





CSIRO Annual Report 2010–11

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.

Responsible Minister



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

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.

- 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.

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:



- 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.

Simon McKeon

Chairman of the Board

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19 September 2011

Megan Clark
Chief Executive

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CONTENTS Part one: **Overview** Letter of transmittal iii Highlights of 2010–11____viii Foreword by the Chairman___x Chief Executive's report____xii Organisational structure___xvi CSIRO locations xviii Part two: **Enterprise performance** Measuring our performance___2 Strategy implementation____2 Financial performance 6 Intellectual property and equity portfolio_____7 Research capability and scientific excellence 9 Collaboration and partnering_I4 Awards and honours______19 Part three: **Outcome** and program performance Program 1: National Research Flagships___ Program 2: Core research 50 and services Program 3: Science outreach: education and scientific 62 publishing Program 4: National research infrastructure: national facilities and collections









PART 1 OVERVIEW

Letter of transmittal_____iii

Highlights of 2010–11_____viii

Foreword by the Chairman___x

Chief Executive's report____xii

Organisational structure___xviii

CSIRO locations___xviiii

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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.

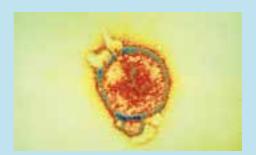
Climate

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

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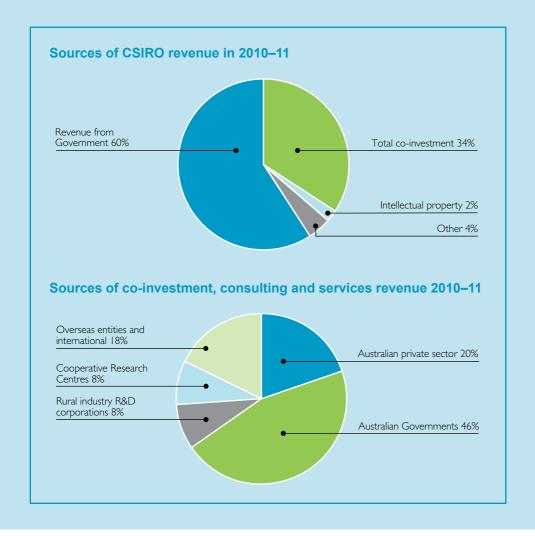


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CSIRO's breakthrough polymer technology known as RAFT (Reversible Addition-Fragmentation chain Transfer) has revolutionised polymer synthesis and spawned a new generation of polymeric materials (more on page 29).

Financial performance 2010-11

CSIRO's financial result for 2010–11 was a deficit of \$10.5 million which included net losses of \$21.3 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.



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 competiveness, 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–II. 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.

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Chairman of the CSIRO Board

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

Year in review

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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 Ngara 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.

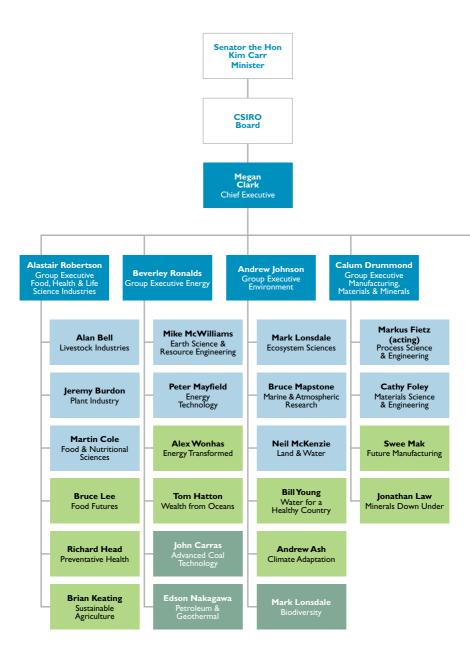
I would like to thank everyone in CSIRO for their dedication and hard work this year as well as the members of the CSIRO Board and Executive Team for their insights, enthusiasm and encouragement.

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

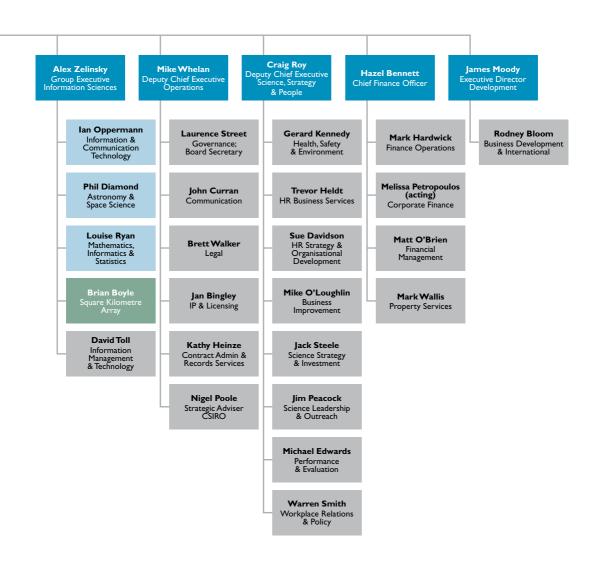
Megan Clark Chief Executive September 2011

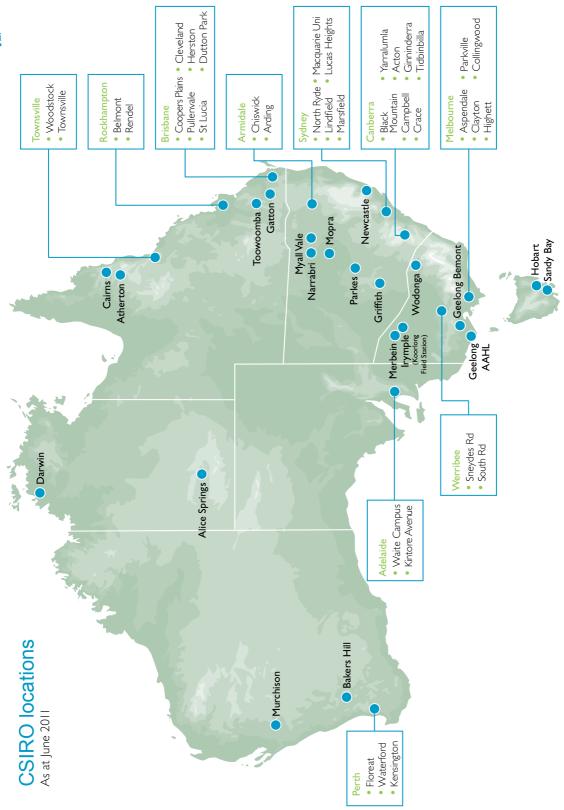
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CSIRO Organisational Chart as at July 2011



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







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

e: (02) 6276 6000 + Facsimile: (02) 6276 6608 + ABN 41 667 119 230

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CONTENTS Part one: **Overview** Letter of transmittal iii Highlights of 2010–11____viii Foreword by the Chairman___x Chief Executive's report____xii Organisational structure___xvi CSIRO locations xviii Part two: **Enterprise performance** Measuring our performance___2 Strategy implementation 2 Financial performance 6 Intellectual property and equity portfolio_____7 Research capability and scientific excellence 9 Collaboration and partnering_I4 Awards and honours______19 Part three: **Outcome** and program performance Program 1: National Research Flagships____ Program 2: Core research 50 and services Program 3: Science outreach: education and scientific publishing Program 4: National research infrastructure: national facilities and collections









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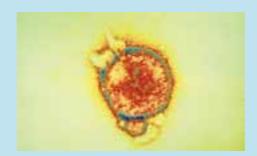
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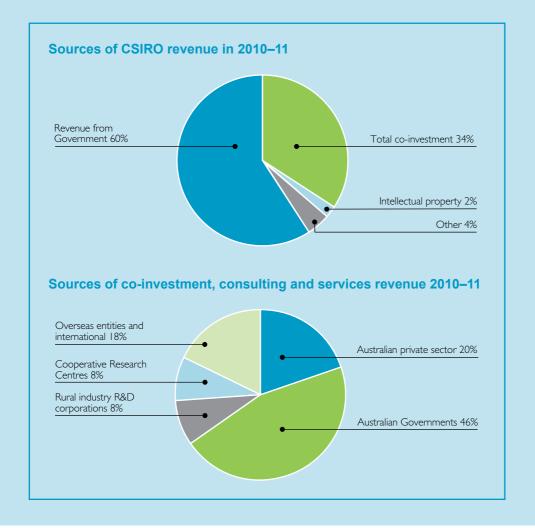


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The Australian Square Kilometre Array Pathfinder (ASKAP) project saw six antennas successfully installed at the Murchison Radio-astronomy Observatory by the end of June 2011. By early 2012, all 36 antennas should be built with the telescope operational 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.

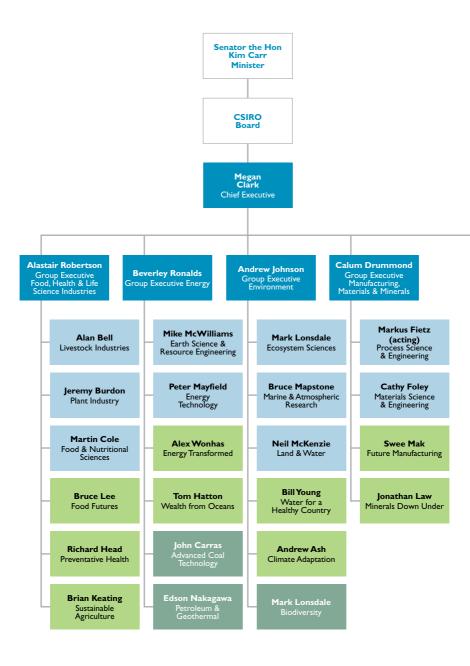
I am confident CSIRO will continue to deliver great science and look forward to the opportunities and challenges in the year ahead.

Megan Clark Chief Executive

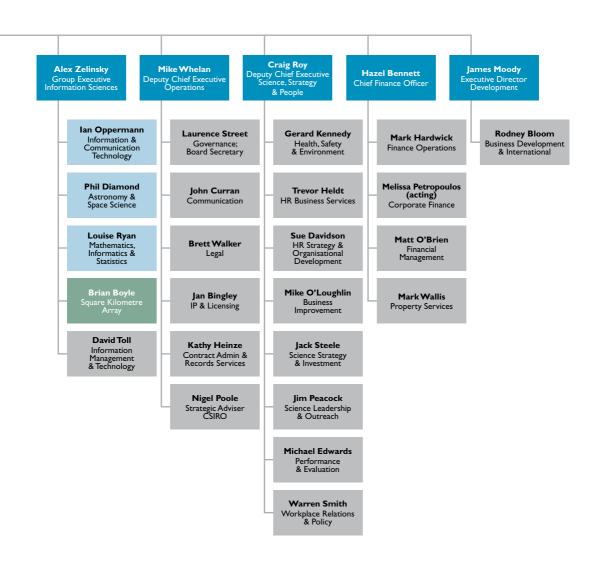
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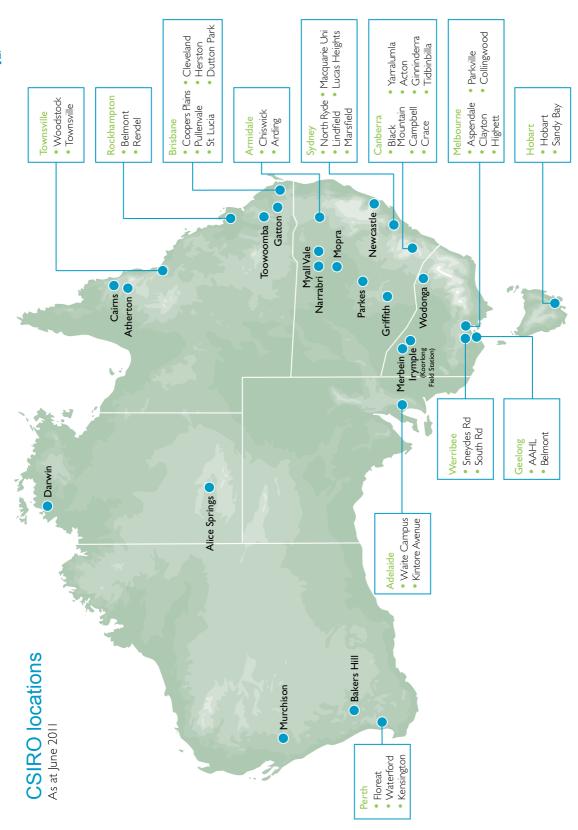
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CSIRO Organisational Chart as at July 2011



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







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