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

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

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

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

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

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.

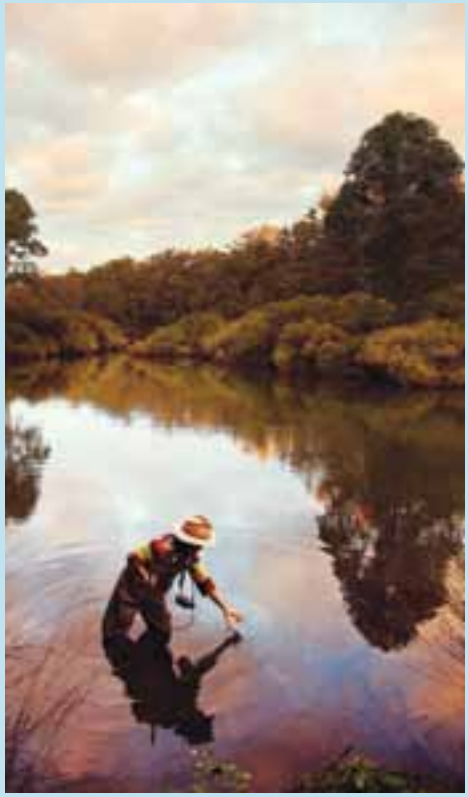
The first project conducted was in the Murray-Darling Basin in 2008, and which has been used to inform decisions about future management of the Murray-Darling Basin, including using updated Murray-Darling Basin Sustainable Yields models in the development of the Murray-Darling Basin Plan.

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

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

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

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