, are expensed in 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 expenditures or total assets.

1.22 Leases

A distinction is made between finance leases and operating leases. Finance leases effectively transfer from the lessor to the lessee substantially all the risks and rewards incidental to ownership of leased assets. An operating lease is a lease that is not a finance lease. In operating leases, the lessor effectively retains all such risks and benefits.

Where an asset is acquired by means of a finance lease, the asset is capitalised at either the fair value of the lease property or, if lower, the present value of minimum lease payments at the inception of the contract and a liability recognised at the same time and for the same amount.

The discount rate used is the interest rate implicit in the lease. Leased assets are amortised over the period of the lease. Lease payments are allocated between the principal component and the interest expense.

Operating lease payments are expensed on a straight-line basis which is representative of the pattern of benefits derived from the leased assets.

1.23 Foreign Currency Transactions

Transactions denominated in a foreign currency are translated at the exchange rate prevailing at the date of the transaction. Foreign currency receivables and payables are translated at the exchange rates prevailing at reporting date. Foreign currency translation gains and losses are recognised in the operating result. The Group has not entered into specific forward exchange contracts during the reporting period.

1.24 Taxation/Competitive NeutralityTaxation

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 (FBT) and the goods and services tax (GST). The Organisation pays applicable taxes in overseas countries.

Revenues, expenses and assets are recognised net of GST except:

- where the amount of GST incurred is not recoverable from the Australian Taxation Office
- for receivables and payables.

The Science Industry Endowment Fund is exempt from income tax in Australia. WLAN Services Pty Ltd is subject to all applicable taxes in Australia.

Competitive neutrality

The Australian Government *Competitive Neutrality Guidelines for Managers* require government bodies to operate with no net competitive advantages over private sector competitors. CSIRO's competitive neutrality policy is applied to consulting and services. Neutrality is achieved by incorporating tax equivalence and rate of return components in pricing of these services.

1.25 Joint VenturesJoint venture operations—Cooperative Research Centres (CRCs)

The proportionate interests in CRCs regarded as joint venture operations are disclosed in the financial statements under appropriate headings. Their primary source of funding is from the Australian Government and funding is progressively drawn down over the life of the CRCs and distributed to participants, including CSIRO and universities, for research and development purposes. CSIRO's contributions to the CRCs are expensed as incurred and funds received from CRCs are recognised as revenue to the extent that work has been performed in the income statement. CSIRO is a participant in 22 CRCs and the names of these CRCs are disclosed in Note 24.

Joint venture entities—unincorporated (Refer Note 8)

Murray-Darling Freshwater Research Centre (MDFRC) – The Group's 33.3% interest in the MDFRC is accounted for using the equity method.

1.26 Borrowing Costs

All borrowing costs are expensed as incurred.

1.27 Contingent Liabilities and Contingent Assets

Contingent liabilities and contingent assets are not recognised in the balance sheet but are reported in the relevant schedules and notes. They may arise from uncertainty as to the existence of a liability or asset, or represent a liability or asset in respect of which the amount cannot be reliably measured. Contingent assets are disclosed when settlement is probable but not virtually certain and contingent liabilities are disclosed when settlement is greater than remote.

1.28 Properties held for sale

Properties which are expected to be recovered primarily through sale rather than through continuing use are classified as 'properties held for sale'. Immediately before classification, the properties are remeasured in accordance with the Group's accounting policies. Thereafter, at reporting date the properties are measured at the lower of their carrying amount and fair value less cost to sell. Impairment losses on initial classification as held for sale and subsequent gains or losses on re-measurement are recognised in the statement of comprehensive income.

1.29 Presentation of financial statements

The Group presents in the consolidated statement of changes in equity all owner changes in equity, whereas all non-owner changes in equity are presented in the consolidated statement of comprehensive income.

Note 2 Events after the balance sheet date

At the time of completion of this note, the Group is not aware of any significant events occurring after the reporting date.

Notes	Consolidated		CSIRO	
	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 3 Expenses				
3.1 Employee benefits				
Wages and salaries	534 725	516 876	534 534	516 615
Superannuation – defined contribution plans	82 559	80 974	82 546	80 965
Leave and other entitlements	97 827	78 098	97 827	78 098
Separation and redundancies	13 763	9 652	13 763	9 652
Total employee benefits	728 874	685 600	728 670	685 330
3.2 Suppliers				
Goods and services				
Goods	118 737	101 570	118 737	101 570
Services	234 989	266 930	234 635	417 207
Total goods and services	353 726	368 500	353 372	518 777
Goods and services are made up of:				
Provision of goods – related entities	-	-	-	-
Provision of goods – external parties	118 737	101 570	118 737	101 570
Rendering of services – related entities	24 488	22 181	24 488	172 174
Rendering of services – external parties	210 501	244 749	210 147	245 033
Total goods and services	353 726	368 500	353 372	518 777
Other Supplier expenses				
Operating lease rentals:				
Minimum lease payments	14 264	13 534	14 264	13 534
Workers compensation expenses	1 769	1 628	1 767	1 628
Total other supplier expenses	16 033	15 162	16 031	15 162
Total supplier expenses	369 759	383 662	369 403	533 939
3.3 Depreciation and amortisation				
Depreciation				
Plant and equipment	41 706	38 801	41 706	38 801
Buildings and leasehold improvements	56 588	53 875	56 588	53 875
Total depreciation	98 294	92 676	98 294	92 676
Amortisation				
Intangibles – computer software	3 434	2 983	3 434	2 983
Total depreciation and amortisation	101 728	95 659	101 728	95 659
3.4 Finance costs				
Finance leases	3 266	3 463	3 266	3 463

Notes	Consolidated		CSIRO	
	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 3 Expenses (cont)				
3.5 Write-down and impairment of assets				
Assets write downs and impairments from:				
Bad debts	87	173	87	173
Increase/(decrease) in allowance for impairment	(34)	(589)	(34)	(589)
Impairment of available for sale investments	7 825	3 472	7 825	3 472
Net impairment loss on revaluation of properties held for sale and investment properties	4 683	1 420	4 683	1 420
Net realisation of fair value loss reserve on available for sale investments	13 040	-	13 040	-
Total write-down and impairment of assets	25 601	4 476	25 601	4 476
3.6 Net foreign exchange losses				
Non-speculative	2 448	5 433	2 448	5 433
3.7 Net loss from sale of assets				
Equity investment and intellectual property				
Proceeds from sale of equity investments	-	47 791	-	47 791
Proceeds from sale of intellectual property	-	2 120	-	2 120
Total proceed	-	49 911	-	49 911
Carrying value of assets sold	-	(52 977)	-	(52 977)
Selling expenses	-	(445)	-	(445)
Net loss from equity investment and intellectual property	-	3 511	-	3 511
Land and Buildings				
Proceeds from sale	-	1 364	-	1 364
Carrying value of assets sold	-	(1 564)	-	(1 564)
Selling expenses	-	(280)	-	(280)
Net loss from sale of land and buildings	-	480	-	480
Plant and equipment				
Proceeds from sale	-	771	-	771
Carrying value of assets sold	-	(1 583)	-	(1 583)
Selling expenses	-	(10)	-	(10)
Net loss from sale of plant and equipment	-	822	-	822
Total net loss from sale of assets	-	4 813	-	4 813
3.8 Other expenses				
Other expenses	-	31	-	-
Total other expenses	-	31	-	-

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 4 Income					
4.1 Sale of goods and rendering of services					
Provision of goods – related entities		-	-	-	-
Provision of goods – external parties		13 379	12 410	13 379	12 410
Total sale of goods		13 379	12 410	13 379	12 410
Rendering of services – related entities		141 221	148 355	141 221	150 858
Rendering of services – external parties		255 076	217 154	263 477	217 154
Total rendering of services		396 297	365 509	404 698	368 012
Total sale of goods and rendering of services		409 676	377 919	418 077	380 422
4.2 Interest					
Bank and term deposits		15 174	10 422	8 729	7 222
4.3 Rents					
Rental income		7 826	8 562	7 826	8 562
4.4 Royalties					
Royalties		29 237	42 985	29 237	42 985
4.5 Other revenues					
Vehicle contributions – staff		-	1	-	1
Sale of primary produce		1 333	986	1 333	986
Donation		524	103	524	103
Capital contributions		2 149	1 069	2 149	1 069
Education programs and subscriptions		3 400	3 510	3 400	3 510
Other		23 360	9 918	24 051	10 480
Total other revenues		30 766	15 587	31 457	16 149

Note 4 Income (cont)	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
4.6 Net gain from sale assets					
Equity investment and intellectual property					
Proceeds from sale of equity investments		3 775	-	3 775	-
Proceeds from sale of intellectual property		2 915	-	2 915	-
Total proceeds		6 690	-	6 690	-
Carrying value of assets sold		(1 860)	-	(1 860)	-
Selling expenses		(8)	-	(8)	-
Net gain from equity investment and intellectual property		4 822	-	4 822	-
Land and Buildings					
Proceeds from sale		40 204	-	40 204	-
Carrying value of assets sold		(34 140)	-	(34 140)	-
Selling expenses		(4 854)	-	(4 854)	-
Net gain from sale of land and buildings		1 210	-	1 210	-
Plant and equipment					
Proceeds from sale		692	-	692	-
Carrying value of assets sold		(1 772)	-	(1 772)	-
Selling expenses		(12)	-	(12)	-
Net gain from sale of plant and equipment		(1 092)	-	(1 092)	-
Total net gain from sale of assets		4 940	-	4 940	-
4.7 Other gains					
Net realisation of fair value gain reserve on available for sale investments		140	3 866	140	3 866
4.8 Revenue from Government					
Department of Innovation, Industry, Science and Research					
CAC Act body payment item		720 415	704 884	720 415	704 884

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 5 Other comprehensive income					
5.1 Changes in asset revaluation reserves					
Revaluation of land and buildings		227 503	-	227 503	-
Net decrease in assets revaluation reserve		227 503	-	227 503	-
5.2 Change in other reserve					
Net change in fair value gain/(loss) of available for sale investments		1 452	16 754	1 452	16 754
Realisation of fair value loss on sale and impairment of available for sale investment		12 900	-	12 900	-
Net increase/(decrease) in other reserve		14 352	16 754	14 352	16 754
Note 6 Cash and cash equivalents					
Cash at bank and on hand		36 874	23 053	36 490	17 722
Term deposits		271 604	208 240	125 000	115 000
Total cash and cash equivalents		308 478	231 293	161 490	132 722
Total cash includes deposits held on behalf of third parties totalling \$6.5 million (2010 \$2.5 million).	20				
Note 7 Trade and other receivables					
Goods and services:					
Goods and services – related entities		17 504	17 504	23 017	17 504
Goods and services – external entities		63 287	61 087	57 774	61 087
Total receivable for goods and services		80 791	78 591	80 791	78 591
Other receivables:					
GST receivable from the ATO		-	726	-	429
Interest		1 351	2 640	569	786
Other receivables		7 833	21 202	8 115	21 761
Total other receivables (gross)		9 184	24 568	8 684	22 976
Total trade and other receivables (gross)		89 975	103 159	89 475	101 567
Less impairment allowance:					
Goods and services		(987)	(1 021)	(987)	(1 021)
Total trade and other receivables (net)		88 988	102 138	88 488	100 546
Receivables are expected to be recovered in:					
No more than 12 months		88 988	102 138	88 488	100 546
Total trade and other receivables (net)		88 988	102 138	88 488	100 546

Notes	Consolidated		CSIRO	
	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 7 Trade and other receivables (cont)				
Receivables are aged as follows:				
Not overdue	77 029	98 678	76 529	97 086
Overdue by:				
0 to 30 days	10 435	2 390	10 435	2 390
31 to 60 days	901	691	901	691
61 to 90 days	553	375	553	375
More than 90 days	1 057	1 025	1 057	1 025
Total receivables (gross)	89 975	103 159	89 475	101 567
The impairment allowance is aged as follows:				
Overdue by:				
More than 90 days	987	1 021	987	1 021
Total impairment allowance	987	1 021	987	1 021

Note 7 Trade and other receivables (cont)**Reconciliation of impairment allowance:**

	Consolidated	CSIRO
	Goods and	Goods and
	services	services
	\$'000	\$'000
Movements in relation to 2011		
Opening balance	1 021	1 021
Decrease recognised in net deficit	(34)	(34)
Closing balance	987	987
Movements in relation to 2010		
Opening balance	1 610	1 610
Decrease recognised in net deficit	(589)	(589)
Closing balance	1 021	1 021

	Consolidated		CSIRO	
	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 8 Investments accounted for using the equity method				
Murray-Darling Fresh Water Research Centre	389	573	389	573

Movements of the carrying amount of investment in the MDFRC joint venture entity are as follows:

Carrying amount at beginning of the financial year	573	543	573	543
Share of MDFRC's net operating surplus/(deficit) for the year	(85)	10	(85)	10
Adjustment based on (unaudited)/audited accounts	(99)	20	(99)	20
Adjusted share of MDFRC's net operating surplus/(deficit) for the year	(184)	30	(184)	30
Carrying amount of investment in MDFRC as at 30 June	389	573	389	573

Murray-Darling Fresh Water Research Centre (MDFRC)

The Murray-Darling Fresh Water Research Centre is a collaborative joint venture for the purpose of Murray-Darling Basin Freshwater Research and the generation of knowledge required to ensure the sustainable management of water and associated environmental resources of the Murray-Darling Basin.

CSIRO's 33.3% (2010 36.59%) investment in MDFRC is accounted for using the equity method. In accordance with the joint venture agreement, the operating surplus/ (deficit) was shared by participants in the joint venture. CSIRO's share of MDFRC's operating deficit was \$84 631(2010 \$9 977 surplus).

Note 8 Investments accounted for using the Equity Method (cont)

The following is a summary of the financial performance and position of MDFRC:

	Total Revenues	Net Operating deficit	Total Assets	Total Liabilities	Net Assets
	\$'000	\$'000	\$'000	\$'000	\$'000
2011					
MDFRC (unaudited)	7 552	254	3 275	2 106	1 169
2010					
MDFRC (audited)	6 199	116	4 364	2 941	1 423

No indicators of impairment were found for investments accounted for using the equity method.

No investments accounted for using the equity method are expected to be sold within the next 12 months.

	Notes	Consolidated		CSIRO	
		2011	2010	2011	2010
		\$'000	\$'000	\$'000	\$'000
Note 9 Other investments					
At fair value classified as available for sale investments.	1.14				
Shares (or equity investments)					
Listed companies		10 461	12 935	10 461	12 935
Unlisted companies		21 508	19 706	21 508	19 706
Total investments		31 969	32 641	31 969	32 641

All other investments are expected to be recovered in more than 12 months.

Available for sale investments were impaired by \$13 040 303 (2010: \$3 472 363)

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 10 Land and buildings					
Freehold land – fair value		386 572	369 587	386 572	369 587
Buildings on freehold land					
– fair value		1 666 384	1 720 189	1 666 384	1 720 189
– accumulated depreciation		(887 366)	(1 097 061)	(887 366)	(1 097 061)
		779 018	623 128	779 018	623 128
– work in progress		14 336	33 957	14 336	33 957
Total buildings on freehold land		793 354	657 085	793 354	657 085
Leasehold improvements					
– fair value		351 503	261 475	351 503	261 475
– accumulated depreciation		(93 638)	(93 974)	(93 638)	(93 974)
		257 865	167 501	257 865	167 501
– work in progress		28 789	61 898	28 789	61 898
Total leasehold improvements		286 654	229 399	286 654	229 399
Buildings under finance lease					
– fair value		188 890	176 004	188 890	176 004
– accumulated amortisation		(56 867)	(65 328)	(56 867)	(65 328)
Total buildings under finance lease		132 023	110 676	132 023	110 676
Total land and buildings		1 598 603	1 366 747	1 598 603	1 366 747

All revaluations are conducted in accordance with the revaluation policy stated in Note 1. Land and building were revalued as at 30 June 2011 by a panel of independent valuers. The primary valuer was CB Richard Ellis.

No indicators of impairment were found for land and buildings.

No land or buildings are expected to be sold or disposed of within the next 12 months.

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 11 Plant and equipment					
Plant and equipment					
– fair value		766 377	718 344	766 377	718 344
– accumulated depreciation		(463 739)	(448 556)	(463 739)	(448 556)
		302 638	269 788	302 638	269 788
– work in progress		61 263	54 400	61 263	54 400
Total plant and equipment		363 901	324 188	363 901	324 188
Research vessel					
– fair value		15 178	15 461	15 178	15 461
– accumulated depreciation		(11 458)	(11 273)	(11 458)	(11 273)
		3 720	4 188	3 720	4 188
– work in progress		13 320	1 407	13 320	1 407
Total research vessel		17 040	5 595	17 040	5 595
Plant and equipment under finance lease					
– fair value		1 890	2 335	1 890	2 335
– accumulated amortisation		(1 686)	(1 801)	(1 686)	(1 801)
Total plant and equipment under finance lease		204	534	204	534
Total plant and equipment		381 145	330 317	381 145	330 317

All revaluations are conducted in accordance with the revaluation policy stated in Note 1. Plant and equipment were revalued as at 30 June 2009 by the Australian Valuation Office.

No indicators of impairment were found for plant and equipment.

No plant and equipment is expected to be sold or disposed within the next 12 months.

Notes 10 – 11 Land and buildings and plant and equipment (cont)

(a) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment (2010–11) – Consolidated

	Land	Buildings	Total Land and Buildings	Plant and Equipment	Total
	\$'000	\$'000	\$'000	\$'000	\$'000
As at 1 July 2010					
Gross book value	369 587	2 253 523	2 623 110	791 947	3 415 057
Accumulated depreciation and impairment	-	(1 256 363)	(1 256 363)	(461 630)	(1 717 993)
Net book value as at 1 July 2010	369 587	997 160	1 366 747	330 317	1 697 064
Additions:	-	64 001	64 001	94 622	158 623
Reclassification	-	-	-	(318)	(318)
Revaluation and impairments	18 085	209 418	227 503	-	227 503
Depreciation expense	-	(56 588)	(56 588)	(41 706)	(98 294)
Disposals	(1 100)	(1960)	(3 060)	(1 770)	(4 830)
Net book value 30 June 2011	386 572	1 212 031	1 598 603	381 145	1 979 748
Net book value as of 30 June 2011 represented by:					
Gross book value	386 572	2 249 902	2 636 474	858 028	3 494 502
Accumulated depreciation and impairment	-	(1 037 871)	(1 037 871)	(476 883)	(1 514 754)
Net book value as of 30 June 2011	386 572	1 212 031	1 598 603	381 145	1 979 748

Notes 10 – 11 Land and buildings and plant and equipment (cont)

(a) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment (2009–10) – Consolidated

	Land	Buildings	Total Land and Buildings	Plant and Equipment	Total
	\$'000	\$'000	\$'000	\$'000	\$'000
As at 1 July 2009					
Gross book value	367 102	2 171 644	2 538 746	725 857	3 264 603
Accumulated depreciation and impairment	-	(1 205 509)	(1 205 509)	(427 750)	(1 633 259)
Net book value as at 1 July 2009	367 102	966 135	1 333 237	298 107	1 631 344
Additions:	3 485	86 273	89 758	72 594	162 352
Reclassification	(1 000)	(1 284)	(2 284)	-	(2 284)
Depreciation expense	-	(53 875)	(53 875)	(38 801)	(92 676)
Disposals	-	(89)	(89)	(1 583)	(1 672)
Net book value 30 June 2010	369 587	997 160	1 366 747	330 317	1 697 064
Net book value as of 30 June 2010 represented by:					
Gross book value	369 587	2 253 523	2 623 110	791 947	3 415 057
Accumulated depreciation and impairment	-	(1 256 363)	(1 256 363)	(461 630)	(1 717 993)
Net book value as of 30 June 2010	369 587	997 160	1 366 747	330 317	1 697 064

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 12 Investment properties					
Investment properties – fair value	1.18	50 950	50 665	50 950	50 665
Reconciliation of the opening and closing balances of investment property					
As at 1 July		50 665	41 340	50 665	41 340
Net gain from fair value adjustments		285	3 625	285	3 625
Reclassification from/(to) property held for sale		-	5 700	-	5 700
Net book value as at 30 June		50 950	50 665	50 950	50 665

All revaluations are conducted in accordance with the revaluation policy stated in Note 1. Land and building were revalued as at 30 June 2011 by a panel of independent valuers. The primary valuer was CB Richard Ellis. As at 30 June 2011 investment properties comprise properties that are leased to third parties. The lease contains an initial non-cancellable period of ten years. No contingent rents are charged. Rental income from investment properties was \$2.1 million (2010 \$2.4 million). No separate record was maintained on direct operating expenses including repairs and maintenance for those investment properties. Fair value gain on investment properties for the year was \$285 000.

No indicators of impairment were found for investment properties.

Note 13 Intangibles

Computer software	1.19				
Internally developed – in use		35 337	28 619	35 337	28 619
Internally developed – in progress		3 015	4 862	3 015	4 862
		38 352	33 481	38 352	33 481
Accumulated amortisation		(10 006)	(6 675)	(10 006)	(6 675)
Total intangibles		28 346	26 806	28 346	26 806

No indicators of impairment were found for intangible assets.

No intangibles are expected to be sold or disposed of within the next 12 months.

Note 13 Intangibles (cont)**(a) Reconciliation of opening and closing balances of Intangibles (2010–11) – Consolidated**

	Internally developed software	Total
	\$'000	\$'000
As at 1 July 2010		
Gross book value	33 481	33 481
Accumulated amortisation and impairment	(6 675)	(6 675)
Net book value 1 July 2010	26 806	26 806
Additions by purchase or internally developed	4 656	4 656
Reclassification	318	318
Amortisation	(3 434)	(3 434)
Net book value as of 30 June 2011	28 346	28 346
Net book value as of 30 June 2011 represented by:		
Gross book value	38 352	38 352
Accumulated amortisation and impairment	(10 006)	(10 006)
Net book value as of 30 June 2011 represented by:	28 346	28 346

(a) Reconciliation of opening and closing balances of Intangibles (2009–10) – Consolidated

	Internally developed software	Acquired software	Total
	\$'000	\$'000	\$'000
As at 1 July 2009			
Gross book value	29 193	243	29 436
Accumulated amortisation and impairment	(2 680)	(243)	(2 923)
Net book value 1 July 2009	26 513	-	26 513
Additions by purchase or internally developed	3 276	-	3 276
Reclassification	-	-	-
Amortisation	(2 983)	-	(2 983)
Net book value as of 30 June 2010	26 806	-	26 806
Net book value as of 30 June 2010 represented by:			
Gross book value	33 481	-	33 481
Accumulated amortisation and impairment	(6 675)	-	(6 675)
Net book value as of 30 June 2010	26 806	-	26 806

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 14 Inventories held for sale					
Books and media products – at lower of cost and net realisable value	1.20	1 010	1 153	1 010	1 153

No items of inventory were recognised at fair value less cost to sell.

All inventory is expected to be sold in the next 12 months.

Note 15 Other non-financial assets

Contract research work in progress – at cost	1.6	32 272	30 398	32 272	30 398
Other prepayments		8 590	11 639	8 590	11 639
Total other non-financial assets		40 862	42 037	40 862	42 037

No indicators of impairment were found for other non-financial assets.

All other non-financial assets are expected to be recovered in no more than 12 months.

Note 16 Properties held for sale

Properties held for sale	1.28	11 865	47 913	11 865	47 913
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Reconciliation of the opening and closing balances of properties held for sale

As at 1 July		47 913	56 760	47 913	56 760
Additions		-	1 089	-	1 089
Reclassification		-	(3 417)	-	(3 417)
Disposals		(31 080)	(1 474)	(31 080)	(1 474)
Impairment loss on revaluation		(4 968)	(5 045)	(4 968)	(5 045)
Net book value as at 30 June		11 865	47 913	11 865	47 913

Balance as at 30 June 2011 represents properties identified as surplus to CSIRO and classified as 'held for sale'. These properties have been valued by independent valuers. They are expected to be sold in the market and settled within the next 12 months. An impairment loss of \$4.9 million on the re-measurement of properties held for sale to the lower of their carrying amount and fair value cost to sell, has been recognised in the Statement of Comprehensive Income.

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 17 Suppliers					
Trade creditors and accruals		84 195	93 742	83 750	93 742
Supplier payable expected to be settled within 12 months.					
Related entities		1 170	2 387	1 170	2 387
External entities		83 025	91 355	82 580	91 355
		84 195	93 742	83 750	93 742
Settlement is usually made within 30 days.					
Note 18 Other payables					
Accrued salaries and wages		20 273	12 143	20 032	12 143
Redundancies		3 349	8 154	3 349	8 154
Contract research revenue received in advance	1.6	96 648	99 904	96 648	100 386
Other revenue received in advance		26 105	26 053	26 105	26 053
Other creditors and accrued expenses		5 574	11 501	5 828	61 489
GST payable to ATO		1 199	-	1 569	-
Total other payables		153 148	157 755	153 531	208 225
All other payables are expected to be settled within 12 months.					
Note 19 Leases					
Finance leases		65 200	69 256	65 200	69 256
Total finance leases		65 200	69 256	65 200	69 256
Payable:					
Within one year					
Minimum lease payments		7 082	7 129	7 082	7 129
Deduct: future finance charges		(2 915)	(3 074)	(2 915)	(3 074)
Total payable within one year (current)		4 167	4 055	4 167	4 055
In one to five years		-			
Minimum lease payments		28 449	28 324	28 449	28 324
Deduct: future finance charges		(9 961)	(10 697)	(9 961)	(10 697)
Total payable in one to five years		18 488	17 627	18 488	17 627
In more than five years		-			
Minimum lease payments		51 737	59 023	51 737	59 023
Deduct: future finance charges		(9 192)	(11 449)	(9 192)	(11 449)
Total payable in more than five years		42 545	47 574	42 545	47 574
Total finance leases recognised on the balance sheet		65 200	69 256	65 200	69 256

Finance leases exist in relation to certain buildings and major equipment assets. The leases are non-cancellable and for fixed terms ranging from 2 to 25 years. CSIRO guarantees the residual values of all assets leased. There are no contingent rentals. The interest rate implicit in the leases averaged 5% (2010, 5%). The lease liabilities are secured by the lease assets.

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 20 Deposits					
Deposits		6 472	2 462	6 472	2 462
Deposits represent monies held on behalf of the following third parties:					
Cooperative Research Centres		250	250	250	250
Goyder Trust		4 820	-	4 820	-
Others		1 402	2 212	1 402	2 212
Total deposits		6 472	2 462	6 472	2 462
All deposits are expected to be settled within the next 12 months.					
Note 21 Employee provisions					
Annual leave		59 922	57 803	59 922	57 803
Long service leave		139 494	125 114	139 494	125 114
Severance pay		6 148	6 194	6 148	6 194
Total employee provisions		205 564	189 111	205 564	189 111
Employee provisions are expected to be settled in:					
No more than 12 months		187 635	175 219	187 635	175 219
More than 12 months		17 929	13 892	17 929	13 892
Total employee provisions		205 564	189 111	205 564	189 111

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 22 Cash flow reconciliation					
Reconciliation of cash and cash equivalents as per Balance Sheet to Cash Flow Statement					
Cash and cash equivalents as per:					
Cash Flow Statement		308 478	231 293	161 490	132 722
Balance Sheet	6	308 478	231 293	161 490	132 722
Difference		-	-	-	-
Reconciliation of net cost of services to net cash from operating activities:					
Net cost of service		(733 917)	(723 796)	(730 710)	(873 907)
Add revenue from Government		720 415	704 884	720 415	704 884
Share of net operating surplus/(deficit) of joint venture accounted for using the equity method		(184)	30	(184)	30
Adjustments for non-cash items					
Depreciation and amortisation		101 728	95 659	101 728	95 659
Net write-down and impairment of assets		25 601	4 476	25 601	4 476
(Gains)/loss from sale of property, plant and equipment		(118)	1 302	(118)	1 302
(Gains)/loss from sale of equity investments and intellectual property		(4 822)	3 511	(4 822)	3 511
Realisation of fair value gain reserve on available for sale investments		(140)	(3 866)	(140)	(3 866)
Changes in assets/liabilities					
(Increase)/decrease in trade and other receivables		12 424	65 396	11 629	66 680
(Increase)/decrease in inventories		143	123	143	123
(Increase)/decrease in other non-financial assets		1 175	(10 973)	1 175	(10 973)
(Increase)/decrease in GST receivable		726	(680)	429	(383)
Increase/(decrease) in GST payable		1 199	-	1 569	-
Increase/(decrease) in employee liabilities		16 453	7 364	16 453	7 364
Increase/(decrease) in supplier payables		(10 746)	(641)	(11 561)	(641)
Increase/(decrease) in other payables		(4 607)	13 539	(54 694)	64 029
Increase/(decrease) in deposits–liabilities		4 010	(3 225)	4 010	(3 225)
Net cash from operating activities		129 340	153 103	80 923	55 063

Notes	Consolidated		CSIRO	
	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 23 Contingent liabilities and assets				
Quantifiable Contingencies				
Contingent assets				
The Organisation's net share of the contingent asset	-	-	-	-
Contingent liabilities				
Estimated legal claims arising from employment, motor vehicle accidents, commercial and patent disputes. The Organisation has denied liability and is defending the claims. The estimate is based on precedent in such cases.	(300)	(250)	(300)	(250)
CSIRO has a financial guarantee for a bank loan.	(17)	-	(17)	-
Total net contingent liability	(317)	(250)	(317)	(250)

Unquantifiable contingencies

CSIRO is currently involved in eight legal proceedings in the USA related to a wireless local area network (WLAN) patent which it owns and wishes to license broadly. The proceedings are additional to proceedings settled by CSIRO in April 2009, and include actions under which declarations of non-infringement and patent invalidity against CSIRO have been sought. CSIRO has claimed (or counter-claimed) for infringement as appropriate. The proceedings are in various phases. If successful, CSIRO expects to receive significant revenue which would exceed the associated legal cost. At this stage, the revenue and costs are considered unquantifiable.

Note 24 Joint Ventures – Cooperative Research Centres (CRCs)

The Group was a party to 22 CRCs during 2010–11.

All CRCs have been classified as joint venture operations as the purpose is for the pursuit of collaborative scientific research where participants share in the scientific outcomes and outputs of the CRCs. In the event that CRC research results in a move to commercialisation, a separate legal entity is established and the Group's share of the new entity is treated either as subsidiary, joint venture or associate in the Balance Sheet as appropriate.

The Group's total cash and in-kind contribution (e.g. staff and use of assets) to CRCs from its own resources was \$33.8 million for the year (2010, \$45.1 million). Contributions made by the Group are expensed as incurred and these are included in the Income Statement.

No contingent liabilities were reported by the CRCs in which the Group is a participant.

The Group is a participant in the following CRCs as at 30 June 2011:

Name of CRC	<u>Expected Termination date</u>
Advanced Automotive Technology CRC	30 June 2012
Australasian Invasive Animals CRC	30 June 2012
Beef Genetic Technologies CRC	30 June 2012
CAST CRC	30 June 2012
Cotton Catchment Communities CRC	30 June 2012
Forestry for CRC	30 June 2012
e-Water CRC	30 June 2012
National Plant Biosecurity CRC	30 June 2012
Parker CRC for Integrated Hydrometallurgy Solutions	30 June 2012
Polymers CRC	30 June 2012
Bushfire CRC	30 June 2013
Advanced Manufacturing CRC	30 June 2014
Australian Seafood CRC	30 June 2014
CRC for Cancer Therapeutics	30 June 2014
Future Farm Industries CRC	30 June 2014
Sheep Industry Innovation CRC	30 June 2014
Greenhouse Gas Technologies CRC	30 June 2015
Deep Exploration Technologies CRC	30 June 2016
Antarctic Climate and Ecosystems CRC	30 June 2017
Australian Poultry CRC	30 June 2017
Remote Economic Participation CRC	30 June 2017
Vision CRC	30 June 2017

Note 25 Resources made available to the Group and not included in the balance sheet

	Land	Buildings	Plant and Equipment	Total
	\$'000	\$'000	\$'000	\$'000
At cost or fair value	4 615	159	35 753	40 527
Accumulated depreciation	-	-	(26 526)	(26 526)
Net value as at 30 June 2011	4 615	159	9 227	14 001
Net value as at 30 June 2010	12 015	50	1 285	13 350

The above assets are made available to the Group at little or no cost in accordance with formal agreements with contributors. They have either been purchased out of contract research monies and expensed in the year of purchase, in accordance with accounting policy Note 1.7, or made available to CSIRO at little or no cost. The assets include vehicles, computers and scientific equipment.

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. There are some restrictions on how these assets are operated. The fair value of in-kind contributions of these assets could not be reliably determined and therefore are not brought to account in the Statement of Comprehensive Income.

Note 26	Monies held in trust	2011 \$'000	2010 \$'000
	Monies held in trust represented by cash, deposits and investments for the benefit of the Group which are not included in the Balance Sheet are:		
	The Sir Ian McLennan Achievement for Industry Award – established to award outstanding contributions by the Group's scientists and engineers to national development.	265	262
	The Elwood and Hannah Zimmerman Trust Fund – established to fund weevil research and the curation of the Australian National Insect Collection (ANIC) weevil collection.	4 574	2 116
	The Schlinger Trust – established to research the taxonomy, biosystematics, general biology and biogeography of Australasian Diptera conducted by the Australian National Insect Collection.	2 285	2 243
	Total monies held in trust as at 30 June 2011	7 124	4 621

Movement summary of monies held in trust:

	McLennan \$'000	Zimmerman \$'000	Schlinger \$'000	Total \$'000
Balance as at 1 July 2010	262	2 116	2 243	4 621
Receipts during the year	-	2 513	-	2 513
Interest and distribution	18	105	197	320
Expenditure	(15)	(160)	(155)	(330)
Balance as at 30 June 2011	265	4 574	2 285	7 124

Note 27**Collections**

The CSIRO has a number of collections used for scientific research. These collections have been established over time and cover an extensive range of evolution and change in species. The collections are irreplaceable, bear scientific and historical value and are not reliably measurable in monetary terms. Therefore, the CSIRO has not recognised them as an asset in its Financial Statements.

The main collections held by the CSIRO are:

- **Australian National Herbarium (ANH)**
The ANH is one of the largest plant collections in Australia with approximately one million preserved plant specimens. It is unique among the Australian Herbaria in having a national focus for its collections, acquisition and research programs.
- **Australian National Insect Collection (ANIC)**
The ANIC has over 11 million specimens and is the largest research collection of Australian insects and related organisms in the world.
- **Australian National Wildlife Collection (ANWC)**
The ANWC, with over 80 000 specimens, holds land vertebrate collections, including the most comprehensively documented collections of Australian–New Guinean birds in the world.
- **Australian National Fish Collection (ANFC)**
The ANFC, also known as the 'ISR Munro Ichthyological Collection', houses more than 80 000 registered adult and 40 000 registered larval specimens of almost 3 000 species from Australasia, Asia, Antarctica, and the Sub-Antarctic Islands. It is among Australia's most diverse ichthyological collections and contains one of the largest collections of sharks, rays and deepwater fishes in the Southern Hemisphere.

Other collections include, but are not limited to, the Australian Tree Seed Centre, the Dadswell Memorial Wood Collection, CSIRO Collection of Living Microalgae and the Wood-Inhabiting Fungi Collection.

Notes	Consolidated		CSIRO	
	2011	2010	2011	2010
Note 28 Remuneration of auditors	\$	\$	\$	\$
Financial statement audit services are provided to the Group by the Auditor-General				
The fee for auditing services provided was :	222 000	310 400	210 000	298 000
No other services were provided by the Auditor-General.				
Note 29 Remuneration of Board Members				
Remuneration and superannuation benefits received or due and receivable by full-time and part-time Board Members, excluding the Chief Executive Officer were:				
Board Members' remuneration	470 775	495 716	470 775	495 716
Payments to superannuation funds for Board Members	54 455	44 522	54 455	44 522
Total remuneration	525 230	540 238	525 230	540 238

The remuneration of the Chief Executive Officer, who is also a Board Member of the Group is reported under Note 30 Remuneration of Senior Executives.

The number of Board Members whose total remuneration fell within the following bands were:

\$	Number	Number	Number	Number
0 – 29 999	3	-	3	-
30 000 – 59 999	5	7	5	7
60 000 – 89 999	2	1	2	1
90 000 – 119 999	1	1	1	1
Total	11	9	11	9

	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Note 30 Senior Executive Remuneration					
30 (a) Senior Executive Remuneration Expense for the Reporting Period¹					
Short-term employee benefits:					
Salary		7 159 801	7 647 977	7 159 801	7 647 977
Annual leave accrued		664 771	777 643	664 771	777 643
Performance bonuses ²		1 650 395	1 750 078	1 650 395	1 750 078
Additional Allowances		487 443	560 347	487 443	560 347
Total short-term employee benefits		9 962 410	10 736 044	9 962 410	10 736 044
Post-employment benefits:					
Superannuation		1 003 540	1 014 415	1 003 540	1 014 415
Total post-employment benefits		1 003 540	1 014 415	1 003 540	1 014 415
Other long-term benefits:					
Long-service leave		423 594	251 593	423 594	251 593
Total other long-term benefits		423 594	251 593	423 594	251 593
Termination benefits					
		58 316	88 326	58 316	88 326
Total termination benefits		58 316	88 326	58 316	88 326
Total		11 447 860	12 090 378	11 447 860	12 090 378

Notes:

2010 comparatives have been updated to represent the changes in 2011 FMOs.

¹ Note 30 (a) excludes acting arrangements and part-year service where remuneration expensed was less than \$150 000.

² Performance bonus expenses disclosed above were prepared on an accrual basis and therefore differ from 'Performance bonus paid' in Note 30 (b).

Note 30 (b)

Average annual remuneration packages and performance bonus paid for substantive senior executives as at the end of the reporting period

Fixed elements and performance bonus paid ¹	as at 30 June 2011					as at 30 June 2010				
	Fixed elements					Fixed elements				
	Senior executives No.	Salary \$	Allowances \$	Total \$	Performance bonus paid ² \$	Senior executives No.	Salary \$	Allowances \$	Total \$	Performance bonus paid ² \$
Total remuneration (including part-time arrangements)	-	-	-	-	-	-	-	-	-	-
less than \$150 000	-	-	-	-	-	-	-	-	-	-
\$150 000 – \$179 999	-	-	-	-	-	-	-	-	-	-
\$180 000 – \$209 999	6	183 236	18 928	202 164	16 692	4	187 527	18 305	205 832	28 271
\$210 000 – \$239 999	10	205 843	17 661	223 504	44 600	12	209 396	16 165	225 561	34 833
\$240 000 – \$269 999	7	232 145	18 551	250 696	56 731	8	231 995	18 404	250 399	52 296
\$270 000 – \$299 999	5	268 639	20 370	289 009	51 655	6	261 161	20 182	281 343	60 170
\$300 000 – \$329 999	1	290 771	19 240	310 011	11 268	1	286 204	17 370	303 574	66 445
\$330 000 – \$359 999	2	321 056	19 240	340 296	74 194	2	319 395	19 240	338 635	97 381
\$360 000 – \$379 999	-	-	-	-	-	-	-	-	-	-
\$390 000 – \$419 999	-	-	-	-	-	-	-	-	-	-
\$420 000 – \$449 999	-	-	-	-	-	-	-	-	-	-
\$450 000 – \$479 999	-	-	-	-	-	-	-	-	-	-
\$480 000 – \$509 999	1	483 482	25 000	508 482	141 831	1	468 672	25 000	493 672	64 267
Total	32	1 985 171	138 991	2 124 162	396 971	34	1 964 350	134 665	2 099 016	403 661

Notes:

2010 comparatives have been updated to represent the changes in 2011 FMOs.

¹ This table reports on substantive senior executives who are employed by the entity as at the end of the reporting period. Fixed elements are based on the employment agreement of each individual – each row represents an average annualised figure (based on headcount) for the individuals in that remuneration package band (i.e. the 'Total' column).

² Represents average actual bonuses paid during the reporting period. The 'performance bonus paid' is excluded from the 'Total' calculation, (for the purpose of determining remuneration package bands). The 'performance bonus paid' within a particular band may vary between financial years due to factors such as individuals commencing with or leaving the entity during the financial year.

Note 30 Senior executive remuneration (cont)**Notes (cont)****Variable elements****Performance bonuses**

- (a) Performance bonuses are calculated by applying a performance rating for each individual's Total Remuneration. The performance rating is determined by the individual's achievements against their Key Result Areas (KRAs).
- There are some executives entitled to deferred accumulated performance bonus payable on termination. They are determined based on a cumulative percentage of Total Remuneration at termination date.
- (b) **On average senior executives are entitled to the following leave entitlements:**
- Annual Leave (AL): entitled to 20 days (2010: 20 days) each full year worked (pro-rata for part-time SES)
 - Personal Leave (PL): entitled to 4 days (2010: 4 days) or part-time equivalent
 - Long Service Leave (LSL): in accordance with Long Service Leave (Commonwealth Employees) Act 1976
- (c) **Senior executives are members of one of the following superannuation funds:**
- Australian Government Employee Superannuation Trust (AGEST): this fund is for senior executives who are employed for a defined period. Employer contribution is set at 9 per cent (2010: 9 per cent). More information on AGESt can be found at <http://www.agemt.com.au>
 - Commonwealth Superannuation Scheme (CSS): this scheme is closed to new members and employer contributions currently average 17.8 per cent (2010: 17.8 per cent) (including productivity component). More information on CSS can be found at <http://www.css.gov.au>
 - Public Sector Superannuation Scheme (PSS): this scheme is closed to new members, with current employer contributions set at 13.7 per cent (2010: 13.7 per cent) (including productivity component). More information on PSS can be found at <http://www.pss.gov.au>
 - Public Sector Superannuation Accumulation Plan (PSSAP): employer contribution is set at 15.4 per cent (2010: 15.4 per cent), and the fund has been in operation since July 2005. More information on PSSAP can be found at <http://www.pssap.gov.au>
 - Other: this is usually for senior executives who have made their own superannuation arrangements (employer contribution are set at 9 per cent (2010: 9 per cent) these groups include employees who self manage their superannuation.
- (d) Other variable allowances are available to some executives under the terms of their employment contracts.
- (e) Various salary sacrifice arrangements are available to senior executives including superannuation, motor vehicle and expense payment fringe benefits.

Note 30 (C) Other highly paid staff

During the reporting period, there were 290 (2010: 289) employees whose salary plus performance bonus were \$150 000 or more. These employees did not have a role as a senior executive and are therefore not disclosed as a senior executive in Note 30 (a) and Note 30 (b).

Note 31 Meetings of the Board and Board Committees – Consolidated

During the financial year, eight Board meetings, six Board Audit Committee meetings, twelve Board Remuneration Committee meetings, three Board Endowment Committee meetings and nine Board Commercial Committee meetings were held. The number of meetings attended by each of the eligible Board members was as follows:

Board Member	CSIRO Board		CSIRO Board Audit Committee		CSIRO Board Nominations and Remuneration Committee		CSIRO Board Commercial Committee		CSIRO Board SIEF Board Endowment Committee	
	Number attended	Number eligible to attend as a member	Number attended	Number eligible to attend as a member	Number attended	Number eligible to attend as a member	Number attended	Number eligible to attend as a member	Number attended	Number eligible to attend as a member
M S Boydell	8	6	6	-	-	-	-	-	2	3
I Chubb	8	-	-	12	7	-	-	-	-	-
M Clark*	8	-	-	-	-	-	-	-	-	-
T A Cutler	8	6	5	-	-	9	9	3	3	3
E J Doyle	8	-	-	12	12	9	9	-	-	-
J Kerin	8	6	5	-	-	-	-	-	-	-
S McKeon	8	-	-	12	12	8	8	3	3	3
D M O'Toole	7	5	4	-	-	-	-	1	0	0
M Paterson	1	-	-	-	-	-	-	-	-	-
J H Ranck	1	-	-	1	1	1	1	-	-	-
D J Rathbone	1	3	0	-	-	-	-	-	-	-
T H Spurling	8	-	-	12	11	9	8	-	-	-

*CEO attended as an observer 4 Board Audit Committee meetings, 12 Board Nominations and Remuneration Committee meetings, 9 Board Commercial Committee meetings and 3 SIEF Board Endowment Committee meetings.

Note 32 Related party disclosures**(a) Controlled Entities**

Science and Industry Endowment Fund was established under the *Science and Industry Endowment Act 1926*. The Fund is deemed to be a CSIRO controlled entity in accordance with AASB 127 Consolidated and Separate Financial Statements and UIG 112. The Science and Industry Endowment Fund's separate financial statements are reported in the CSIRO Annual Report.

The principal activity of the Science and Industry Endowment Fund is to provide assistance to persons engaged in scientific research and in training of students in scientific research.

WLAN Services Pty Ltd was established in 2005. The company is a CSIRO controlled entity in accordance with AASB 127 Consolidated and Separate Financial Statements and UIG 112. The principal activity is to provide services to CSIRO.

Hydropem Pty Ltd is an inactive company and as a result it has not been included in the consolidated financial statements.

Names	CSIRO Investment Amount		% Equity Interest Held	
	2011 \$	2010 \$	2011 \$	2010 \$
Science and Industry Endowment Fund (SIEF)	-	-	100%	100%
WLAN Services Pty Ltd	1	1	100%	100%
Hydropem Pty Ltd (inactive)	1	1	100%	100%
Total	2	2		

(b) Board Members

The Board Members of the Group during the financial year were:

S McKeon (Chairman)
 T A Cutler (Deputy Chairman)
 M E Clark (Chief Executive)
 E J Doyle
 D J Rathbone (term completed 25 September 2010)
 D M O'Toole (term completed 30 April 2011)
 M Paterson (resigned 31 May 2011)
 T H Spurling
 I Chubb
 The Honourable J Kerin
 M S Boydell
 J H Ranck (commenced 1 May 2011)

Remuneration – the aggregate remuneration of Board Members is disclosed in Note 29.

(c) Board Members' interest in contracts

Since 1 July 2010 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 29 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.

This information relates to the period 1 July 2010 to 30 June 2011.

Note 32 Related party disclosures (cont)**(d) Other transactions of Board Members – related entities**

Ms M S Boydell is the Chairperson of the Gladstone Area Water Board and Commissioner of the Queensland Water Commission. Ms Boydell is a Director of Energex Limited, Uniquest Pty Limited and UATC Pty Ltd; and a Member of the Premier of Queensland's Smart State Council Standing Committee and the Surat Basin Coal Seam Gas Engagement Group. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Professor I Chubb was appointed Chief Scientist for Australia on 23 May 2011. Professor Chubb was Vice-Chancellor of the Australian National University till March 2011. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Dr M Clark is a member of the Prime Minister's Science, Engineering and Innovation Council, the Automotive Industry Innovation Council and the National Research Infrastructure Council (NRIC). Dr Clark also became a Director of a family company, registered 27 June 2011: Cradle Mountain Carbon Pty Ltd. ACN 151 512 220, the business purpose of which is as a vehicle to hold land for conservation purposes. She is also trustee of the Science and Industry Endowment Fund and a member of the Australia Advisory Board of the Bank of America Merrill Lynch. During the year, she ceased as a member of the St Vincent's Hospital Foundation Board and the Great Barrier Reef Foundation. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Dr T A Cutler is the Principal of Cutler & Company, a technology and strategy consultancy. He is also a Director of The National Health Call Centre Network Ltd, the Multimedia University (Malaysia), The Conversation Ltd and MHM Higher Education Pty Ltd. He is Chairman of the Advisory Board of the Centre of Excellence for Creative Industries and Innovation and is a member of the Design Research Institute Advisory Board RMIT. During 2010–11, Dr Cutler stepped down as Chairman of Pharmacy Australia Centre of Excellence (PACE) Precinct, Brisbane and as a Director of Chunky Move, and from membership of the Advisory Board to the Australian Biological Resources Study (ABRS) and of the Monash University and CSIRO joint Advisory Group for the SE Melbourne Innovation Precinct. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Dr E J Doyle is Chair of the Hunter Valley Research Foundation. She is also a Director of the Hunter Founders Forum, GPT Ltd and Boral Ltd. From 1 July 2011, Dr Doyle is also a Director of Bradken Limited. During 2010–11, Dr Doyle stood down as a Director of Benex Technologies Pty Ltd, Ross Human Directions Ltd and OneSteel Ltd. She is a Conjoint Professor at the University of Newcastle Graduate School of Business and a member of the Enterprise Connect Advisory Council. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

The Honourable Mr John Kerin is Chair of the Poultry CRC, the National Weeds, Productivity Research Program Advisory R&D Committee and the Board of Governors of The Crawford Fund. He is a member of the Board of the Southern Rivers Catchment Management Authority, the Clunies Ross Foundation and Governor of the World Wildlife Fund. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Mr S McKeon is the Executive Chairman of Macquarie Group's Melbourne Office, President of the Australian Government's Takeovers Panel and Chairman of Business for Millennium Development. He is Director of Global Poverty Project and a Director of Red Dust Role Models, Vision Fund International and MS Research Australia. He is also a member of the Federal Government's Human Rights Grants Scheme Advisory Panel and the Victorian Government's National Disability Insurance Scheme Implementation Taskforce. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Note 32 Related party disclosures (cont)

Ms D M O'Toole is the Chief Financial Officer of QR National, a former Director of Norfolk Group Ltd, a former Director of Raheny Consulting Pty Ltd and a former CFO of MIM Holdings Limited. She was a member of the Queensland Biotech Advisory Council and is a member of the Advisory Committee for the Banking and Finance School of the Queensland University of Technology. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Mr M Paterson was Secretary of the Commonwealth Department of Innovation, Industry, Science and Research. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Mr J H Ranck is a Director of Elders and a member of the Board of the Bush Heritage Foundation. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Mr D J Rathbone is Managing Director and Chief Executive of Nufarm Limited. He is also a Director of the Children's Cancer Centre Foundation, Royal Children's Hospital, Victoria. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Professor T H Spurling is a Research Professor in the Faculty of Life and Social Sciences, Swinburne University of Technology, Victoria. He is also a member of the Board of the International Centre for Radio Astronomy Research; and Chairman of the Board of Advanced Molecular Technologies Pty Ltd. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Note 33 Financial instruments	Notes	Consolidated		CSIRO			
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000		
(a) Categories of financial instruments							
Financial assets							
Available for sale financial assets							
		Investments	9	31 969	32 641	31 969	32 641
Loans and receivables							
		Cash at bank	6	36 874	23 053	36 490	17 722
		Term deposits	6	271 604	208 240	125 000	115 000
		Receivables for goods and services	7	80 791	78 591	80 791	78 591
		Other receivable	7	9 184	23 842	8 684	22 547
		Carrying amount of financial assets		430 422	366 367	282 934	266 501
Financial liabilities							
		Finance lease liabilities	19	65 200	69 256	65 200	69 256
		Trade creditors	17	84 195	93 742	83 750	93 742
		Research revenue received in advance	18	96 648	99 904	96 648	100 386
		Deposits	20	6 472	2 462	6 472	2 462
		Other creditors	18	55 301	57 851	55 314	107 839
		Carrying amount of financial liabilities		307 816	323 215	307 384	373 685
(b) Net income and expense from financial assets							
Cash at bank and term deposits							
		Interest revenue	4.2	15 174	10 422	8 729	7 222
		Net gain from financial assets		15 174	10 422	8 729	7 222
(c) Net income and expense from financial liabilities							
Finance Leases							
		Interest expense	3.4	3 266	3 463	3 266	3 463
		Net loss from financial liabilities		3 266	3 463	3 266	3 463
(d) Fair value of financial instruments							

A comparison between the fair value and carrying amount of the Group's financial assets and liabilities is not disclosed because the Group considers that the carrying amounts reported in the balance sheet are a reasonable approximation of the fair value of these financial assets and liabilities.

Note 33 Financial instruments (cont)	Notes	Consolidated		CSIRO	
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
(e) Fair value hierarchy (cont)					
Fair value measurements categorised by fair value hierarchy					
Level 1	9	10 461	12 935	10 461	12 935
Level 2		-	-	-	-
Level 3	9	21 508	19 706	21 508	19 706
Total		31 969	32 641	31 969	32 641
Reconciliation of Level 3 fair value hierarchy					
As at 1 July		32 641	62 453	32 641	62 453
Total losses for the period recognised in statement of comprehensive income ¹	3.5	(7 825)	(3 472)	(7 825)	(3 472)
Total gains recognised in other comprehensive income ²	5.2	1 452	20 620	1 452	20 620
Purchases		5 613	6 017	5 613	6 017
Sales		(1 860)	(52 977)	(1 860)	(52 977)
Issues		1 948	-	1 948	-
Closing balance		31 969	32 641	31 969	32 641

¹These losses are presented in the statement of comprehensive income note 3.5.

²Gains for the period included in other comprehensive income that are attributable to gains relating to those assets held at the end of the reporting period is \$7 532 623. Those gains are presented in the statement of comprehensive income in note 5.2.

Fair value of investments in unlisted companies

For investments in unlisted companies where there is no readily available market pricing for the equity instruments, the fair value has been determined by applying valuation techniques in line with the generally accepted valuation guidelines 'International Private Equity and Venture Capital Valuation Guidelines (AVCAL)'.

Where recent transactions for the unlisted companies' equity have taken place, these equity transaction prices are used to value CSIRO's investment.

For unlisted companies that have not had any recent equity transactions, other AVCAL valuation techniques are used such as discounted cash flows and share of net assets.

In addition, independent valuations are performed as at reporting date for unlisted companies that are considered to have a material impact on CSIRO's investment portfolio.

Investments in special purpose entities are either valued at cost or share of net assets since a reliable estimate of fair value cannot be established. These entities have been set up primarily to gain access to research facilities/networks, or to provide services to owners. Hence, there is no 'active market' for these equity investments. CSIRO is a long-term shareholder and is unlikely to dispose of its interest in these investments.

Note 33 Financial Instrument (cont)**(f) Credit risk**

The maximum exposure to credit risk is the risk that arises from potential default of a debtor. This amount is equal to the total amount of trade and other receivables of \$88.9 million (2010 \$102.6 million). The Group has assessed the risk of the default on payment and has allocated \$987k (2010 \$1.021 million) to an allowance for impairment account.

The Group manages its credit risk by undertaking background and credit checks prior to allowing a debtor relationship. In addition, the Group has policies and procedures that guide employees to apply debt recovery techniques. The Group holds no collateral to mitigate against credit risk.

Credit risk of financial instruments not past due or individually determined as impaired – Consolidated

	Notes	Not Past Due Nor Impaired	Not Past Due Nor Impaired	Past due or Impaired	Past due or Impaired
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Cash at bank	6	36 874	23 053	-	-
Term deposits	6	271 604	208 240	-	-
Receivables for goods and services	7	67 845	74 110	12 946	4 481
Other receivable	7	9 184	23 842	-	-
Investments	9	31 969	32 641	-	-
Total		417 476	361 886	12 946	4 481

Credit risk of financial instruments not past due or individually determined as impaired – CSIRO

	Notes	Not Past Due Nor Impaired	Not Past Due Nor Impaired	Past due or Impaired	Past due or Impaired
		2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Cash at bank	6	36 490	17 722	-	-
Term deposits	6	125 000	115 000	-	-
Receivables for goods and services	7	67 845	74 110	12 946	4 481
Loans receivables	7	-	-	-	-
Other receivable	7	8 684	22 547	-	-
Investments	9	31 969	32 641	-	-
Total		269 988	262 020	12 946	4 481

Note 33 Financial instruments (cont)**(f) Credit risk (cont)****Ageing of financial assets that are past due but not impaired for 2011 – Consolidated**

	0 to 30 days \$'000	31 to 60 days \$'000	61 to 90 days \$'000	90+ days \$'000	Total \$'000
Receivables for goods and services	10 435	901	553	1 057	12 946
Total	10 435	901	553	1 057	12 946

Ageing of financial assets that are past due but not impaired for 2010 – Consolidated

	0 to 30 days \$'000	31 to 60 days \$'000	61 to 90 days \$'000	90+ days \$'000	Total \$'000
Receivables for goods and services	2 390	691	375	1 025	4 481
Total	2 390	691	375	1 025	4 481

Ageing of financial assets that are past due but not impaired for 2011 – CSIRO

	0 to 30 days \$'000	31 to 60 days \$'000	61 to 90 days \$'000	90+ days \$'000	Total \$'000
Receivables for goods and services	10 435	901	553	1 057	12 946
Total	10 435	901	553	1 057	12 946

Ageing of financial assets that are past due but not impaired for 2010 – CSIRO

	0 to 30 days \$'000	31 to 60 days \$'000	61 to 90 days \$'000	90+ days \$'000	Total \$'000
Receivables for goods and services	2 390	691	375	1 025	4 481
Total	2 390	691	375	1 025	4 481

(g) Liquidity risk

The Group's financial liabilities are payables, finance leases and other interest bearing liabilities. The exposure to liquidity risk is based on the notion that the Group will encounter difficulty in meeting its obligations associated with financial liabilities. This is highly unlikely due to Australian Government funding and internal policies and procedures put in place to ensure there are appropriate resources to meet its financial obligations.

The Group manages its budgeted funds to ensure it has adequate funds to meet payments as they fall due. In addition, the Group has policies in place to ensure timely payments are made when due and has no past experience of defaults.

Note 33 Financial instruments (cont)**(g) Liquidity risk (cont)**

The following table illustrates the maturities for financial liabilities for 2011 – Consolidated

	On demand	Within 1 year	1 to 5 years	> 5 years	Total
	\$'000	\$'000	\$'000	\$'000	\$'000
Finance lease liabilities	-	7 082	28 449	51 737	87 268
Trade creditors	-	84 195	-	-	84 195
Research revenue received in advance	-	96 648	-	-	96 648
Deposits	6 472	-	-	-	6 472
Other creditors	-	55 301	-	-	55 301
Total	6 472	243 226	28 449	51 737	329 884

The following table illustrates the maturities for financial liabilities for 2010 – Consolidated

	On demand	Within 1 year	1 to 5 years	> 5 years	Total
	\$'000	\$'000	\$'000	\$'000	\$'000
Finance lease liabilities	-	7 129	28 324	59 023	94 476
Trade creditors	-	93 742	-	-	93 742
Research revenue received in advance	-	99 904	-	-	99 904
Deposits	2 462	-	-	-	2 462
Other creditors	-	57 851	-	-	57 851
Total	2 462	258 626	28 324	59 023	348 435

The Group has no derivative financial liabilities in both the current and prior years

Note 33 Financial instruments CSIRO (cont)**(g) Liquidity risk (cont)**

The following table illustrates the maturities for financial liabilities for 2011 – CSIRO

	On demand \$'000	Within 1 year \$'000	1 to 5 years \$'000	> 5 years \$'000	Total \$'000
Finance lease liabilities	-	7 082	28 449	51 737	87 268
Trade creditors	-	83 750	-	-	83 750
Research revenue received in advance	-	96 648	-	-	96 648
Deposits	6 472	-	-	-	6 472
Other creditors	-	55 314	-	-	55 314
Total	6 472	242 794	28 449	51 737	329 452

The following table illustrates the maturities for financial liabilities for 2010 – CSIRO

	On demand \$'000	Within 1 year \$'000	1 to 5 years \$'000	> 5 years \$'000	Total \$'000
Finance lease liabilities	-	7 129	28 324	59 023	94 476
Trade creditors	-	93 742	-	-	93 742
Research revenue received in advance	-	100 386	-	-	100 386
Deposits	2 462	-	-	-	2 462
Other creditors	-	107 839	-	-	107 839
Total	2 462	309 096	28 324	59 023	398 905

(h) Market risk

The Group holds basic financial instruments that do not expose the Group to certain market risks except for equity price risk for its available for sale equity investments. See Note 9.

Interest rate risk

The only interest-bearing items on the balance sheet are finance leases. They all bear interest at a fixed interest rate and will not fluctuate due to changes in the market interest rate.

Equity price risk

Equity price risk arises from changes in market prices of listed equity investments that the Group has designated as 'available for sale' financial instruments. See Note 9.

Sensitivity analysis

The Group's listed equity investments are listed on the Australian Securities Exchange (ASX). For such instruments classified as available for sale, a 10% increase in the ASX All Ordinary Index at the reporting date would have increased equity by \$1 046 092 (2010 an increase of \$1 293 481). An equal change in the opposite direction would have decreased equity by \$1 046 092 (2010 a decrease of \$1 293 481). The analysis is performed on the same basis for 2010.

Note 33 Financial Instrument (cont)**(h) Market risk (cont)****Currency risk**

In accordance with Australian Government policy, the Group is prohibited from entering into foreign currency hedges.

The Group's exposure to foreign exchange risk on sales and purchases that are denominated in currencies other than Australian dollar is not considered material. At any point in time the Group's foreign currency risk exposure is not material.

Note 34 Reporting of Outcome**(a) Reporting of outcome**

The Organisation's outputs contribute to a single outcome:

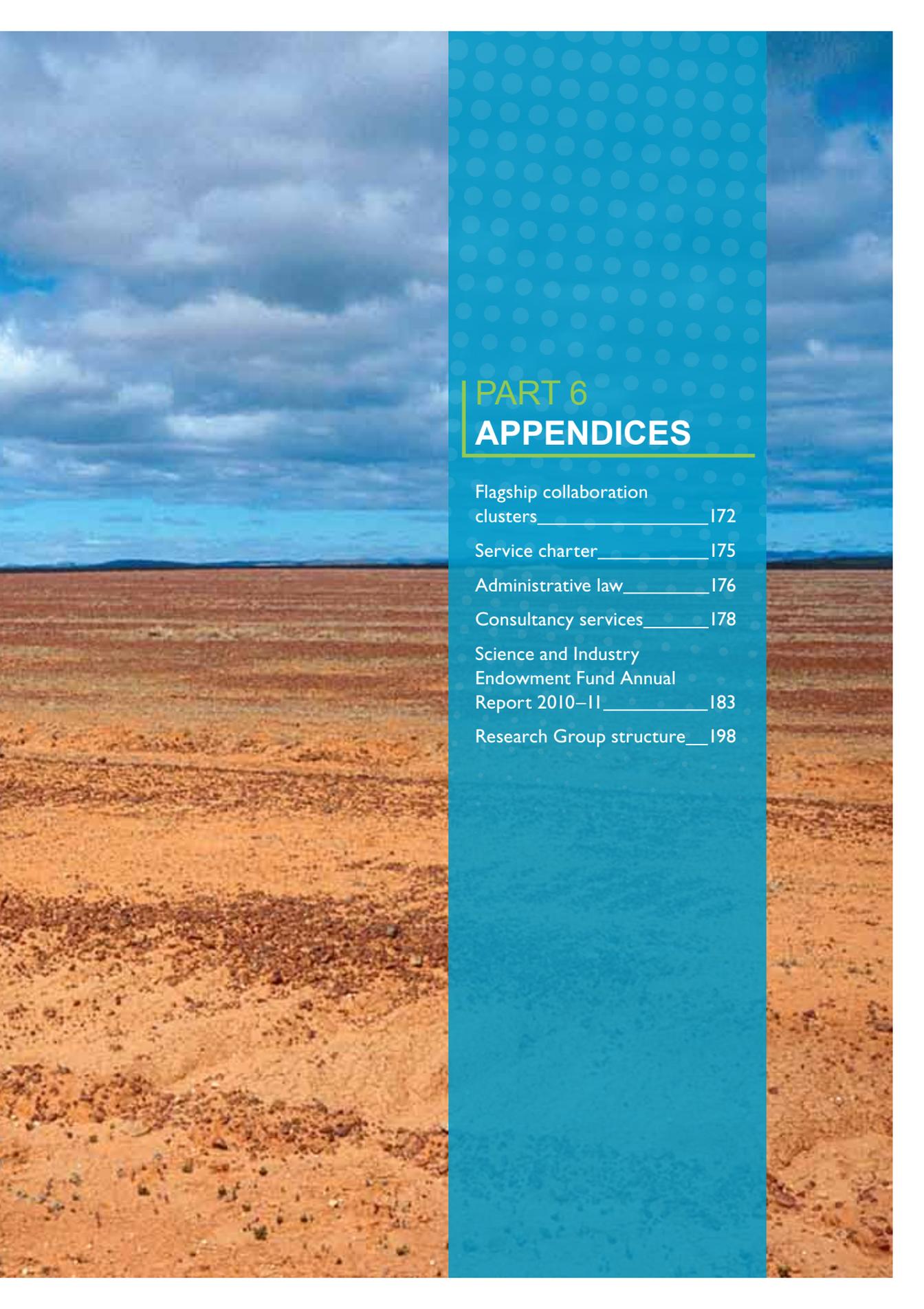
Innovative scientific and technology solutions to national challenges and opportunities to benefit industry, the environment and the community, through scientific research and capability development, services and advice.

(b) Net cost of outcome delivery

	Consolidated		CSIRO	
	2011 \$'000	2010 \$'000	2011 \$'000	2010 \$'000
Total expenses¹	1 231 860	1 183 137	1 231 300	1 333 113
Income from non-government sector				
Other external revenues:				
Sale of goods and rendering of services – to related entities	141 221	148 355	141 221	150 858
Sale of goods and rendering of services – to external entities	268 455	229 564	276 856	229 564
Interest	15 174	10 422	8 729	7 222
Net gains from sale of assets	118	-	118	-
Donations	524	103	524	103
Rents	7 826	8 562	7 826	8 562
Royalties	29 237	42 985	29 237	42 985
Net gains from sale of investments	4 822	-	4 822	-
Realisation of fair value gain reserve	140	3 866	140	3 866
Sale of primary produce	1 333	986	1 333	986
Other	28 909	14 528	29 600	15 090
Total other own-source income	497 759	459 371	500 406	459 236
Net cost of outcome delivery	734 101	723 766	730 894	873 877

¹Total expenses adjusted for movement in investment accounted for using equity method





PART 6

APPENDICES

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Appendix 1: Flagship Collaboration Fund Clusters

During 2010–11, approximately \$17.2 million was disbursed from the Flagship Collaboration Fund. Overall 94 per cent of the initial \$114.25 million had been committed to scholarships, fellowships, projects and clusters. Three new clusters involving 14 national and international universities and industry partners were approved for funding. Active clusters are listed below. Completed clusters are listed in previous annual reports.

Year	06–07	07–08	08–09	09–10	10–11
Disbursement (\$m)	8	15.5	14	16.7	17.2
Committed (\$m)	50	56	88	96	108

Round 2 clusters

Flagship	Cluster name	Cluster leader(s)	Other partners
Wealth from Oceans	Subsea pipelines for reliable and environmentally safe development	Professor Mark Cassidy, University of Western Australia (UWA)	Curtin University of Technology (CUT), Flinders University, Monash University, University of Sydney, University of Queensland (UQ)

Round 3 clusters

Flagship	Cluster name	Cluster leader(s)	Other partners
Energy Transformed	The 'intelligent grid' – modelling distributed generation and interruptible load	Professor Stuart White, University of Technology, Sydney	University of South Australia, UQ, CUT, Queensland University of Technology
Light Metals	Breakthrough technology for primary aluminium	Professor Geoff Brooks, Swinburne University	University of New South Wales (UNSW), UQ
Preventative Health	The ASPREE healthy ageing cohort biobank	Professor John McNeil, Monash University	University of Melbourne, University of Tasmania, Australian National University (ANU), Ludwig Institute for Cancer Research

Round 4 clusters

Flagship	Cluster name	Cluster leader(s)	Other partners
Climate Adaptation	Human health and climate change adaptation	Professor Anthony Capon, ANU	University of Western Sydney, Curtin University, UQ, University of Melbourne, James Cook University, Queensland Institute of Medical Research, Ove Arup Pty Ltd
Climate Adaptation	Regional adaptation to climate change – a case study in south-east Queensland	Professor Jan McDonald, Griffith University	UQ, University of Sunshine Coast
Minerals Down Under	Future sustainability of Australia's mineral industry	Professor David Brereton, UQ	University of Technology Sydney, CUT, Central Queensland University, ANU
Minerals Down Under	Preconcentration and agglomeration to enhance heap leaching of nickel laterite	Professor John Ralston, University of South Australia	UQ, University of Melbourne, University of British Columbia
Future Manufacturing	Sensor systems for analysis of aquatic environments	Professor Justin Gooding, UNSW	Griffith University, CUT, Monash University, Flinders University, La Trobe University
Preventative Health	STroke imAging pRevention and Treatment (START)	Professor Geoffrey Donnan, University of Melbourne	National Stroke Institute, Brain Research Institute, Neurosciences Victoria, Melbourne Health
Wealth from Oceans	Institutional and social barriers to science impact (Coastal Cluster)	Professor David Wood, CUT	University of Adelaide, Deakin University, Flinders University, University of Sunshine Coast, University of Tasmania, University of Wollongong

Round 5 clusters

Flagship	Cluster name	Cluster leader(s)	Other partners
Water for a Healthy Country	Ecological Response to Altered Flow Regimes Cluster	Professor Stuart Bunn, Griffith University	UNSW, Charles Sturt University, Monash University, Latrobe University, Australian Rivers Institute (Griffith University)
Food Futures	Healthy complex cereal carbohydrates	Professor Geoff Fincher, University of Adelaide	University of Melbourne, UQ
Food Futures	Sex ratio and sterility for commercial animal production	Professor Michael Holland, UQ	University of Newcastle, Murdoch Children's Research Institute, Monash University, Flinders University, Simon Fraser University (Canada), Central Michigan University
Energy Transformed	Biological solutions for energy and greenhouse challenges	Professor Chris Easton, ANU	University of Manchester, UQ, Royal Melbourne Institute of Technology

Appendix 2: Service Charter

CSIRO's Service Charter describes the standards of service we aim to deliver to our customers and our commitment to ensuring that these standards are maintained.

In summary:

- we believe our customers and partners are essential to our success
- we maintain relevance in our work through input from the public, government, industry and the research community
- we communicate with our customers in a courteous, helpful and professional manner
- we respect our customers' confidentiality
- we evaluate our services to ensure the highest standards.

Our full Service Charter is available on our website: www.csiro.au/servicecharter

CSIRO welcomes your feedback on our performance. Please contact the CSIRO officer with whom you have been dealing or CSIRO Enquiries who can direct your feedback to the relevant person.

CSIRO Enquiries:

Bag 10, Clayton South, VIC 3169

Phone: 1300 363 400

Fax: +61 3 9545 2175

Email: enquiries@csiro.au

Appendix 3: Administrative law

Freedom of information

The *Freedom of Information Act 1982* (FOI Act) provides the public with a general right of access to documents held by Australian Government agencies including CSIRO.

The general right is limited by exceptions to protect essential public interests or the privacy or business affairs of those who give information to the agency.

In the year to 30 June 2011, CSIRO received 44 requests for information under the FOI Act.

The following information is provided in compliance with section 8 of the FOI Act:

- the functions and powers of CSIRO are set out on page 84
- information about CSIRO's procedures for external consultation can be found at www.csiro.au/SAC and www.csiro.au/FAC
- CSIRO holds the following categories of documents:
 - corporate records including documents relating to government, policy, finance, personnel, business development, commercialisation, communication, real property, intellectual property and education
 - business unit records including documents relating to scientific research and technology transfer
- members of the public may obtain access to scientific and technical publications from **CSIRO PUBLISHING** (www.publish.csiro.au). CSIRO administrative manuals are available from the Freedom of Information Officer.

Part V of the FOI Act confers a right to request CSIRO to amend a document to which lawful access has been granted, where the applicant claims that information in the document:

- relates to his or her personal affairs
- is incomplete, incorrect, out-of-date or misleading
- has been used, is being used, or is available for use by the agency or Minister for an administrative purpose.

In the year to 30 June 2011, CSIRO received no requests for amendments of personal information under the FOI Act.

Information on CSIRO's implementation of the Information Publication Scheme (IPS) can be found on page 89.

Archives, privacy, administrative decisions

CSIRO maintains an archives collection which includes records dating from the establishment in 1926 of the Council for Science and Industrial Research, the predecessor of CSIRO. Certain CSIRO records are held by Australian Archives. Disposal arrangements for CSIRO records are made in accordance with the provisions of the *Archives Act 1983*. Access to records over 20 years old is provided in accordance with that Act.

The *Privacy Act 1988* provides for Information Privacy Principles and National Privacy Principles. During 2010–11, the Office of the Australian Information Commissioner did not undertake any investigations under section 36 of the *Privacy Act 1988* in relation to CSIRO.

The *Administrative Decisions (Judicial Review) Act 1977* (ADJR Act) enables a person aggrieved by certain classes of administrative decisions made by Australian Government agencies, including CSIRO, to obtain reasons for or to challenge those decisions. During 2010–11, CSIRO received no challenges or requests for statements of reasons under the ADJR Act.

Judicial Decisions

During 2010–11, there were no judicial decisions or decisions of administrative tribunals that have had, or may have, a significant impact on the operations of CSIRO.

Reviews by outside bodies

During 2010–11, there were no reports on the operations of CSIRO by the Auditor-General (other than the report on the Financial Statements), a Parliamentary committee or the Commonwealth Ombudsman.

Contact

All enquiries under the above legislation (including FOI requests) should be directed to: Freedom of Information Officer and Privacy Officer

CSIRO, PO Box 225, Campbell ACT 2602

Phone: 02 6276 6123

Fax: 02 6276 6437

Email: rosemary.caldwell@csiro.au

Appendix 4: Consultancy services

CSIRO's policy on selection and engagement of consultants is based on the principles of:

- value for money
- open and effective competition
- ethics and fair dealing
- accountability and reporting
- national competitiveness and industry development
- support for other Australian Government policies.

These principles are included within CSIRO's Procurement Policy and Procedures.

CSIRO engages individuals and companies to provide professional services, taking account of the skills and resources required for the task, the skills available internally and the cost-effectiveness of these options.

CSIRO spent \$1,845,670 (including goods and services tax (GST)) on consultancies during 2010–11 (\$1,249,355 in 2009–10). There were 25 consultancies let during the year with the total whole-of-life value of \$1,917,497 (including GST) (\$2,282,903 in 2009–10). Table 6.1 provides details of consultancy services let by CSIRO during 2010–11 with a contract value, GST inclusive, of \$10,000 or more.

Notes to table:

Reason code	Reason for consultancy
IS	Need for independent study/evaluation.
PA	Need for professional assistance to manage and facilitate change and its consequence.
SS	Specialist skills were not otherwise available.
Procurement code	Procurement method
PM	An existing panel member – this category includes standing offers, common use arrangements and approved supplier panels.
OT	Tenders sought from the market place (Request for Proposal, Request for Tender, Expressions of Interest).
ST	Tenders being sought from suppliers who have pre-qualified through some form of previous competitive process.
RQ	Purchasing thresholds consistent with CSIRO's minimal standards.
EX	Exemption arrangement such as sole supplier, pre-eminent expertise or urgency and/or practicality.

Table 6.1: Consultancy services

Registration number	Consultant	Purpose	Cost ¹	Reason	Method
2010/08/01	TPI Consultants	The consultant will provide advice to the CSIRO Software Services team in relation to ICT benchmarking services.	11,440	SS	PM
2010/09/01	Wohlers Associates, Inc.	The consultant will create an industry-aligned Technology Roadmap for Additive Fabrication in Australia, with a particular focus on metals, especially Titanium.	60,000	IS	EX
2010/09/02	Katrina Spencer	CSIRO has patented a genetic method for producing high-levels of fructans in grains. The purpose of this consultancy is to scope out the options and directions for CSIRO to commercialise this technology.	19,999	IS	RQ
2010/09/03	Paul Hogie and Paul McFadden	The consultant will advise on eResearch enterprise data and information management, business transformation and strategy formulation, planning and implementation implications.	191,400	SS	ST
2010/09/04	Richard Sauerman	The consultant will work with CSIRO Communications to progress development and implementation of CSIRO brand strategy.	65,000	IS	EX
2010/10/01	Pacific Strategy Partners	The consultant will develop a detailed strategy identifying priorities in building an e-enabled organisation that impacts nationally and internationally through collaborative support for science-based integrated support tools, technologies and infrastructure.	210,000	SS	OT
2010/12/01	Willem Bouma	The consultant will review and edit the First Order Draft of Climate Change in the Pacific Technical Report.	13,800	SS	RQ

¹ Estimated total life cost of consultancy \$ (GST inclusive)

Registration number	Consultant	Purpose	Cost ¹	Reason	Method
2010/12/02	Nice Idea Creative Pty Ltd	The consultant will design and produce a range of communication materials, templates, a visual identity style guide, and a logo, presenting up to six finished logos to presentation standard.	68,000	IS	EX
2011/01/01	Mantrax Ventures Pty Ltd	The consultant will assist CSIRO to promote the RAFT technology within TCG Life Sciences Pty Ltd client base, to identify and facilitate R&D collaboration/licenses with appropriate clients.	21,000	SS	EX
2011/01/02	451 Consulting	The consultant will provide expert advice on using the performance measurement process (PuMP) for the 2011–15 CSIRO Strategy.	11,000	PA	EX
2011/02/01	Martin Grabert	The consultant will undertake evaluation of selected aspects of CSIRO's International Strategy 2007–11, as well as provide advice on relevant developments in European science, as input to CSIRO's next international strategy.	16,500	SS	RQ
2011/02/03	Dr David Cousins	The consultant will prepare an evaluation framework and assist CSIRO staff in conducting an initial evaluation within the Department of Primary Industries (Victoria) and CSIRO collaborative research relationship.	61,500	SS	RQ
2011/02/04	Rhodes Shapter	The consultant will provide a strategy for the development of brand campaigns including strategy development and creative concept development.	196,600	SS	EX

¹ Estimated total life cost of consultancy \$ (GST inclusive)

Registration number	Consultant	Purpose	Cost ¹	Reason	Method
2011/02/05	Josh Tai	The consultant will provide Desktop external review and analysis of market size, case studies, and forecasts for target markets and arenas, to assist the Business Development group explore step change growth options for CSIRO.	61,490	SS	EX
2011/04/01	OTM Consulting Ltd	The consultant will work with CSIRO to develop and commercialise the Near Wellbore Characterisation Tool to ensure that a commercially and technically strong Joint Industry Project collaboration can be established within a rapid time frame.	25,000	IS	EX
2011/05/01	Centre for International Economics (CIE)	The consultant will refine and validate a Strategic Framework for CSIRO impact planning, monitoring and characterisation. External validation will improve the robustness of CSIRO's impact evaluation framework.	88,000	IS	OT
2011/05/02	Deloitte Touche Tohmatsu	The consultant will undertake economic evaluation, investment planning and business model development designed to prepare material to invite third party investment in the Australian Biosecurity Intelligence Network.	85,000	IS	OT
2011/05/03	PricewaterhouseCoopers	The consultant will conduct an independent review to improve the efficiency, effectiveness and service delivery of finance operations and procurement.	121,000	IS	OT
2011/05/04	PricewaterhouseCoopers	The consultant will develop concept options for five of the major research precincts under consideration.	145,659	IS	OT

¹ Estimated total life cost of consultancy \$ (GST inclusive)

Registration number	Consultant	Purpose	Cost ¹	Reason	Method
2011/06/01	Deloitte	The consultant will design, develop and handover an Excel based financial model to support CSIRO's 2011–15 strategy process.	55,000	SS	OT
2011/06/02	Ernst & Young	The consultant will develop a strategic business case for the establishment of a South Australian based Australian Institute for Food and Nutrition Research.	76,778	SS	RQ
2011/06/03	Rockwater Pty Ltd	The consultant will provide specialist hydrogeological advice in relation to the scoping of a geothermal project at the Pawsey Centre and the Australian Resources Research Centre (ARRC) site.	222,349	SS	EX
2011/06/05	Grosvenor Management Consulting Pty Ltd	The consultant will undertake a Functional review of CSIRO Property Services.	73,082	IS	RQ
Total value of consultancies below \$10,000			17,900		
Total value of consultancies let during 2010–11			1,917,497		

¹ Estimated total life cost of consultancy \$ (GST inclusive)

Appendix 5: Science and Industry Endowment Fund Annual Report 2010–11



Dr Megan Clark
Trustee SIEF

As Trustee of the Science and Industry Endowment Fund (SIEF), it is a pleasure to share with you the progress we have made this year in supporting some very exciting and promising science being undertaken in a truly collaborative way. The Fund exists to support research that assists Australian industry, furthers the interests of the Australian community or contributes to the achievement of Australian national objectives.

SIEF funded research

SIEF's unique placement in Australia's science community, as an independent fund, has been recognised by the scientific community through the submission of hundreds of project suggestions over the course of 2010–11. The quality of the researchers seeking involvement with SIEF has enabled the Fund to address issues of urgent national need using the best researchers in Australia to tackle those issues collaboratively. SIEF's involvement with selected projects has been effective in drawing additional investment into these projects from other sources, thereby leveraging the value of the Funds' investment in science and multiplying the potential for addressing key national and global needs with science.

In the second year of its rejuvenation following the substantial gift of funds from CSIRO, SIEF's strategy of funding projects which exhibit a high level of collaboration in areas of national priority, has seen it fulfil a unique role in Australia's science landscape. As the outcomes of these elite projects emerge, they provide potential for extraordinary benefits to our whole community.

One of the urgent challenges being tackled by SIEF is the need to ensure local and global food security. The Fund is sponsoring two projects that are investigating how to utilise more effectively the benefits of hybrid crops to increase yields. We have known for a long time that hybrid plants often have higher yields than their parents, but how this happens has remained a mystery. One of these projects looks to unlock this mystery and the other will look at asexual seed formation. These projects offer new methodologies in plant breeding in response to the need for increased yields and adaptation to climate change. In isolation, each can provide dramatic advances in crop breeding, but in combination they have the potential to deliver a new paradigm in agricultural production.

Another urgent challenge, as our population ages, is to better understand the mechanisms of healthy ageing. SIEF is supporting four leading research organisations from around Australia to enhance a major study investigating the mechanisms of Alzheimer's disease, early detection methods and healthy ageing. All these projects promise outcomes of real benefit to all Australians.

SIEF Governance

I would like to sincerely thank the Advisory Council, composed of some of the luminaries of Australian science, who have ensured the projects funded are of the highest quality and potential benefit. The current members of the Advisory Council are:

- Professor Alan Robson (Chair), Vice-Chancellor, University of Western Australia
- Professor Margaret Sheil, Chief Executive Officer, Australian Research Council
- Professor Tom Spurling, Professor, Faculty of Life and Social Sciences Swinburne University of Technology; CSIRO Board Member; Board Member, International Centre for Radio Astronomy Research
- Dr Ezio Rizzardo, CSIRO Fellow and Honorary Professorial Fellow, University of Melbourne
- Mr Nigel Poole, Strategic Adviser, CSIRO.

The Council provides invaluable advice and guidance in relation to the most effective deployment of SIEF funds.

The Advisory Council is supported by an Expert Panel which reviews hundreds of project suggestions that are submitted to SIEF. I would like to thank the members of the Expert Panel, chaired by Professor Tom Spurling, and comprised of Dr Ezio Rizzardo, Professor Oliver Mayo (former Dean, Faculty of Agricultural Sciences, University of Adelaide and former Chief CSIRO Animal Production) and Emeritus Professor John McKenzie (former Dean of Science and Deputy Vice-Chancellor (Research) University of Melbourne). The Expert Panel provides detailed assistance to the Advisory Council and to the Trustee in relation to technical matters. Advice of specialist experts is sought as required.

The advice provided to the Trustee by all members of the Advisory Council and Expert Panel is *pro bono*, a tribute to the generosity of these individuals and their shared commitment to SIEF's purpose of advancing the community's wellbeing through science.

Reinforcing the unique strengths of the Fund is the strong support provided by Australia's premier science organisation, CSIRO. CSIRO has provided a gift of \$150 million to the SIEF, made in tranches between October 2009 and April 2011. In addition, CSIRO provides support services to the Fund to enable the resources to be managed cost-effectively, maximising the funds available to science. The SIEF team has welcomed the commencement of Dr Melissa Straffon in March 2011 as a full-time, dedicated SIEF Manager. I am indebted to Dr Straffon for the excellent management of the Fund, and to Katrina O'Leary for governance support and to Rose Lenaghan for legal support.

Gifts to SIEF

This financial year saw another generous gift imparted to SIEF from funds donated by the former CSIRO scientist, Dr John O'Sullivan. Dr O'Sullivan led a multidisciplinary CSIRO team that developed and patented the technology at the heart of most modern high speed wireless communications systems and which provided the source of funds for CSIRO's own gift to SIEF. The Fund will apply Dr O'Sullivan's generous donation to two postgraduate scholarships, preferentially in the area of utilisation of scarce radio frequencies.



Dr John O'Sullivan. Credit: Mr Chris Walsh, Patrick Jones Photo Studio



Dr H Eric Dadswell was one of the first SIEF studentship recipients in 1926. In 1960 he became Chief of the CSIRO Division of Forest Products. Credit: Courtesy of Gordon Dadswell

The gift originating from Dr O'Sullivan is a wonderful illustration of the positive contribution that can be made to society when people have faith in the vast capacity of science to address community needs. SIEF is a small and nimble entity which has the ability to be flexible in its strategy to address not only the needs of the Australian community, but to facilitate the vision of those who recognise the value of investing in science.

Promotion of science

The inauguration this year of a program of postgraduate scholarships and postdoctoral fellowships addresses the critical need to promote science through funding the training of Australia's scientific elite. The recipients of these John Stocker Postgraduate Scholarships and Postdoctoral Fellowships are of outstanding academic calibre and will be carrying out research with the highest potential for important scientific achievement and benefits to Australia. During 2010–11, the Fund has awarded six postdoctoral



Recipients of the John Stocker Postgraduate Scholarships and Postdoctoral Fellowships with the Trustee, the Minister; Dr John Stocker (Chairman) and Dr John O'Sullivan. (Front row, left to right) Dr Megan Clark (SIEF Trustee), Dr Caroline Bull, Senator the Hon Kim Carr (Minister for Innovation, Industry, Science and Research), Dr John Stocker (Chairman) and Dr John O'Sullivan. (Back row, left to right) Mr Ashley Jones, Dr Bi-Qing For, Dr Robert Thorne, Dr Navid Nourani, Mr Aaron Song and Dr Kaikai Shen (absent Dr Hannah Lomas and Mr Vikram Ravi).

fellowships and three postgraduate scholarships in areas ranging from astronomy/astrophysics, exploration geosciences and combinatorial material sciences to mathematics and network sciences, environmental informatics and genomics/epigenomics. This successful program will continue for at least three further years.

The John Stocker program has already established a prestigious reputation in the scientific and academic community and is a fitting echo of SIEF's historical origins as an endowment made under an Act of Parliament in 1926 for the purpose of funding the training of an emerging nation's young scientists.

Future SIEF initiatives

In 2011–12, new initiatives for SIEF are anticipated, including the strategic investment in Australian research infrastructure projects of international significance. Processes and protocols for making large strategic investments in infrastructure to support precinct developments around Australia will be a focus for the Fund as well as SIEF's ongoing commitment to Supporting Research, Emerging Research, Strategic Research and the Promotion of Science.

It has been my privilege to observe the unfolding of SIEF into an entity unique in Australia's science landscape which is truly delivering on the vision of Senator the Hon Kim Carr, Minister for Innovation, Industry, Science and Research from the launch of the rejuvenated SIEF in October 2009. Senator Carr described the Fund as 'a great national resource', supported by 'benefactors who share our passion for science and our faith in its ability to make the world a better place' and I look forward to its continued development in 2011–12.



Dr Megan Clark
Trustee SIEF



INDEPENDENT AUDITOR'S REPORT

To the Trustee of the Science and Industry Endowment Fund

I have audited the accompanying financial report of the Science and Industry Endowment Fund, which comprises the Statement by Trustee, Balance Sheet as at 30 June 2011, Statement of Comprehensive Income, Statement of Changes in Equity and Cash Flow Statement for the year then ended and the Notes to and forming part of the Financial Statements, including a Summary of Significant Accounting Policies.

The Trustee's Responsibility for the Financial Report

The Trustee of the Science and Industry Endowment Fund is responsible for the preparation of the financial report that gives a true and fair view in accordance with Australian Accounting Standards (including the Australian Accounting Interpretations). This includes internal control as the Trustee determines is necessary to enable the preparation of the financial report that is free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

My responsibility is to express an opinion on the financial report based on my audit. I conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. These Auditing Standards require that I comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance about whether the financial report is free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial report. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial report, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the company's preparation of the financial report that gives a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the company's internal control. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made by the directors, as well as evaluating the overall presentation of the financial report.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Independence

In conducting my audit, I have complied with the independence requirements of the Australian National Audit Office, which incorporates the requirements of the Australian Accounting Profession.

Opinion

In my opinion the financial report of the Science and Industry Endowment Fund:

- (i) have been prepared in accordance with the Australian Accounting Standards (including the Australian Accounting Interpretations); and
- (ii) give a true and fair view of the Science and Industry Endowment Fund's financial position as at 30 June 2011 and of its performance for the year ended on that date.

Australian National Audit Office



John McCullough
Executive Director
Delegate of the Auditor-General

Canberra
24 August 2011

**SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT BY TRUSTEE**

In our opinion, the attached financial statements for the year ended 30 June 2011 have been prepared based on properly maintained financial records and in accordance with Australian Accounting Standards and other mandatory financial reporting requirements in Australia, and give a true and fair view of the financial position of the Fund as at 30 June 2011 and of its performance for the year then ended.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Fund will be able to pay its debts as and when they become due and payable.



Megan Clark
Trustee of the Science and
Industry Endowment Fund

24 August 2011



Hazel Bennett
Chief Finance Officer of CSIRO
as service provider to the Science and Industry
Endowment Fund

24 August 2011

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF COMPREHENSIVE INCOME
For the year ended 30 June 2011

	Notes	2011 \$	2010 \$
EXPENSES			
Scientific research grants	8	8 998 517	2 533 025
Gift fund establishment fees		-	203 489
Gift fund services fees		687 405	354 464
Consulting fees		64 266	-
Audit fees		7 000	7 000
Bank fees		64	31
In-kind advertising and approval fees	4	4 739	4 419
Total expenses		9 761 991	3 102 428
LESS:			
REVENUE			
Gift income		100 000	150 000 000
Interest		6 444 319	3 198 744
In-kind contributions received	4	4 739	4 419
Total revenue		6 549 058	153 203 163
Net surplus		(3 212 933)	150 100 735
Other comprehensive income		-	-
Total comprehensive income		(3 212 933)	150 100 735

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
BALANCE SHEET
As at 30 June 2011

	Notes	2011 \$	2010 \$
ASSETS			
Current Assets			
Cash	5	146 984 990	98 569 482
Sundry debtors		-	50 000 000
Interest receivable	6	782 734	1 854 002
GST receivable		373 849	298 400
Prepayments	8	-	482 398
Total current assets		148 141 573	151 204 282
TOTAL ASSETS		148 141 573	151 204 282
LIABILITIES			
Current Liabilities			
Creditors		502 815	-
Accrued expenses	7	212 362	564 953
Total current liabilities		715 177	564 953
TOTAL LIABILITIES		715 177	564 953
NET ASSETS		147 426 396	150 639 329
EQUITY			
Contributed equity		200 000	200 000
Accumulated surpluses		147 226 396	150 439 329
TOTAL EQUITY		147 426 396	150 639 329

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF CHANGES IN EQUITY
 For the year ended 30 June 2011

	Accumulated Surpluses		Contributed Equity		Total Equity	
	2011 \$	2010 \$	2011 \$	2010 \$	2011 \$	2010 \$
Balance as at 1 July	150 439 329	338 594	200 000	200 000	150 639 329	538 594
Net surplus	(3 212 933)	150 100 735	-	-	(3 212 933)	150 100 735
Closing balance at 30 June	147 226 396	150 439 329	200 000	200 000	147 426 396	150 639 329

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
CASH FLOW STATEMENT
For the year ended 30 June 2011

	Notes	2011 \$	2010 \$
OPERATING ACTIVITIES			
Cash received			
Gift receipts from CSIRO		50 100 000	100 000 000
Interest received		7 515 587	1 356 023
Total cash received		57 615 587	101 356 023
Cash used			
Payments to grantees		8 028 000	3 015 423
Other payments		1 142 277	-
Net GST paid		29 738	298 400
Bank fees paid		64	31
Total cash used		9 200 079	3 313 854
Net cash provided by operating activities	9	48 415 508	98 042 169
Net increase in cash held		48 415 508	98 042 169
Cash at the beginning of the reporting period		98 569 482	527 313
Cash at the end of the reporting period		146 984 990	98 569 482

The above statement should be read in conjunction with the accompanying notes.

**SCIENCE AND INDUSTRY ENDOWMENT FUND
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS**

For the year ended 30 June 2011

Note 1 Summary of Significant Accounting Policies

1.1 Basis of Preparation of the Financial Statements

The financial report is required by section 10 of the *Science and Industry Endowment Act 1926* and is a general purpose financial report that has been prepared in accordance with Australian Accounting Standards, Australian Accounting Interpretations, and other authoritative pronouncements of the Australian Accounting Standards Board.

The financial statements have been prepared on an accrual basis and are in accordance with the historical cost convention. No allowance is made for the effect of changing prices on the results or the financial position.

Assets and liabilities are recognised in the Balance Sheet when and only when it is probable that future economic benefits will flow and the amounts of the assets or liabilities can be reliably measured.

Revenues and expenses are recognised in the Statement of Comprehensive Income when and only when the flow or consumption or loss of economic benefits has occurred and can be reliably measured.

1.2 Cash

For the purpose of the Statement of Cash Flows, cash includes cash at bank and deposits at call. They are readily convertible to cash.

1.3 Revenue

Interest revenue is recognised on a proportional basis taking into account the interest rates applicable to the financial assets.

1.4 Resources Received Free of Charge

Services received free of charge are recognised as gains when and only when a fair value can be reliably determined and the services would have been purchased if they had not been donated. Use of those resources is recognised as an expense.

1.5 Financial Instruments

Accounting policies for financial instruments are stated in Note 10.

Note 2 Principal Activity

The Fund was established under the *Science and Industry Endowment Act 1926* with the Trustee of the Fund being the CSIRO Chief Executive. An appropriation of 100 000 pounds was received at the time the Fund was established. The funds were invested and have subsequently earned interest over time.

The principal activity of the Science and Industry Endowment Fund is to provide assistance to persons engaged in scientific research and in the training of students in scientific research.

New Gift October 2009

In October 2009, Senator Carr announced a gift of \$150 million to be donated by CSIRO to the Science and Industry Endowment Fund. The gift is intended to be used for scientific research for the purposes of assisting Australian industry, furthering the interests of the Australian community or contributing to the achievement of Australian national objectives. The gift was made subject to the terms of a Deed of Gift between the Trustee and CSIRO dated 15 October 2009.

One hundred million dollars was received in financial year 2009-10. The final instalment of \$50 million was received in financial year 2010-11.

Note 3 Contingencies and Commitments

No contingent liabilities exist as at 30 June 2011.

Schedule of Commitments**BY TYPE**

	2011 \$	2010 \$
Grants payable	17 702 895	13 717 600
Total grants payable	17 702 895	13 717 600

Note 4 Estimated value of resources provided free of charge by CSIRO are as follows:

– advertising and approval fees	4 739	4 419
Total	4 739	4 419

Note 5 Cash (current)

Cash at bank	381 349	5 329 911
Deposits – at call	146 603 641	93 239 571
Total	146 984 990	98 569 482

Note 6 Receivables (current)

Interest receivable	782 734	1 854 002
	782 734	1 854 002
Gross receivables are aged as follows:		
Not overdue	782 734	1 854 002

Note 7	Accrued expenses	2011	2010
		\$	\$
	Establishment costs	-	203 489
	Service fee under Services Agreement with CSIRO	174 347	354 464
	CREST Program awards	31 015	-
	Audit fee	7 000	7 000
	Total	212 362	564 953
Note 8	Scientific research grants		
	CREST Program awards	31 015	31 423
	John Stocker Scholarships	385 000	-
	Macquarie University joint chair in Wireless Communication	365 104	-
	CSIRO AIBL2 grant	1 942 000	-
	CSIRO Plant Breeding grant	900 000	-
	CSIRO Ngara grant	4 893 000	2 984 000
	<i>Prepaid research grants</i>	482 398	(482 398)
	Total	8 998 517	2 533 025
Note 9	Cash Flow Reconciliation		
	Reconciliation of operating surplus to net cash from/(used by) operating activities:		
	Operating surplus/(deficit)	(3 212 933)	150 100 735
	Changes in assets and liabilities		
	(Increase)/decrease in receivables	50 995 819	(52 141 121)
	(Increase)/decrease in prepayments	482 398	(482 398)
	Increase/(decrease) in payables	150 224	564 953
	Net cash from/(used by) operating activities	48 415 508	98 042 169

Note 10 Financial Instruments**10A: Categories of Financial Instruments**

	2011	2010
	\$	\$
Financial Assets		
Cash	146 984 990	98 569 482
Sundry Debtors	-	50 000 000
Interest Receivable	782 734	1 854 002
Total financial assets	147 767 724	150 423 484
Financial liabilities		
Supplier Payables	715 177	564 953
Total financial liabilities	715 177	564 953

The net value of the financial assets are their carrying amounts.

10B: Credit risk

SIEF is exposed to minimal credit risk as financial assets represent cash and short term deposits held at reputable Australian financial institutions and receivables from the CSIRO. For the purpose of this note GST receivables are not disclosed as financial instruments as they do not meet the definition of a financial asset. SIEF has assessed the risk of default on payment to be nil as of 30 June 2011 (2010: nil).

10C: Liquidity risk

SIEF's financial liabilities are supplier payables. The exposure to liquidity risk is based on the notion that SIEF will encounter difficulty in meeting its obligations associated with financial liabilities. This is highly unlikely due to funding that is in place and internal policies and procedures to ensure that there are appropriate resources to meet its financial obligations.

10D: Market risk

SIEF holds basic financial instruments that do not expose SIEF to any market, currency or other price risk.

10E: Interest rate risk

SIEF maintains an operating bank account and short term deposits which are subject to short term interest rates. Funds are maintained in term deposits for short periods. In 2010-11 the average return on cash and short term deposits was 5.96% (2010: 5.54%).

Appendix 6: Research Group structure

Energy

Divisions

Earth Science and Resource Engineering
Energy Technology

Portfolios

Advanced Coal Technology
Energy Transformed National Research Flagship
Petroleum and Geothermal
Wealth from Oceans National Research Flagship

Environment

Divisions

Ecosystems Sciences
Land and Water
Marine and Atmospheric Research

Portfolios

Biodiversity
Climate Adaptation National Research Flagship
Marine and Atmospheric Research
Water for a Healthy Country National Research Flagship

Facilities and Collections

Australian National Fish Collection
Australian National Wildlife Collection
Marine National Facility

Food, Health and Life Science Industries

Divisions

Food and Nutritional Sciences
Livestock Industries
Plant Industry

Portfolios

Food Futures National Research Flagship
Food and Nutritional Sciences
Livestock Industries
Plant Industry
Preventative Health National Research Flagship
Sustainable Agriculture National Research Flagship

Transformational Capability Platforms

Transformational Biology

Facilities and Collections

Australian Animal Health Laboratory
Australian National Herbarium
Australian National Insect Collection

Information Sciences

Divisions

Astronomy and Space Science
ICT Centre
Mathematics, Informatics and Statistics

Portfolios

Astronomy and Space Sciences
Digital Technologies and Services

Transformational Capability Platforms

Computational and Simulations Sciences
Sensors and Sensor Networks

Facilities and Collections

Australia Telescope National Facility
Canberra Deep Space Communication Complex

Manufacturing, Materials and Minerals

Divisions

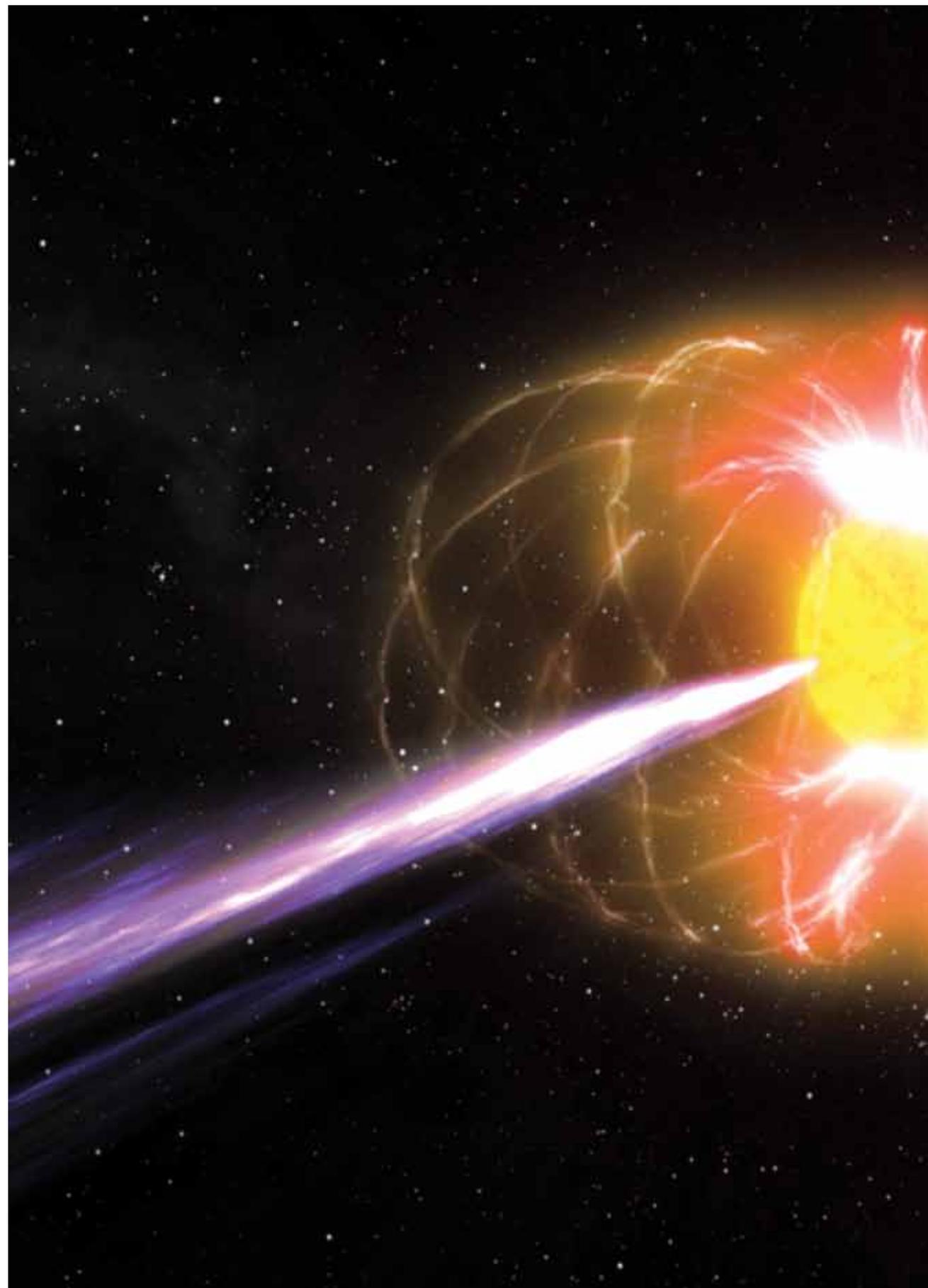
Materials Science and Engineering
Process Science and Engineering

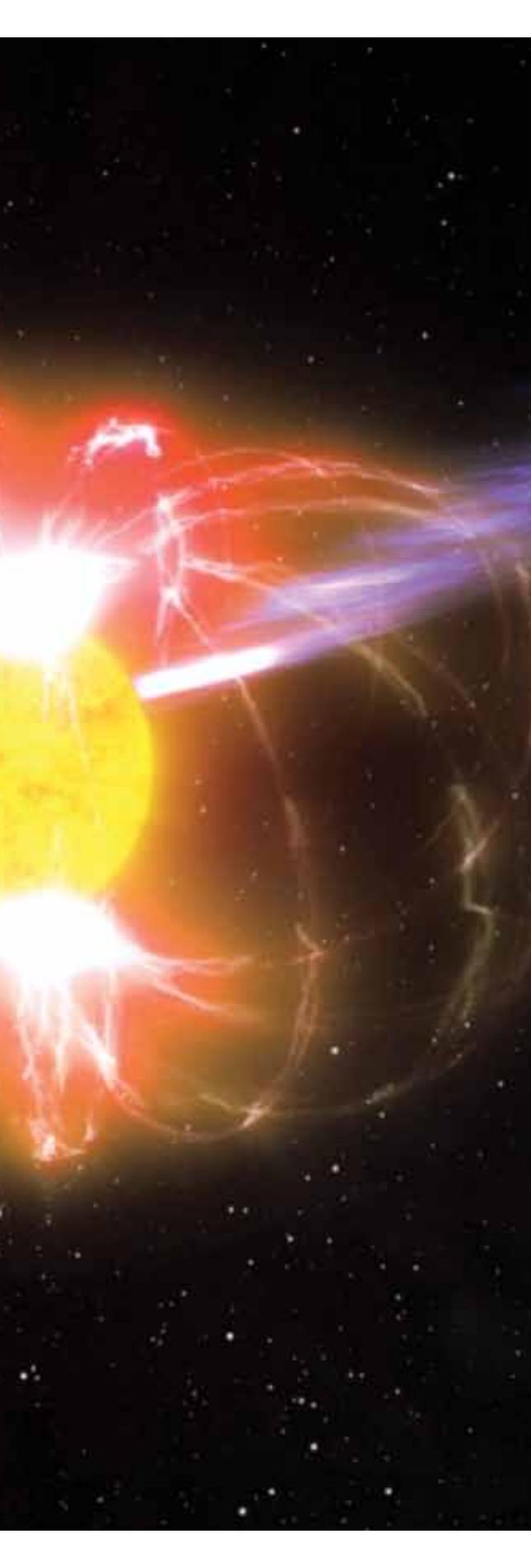
Portfolios

Future Manufacturing National Research Flagship
Light Metals National Research Flagship (closed from 1 July 2011)
Minerals Down Under National Research Flagship
Materials Science and Engineering

Transformational Capability Platforms

Advanced Materials





PART 7

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	Atomic structure of the amyloid-beta protein, caged by four shark antibodies to stop uncontrolled amyloid plaque formation. ©Victor Streltsov, Joseph Varghese, Stewart Nuttall and Colin Masters, CSIRO	
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	CSIRO and collaborators are building a biobank of blood samples in an effort to predict diseases such as colorectal cancer and Alzheimer's disease in ageing Australians. ©iStockphoto	
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- 53 The SynCat facility is helping industry create cleaner, efficient transport fuels from natural gas and other sources. ©Darryl Peroni Photography
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- 55 Funded and managed by the Bureau of Meteorology, the Cape Grim Station (and its archive, pictured) detects atmospheric changes in climatically-important trace gases, including carbon dioxide and methane, as part of a scientific research program jointly supervised by CSIRO and the Bureau. ©CSIRO
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- 55 Michael Thompson (CRC for National Plant Biosecurity/CSIRO) and Anita Lyons (AQIS/CSIRO) using remote microscope technology to make pest identifications. ©CSIRO
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- 57 CSIRO is reducing the energy usage required to produce prunes. ©CSIRO
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- 57 The Texel ewe sequenced in the sheep reference genome project. ©Image courtesy of Jacob Bo Højberg Hansen, University of Copenhagen
- 57 *The CSIRO and Baker IDI Diabetes Diet and Lifestyle Plan*. ©Penguin Publishing
- 57 CSIRO researchers have found a way to delay the ripening times of grapes. ©CSIRO
- 58 Analysis shows current wireless access technologies require four times as many towers as CSIRO's Ngara system. Ngara is an Indigenous word meaning 'listen, hear, think'. ©CSIRO
- 58 An artist's impression of a pulsar with its surrounding magnetic fields (blue lines). ©Russell Kightley Media
- 59 The chief veterinary officers of Australia and Queensland successfully trialled the system in June, when they linked with researchers at CSIRO's Australian Animal Health Laboratory in Geelong, Victoria. ©Nic Svenson, CSIRO
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- 80 A unit tray containing a variety of phenotypes (colour variants) of Christmas Beetles (*Anoplognathus* sp.) ©Gavin Jackson
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- 200–201 An artist's impression of magnetar XTE J1810-197 showing the radio emissions and the magnetic field. ©John Rowe Animation

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Acronyms

AAHL	Australian Animal Health Laboratory	FOC	Flagship Oversight Committee
ADJR Act	<i>Administrative Decisions (Judicial Review) Act 1977</i>	FOI Act	<i>Freedom of Information Act 1982</i>
AGP	Australian Growth Partnership	GE	General Electric
AGSM	Australian Graduate School of Management	GHG	Greenhouse Gas Emissions
ALA	<i>Atlas of Living Australia</i>	GRA	Global Research Alliance
ANAO	Australian National Audit Office	HSE	Health, Safety and Environment
ANDS	Australian National Data Service	HSESC	Health, Safety, Environmental Sustainability and Community
ANIC	Australian National Insect Collection	HSMA	Health and safety management arrangements
ANFC	Australian National Fish Collection	IES	Indigenous Engagement Strategy
ANH	Australian National Herbarium	JSTCC	Joint Science and Technology Cooperation Committee
ANU	Australian National University	LTIFR	Lost Time Injury Frequency Rate
ANWC	Australian National Wildlife Collection	ML	Megalitres
ASKAP	Australian Square Kilometre Array Pathfinder	MNF	Marine National Facility
ASPREE	ASpirin in Reducing Events in the Elderly	MTFR	Medical Treatment Frequency Rate
ATNF	Australia Telescope National Facility	NAIDOC	National Aboriginal Islander Day Observance Committee
CAC Act	<i>Commonwealth Authorities and Companies Act 1997</i>	NIS	National Innovation System
CAS	Chinese Academy of Sciences	NRPs	National Research Priorities
CDS	Commonwealth Disability Strategy	OIE	Office of Indigenous Engagement
CDSCC	Canberra Deep Space Communication Complex	PCC	Post-combustion capture
CRC	Cooperative Research Centre	QFA	Quadrennium Funding Agreement
CREST	Creativity in Science and Technology	RAFT	Reversible Addition-Fragmentation chain Transfer
CSIR	Council for Scientific and Industrial Research	SAC	Sector Advisory Council
CSIROSEC	CSIRO Science Education Centre	SEACI	South Eastern Australian Climate Initiative
CUT	Curtin University of Technology	SIEF	Science and Industry Endowment Fund
DHA	Docosahexaenoic acid	SIR Act	<i>Science and Industry Research Act 1949</i>
EFT	Equivalent Full-Time	SKA	Square Kilometre Array
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>	SQUIDS	Superconducting Quantum Interference Devices
ESD	Ecologically Sustainable Development	START	STroke imAging pRevention and Treatment
ESS	Environmental Sustainability Strategy	TJ	Terajoules
FCF	Flagship Collaboration Fund	TCP	Transformational Capability Platforms
		UAC	Unified Area Command
		UNSW	University of New South Wales
		UQ	University of Queensland
		UWA	University of Western Australia
		VAMCAT	Ventilation Air Methane Catalytic Turbine
		WLAN	Wireless Local Area Networks

Glossary

Intellectual Property

Inventions: This is the number of inventions where one or more patent/applications are current. Accordingly an invention might include a granted patent that is near the end of its life (e.g. 20 years), or it might include a provisional patent application that has only recently been filed. Furthermore, one invention might relate to a patent application in one country only, or it might relate to over 20 patents/applications in different countries covering the one invention.

New inventions: This is the number of new inventions where an application (normally an Australian provisional application) is filed for the first time to protect that invention. A major implication of filing that provisional application is that it provides the applicant with an internationally recognised priority date. A small percentage of CSIRO's new inventions are filed as US provisional applications.

PCT applications: International PCT (Patent Cooperation Treaty) applications are a 'temporary' phase in any international patenting process and these have a life span of 18 months. This type of application is very common in major international corporations and is used by CSIRO when it considers its invention may have wide commercial application. In view of the 18-month time span, it is reasonable to approximate that two-thirds of the reported number were filed in the previous 12 month period.

Granted patents: Once a patent application has been examined and satisfies various patentability criteria it becomes a granted patent. It remains a granted patent until the end of the patent period (normally 20 years) provided renewal fees are paid.

Live patent cases: A live patent case is where either a patent application or a granted patent exists. It does not include cases that have lapsed, expired or been withdrawn. Applications may include provisional applications, PCT applications, and applications pending in Australia or foreign jurisdictions.

Publications

Journal articles: Includes journal articles and other items published as part of a journal (for example, an editorial or book review).

Conference papers: Includes published conference papers, abstracts or edited proceedings.

Technical reports: Includes individually authored chapters as well as whole reports that are subject to peer review and usually publicly released.

Books and chapters: Includes monographs, complete or individual chapters, usually published by a commercial publisher.

Student supervision and sponsorship

Sponsored students: Students are deemed to be sponsored if they receive a full or partial scholarship paid from CSIRO funds to pursue a research project leading to a PhD or Honours/Masters degree. This excludes CSIRO employees, whose study expenses are considered to be 'training and development'.

Supervised students: Students are deemed to be supervised if they have a CSIRO staff member appointed officially by the University as the supervisor for their research project. Normally, CSIRO staff are joint supervisors in conjunction with a university academic.

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