



# SCIENCE IN *ACTION* 06

Commercial achievements and outcomes from  
Australia's  
Cooperative Research Centres

2006

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# Introduction

Australia's Cooperative Research Centres (CRC) Programme is not only teaming the best brains in science and industry across Australia on issues of national priority – it is also delivering substantial economic returns.

The following stories (# 1-12) illustrate the many commercial outcomes and measurable achievements by CRCs, reported in a study “The Economic Impact of Cooperative Research Centres in Australia” by the Allen Consulting Group in December 2005; the others (#13-15) were new developments after the study.

The study found Australia is \$0.60 wealthier for every \$1 invested by the Federal Government in CRC research.

In addition the study showed that:

- gross domestic product (GDP) is cumulatively \$1,142 million higher than would have occurred had the money spent on the CRC programme instead gone to general government expenditure (i.e. Australia is \$1.1 billion better off); and
- real consumption in the economy was up by \$763 million, real investment by \$417 million and tax revenue higher by \$66m compared to what would have been the case without CRC research.

The study looked only at research where the benefits had been delivered, were clearly attributable to CRC research, were validated by industry or other users and would not otherwise have occurred. Twenty five examples met the rigorous criteria for inclusion in the study and half of these are illustrated in more depth in Science in Action 06.

The stories show facets of the growing impact of the CRCs on industry, commerce, employment and the economy.

The stories were compiled as part of the CRC Association's 2006 National Media Initiative by Julian Cribb & Associates. Original media releases are available on [www.crca.asn.au](http://www.crca.asn.au) and an index correlating the names of the stories with those of the media release and date of release is provided at Appendix A

The CRC Programme covers six industry sectors:

- Manufacturing Technology
- Information & Communication Technology
- Mining & Energy
- Agriculture & Rural-Based Manufacturing
- Environment
- Medical Science & Technology

Contacts for the participating CRCs are at Appendix B.

# **SCIENCE IN *ACTION* 06**

## **SUMMARIES**

## **1. Mining Technology Hits Paydirt**

Advanced Australian technology has capped a year of excellent returns in 2005 for the mining sector, according to a new national study.

By early 2006 five draglines had been fitted with the Universal Dig and Dump (UDD) technology developed by CMTE and commercialised through CRCMining. A further two draglines were scheduled for UDD retrofits. According to the Allen Consulting Group retrofitting of two draglines a year will save miners \$8m per annum. Total benefits to the economy are put at \$500m over a decade

## **2. Beef Vaccines Deliver Healthy Profit**

Vaccines for a major disease of cattle in Australian feedlots are generating healthy profits as well as a healthier herd. Two new vaccines to control Bovine Respiratory Disease were commercially released in 2003 and 2004.

Sales of the vaccines had generated \$6 million by late 2005, according to a study carried out by the Allen Consulting Group. They will help prevent a problem that costs industry \$60m a year.

## **3. Composites in \$4bn Aerospace Return**

Australian companies are playing a key role in one of the world's most advanced passenger aircraft, in a contract expected to generate \$4 billion for the national economy over the next 25 years.

In one of the largest contracts ever landed by Australia's aerospace sector, technology developed in the CRC for Advanced Composite Structures (CRC-ACS) is enabling the local aerospace industry to design and construct all the wing trailing-edge devices for a new-generation commercial airliner.

## **4. Now Hear This: Hearing Returns**

Many people in the world who wear a new hearing aid now benefit from software developed in Australia – a growing business that is starting to deliver a solid financial return.

Associate Professor Bob Cowan, Chief Executive of the Cooperative Research Centre for Cochlear Implant and Hearing Aid Innovation (CRC HEAR), says that throughout the world, more people have their hearing aids fitted using software developed by CRC HEAR and the National Acoustic Laboratories (NAL) than by

any other method. This is just one of many projects conducted by the CRC and its partners. The Allen Consulting Group found the research helped Cochlear Ltd to maintain its world-lead and also generated \$3.7m in returns.

## **5. Turning “Noise” into Dollars**

Australian scientists are helping build a profitable new industry which turns ‘noise’ into money. The ‘noise’ is the vast amount of unprocessed data that accumulates whenever something is monitored with sensing devices in areas such as security, radar, water supply, cancer-detection or mineral processing.

Returns totaling \$15m have been delivered by technologies developed by the CRC for Sensor Signal and Information Processing (CSSIP) that can make sense of the data, and see patterns in it that enable people – or machines – to take appropriate action.

## **6. Big Returns from Clearer Vision**

Over 60 million people around the world who wear contact lenses will soon have better vision and greater comfort, thanks to polymers developed by an Australian research team.

“A hundred and twenty five million people wear contact lenses, and half of them will be wearing silicone hydrogel lenses within the next five years,” says Professor Deborah Sweeney, Chief Executive Officer of the Vision Cooperative Research Centre. The NIGHT & DAY<sup>®</sup> lens developed by the CRC and CIBA Vision<sup>®</sup>, has captured a significant share of the \$4.6bn world contact lens market.

## **7. The Scambusters**

Australia’s scambusters are using a combination of high technology and maths to launch an international assault on a \$2 billion securities fraud problem.

In two years, a new anti-fraud product “Compliance Explorer” developed by the Capital Markets Cooperative Research Centre has captured 95% by volume of the Australian broker market and has been widely adopted in New Zealand, Singapore, Hong Kong, the United Kingdom and Canada. The new broker anti-fraud technology complements systems previously supplied by the CRC and its partners to 26 stock exchanges and regulators in 20 countries worldwide, to provide round-the-clock online surveillance.

## **8. Fireproof Polymer Blazes a Trail**

A world-first Australian plastic that transforms itself into a tough, fireproof ceramic-like substance in a blaze is making a big impact in the global fire-prevention market.

Developed by the Cooperative Research Centre for Polymers (CRCP) with partner Olex Australia as a revolutionary fire-resistant electrical cable, sales of products made from the novel polymer and other polymer-based cable compositions generated \$16.6 million in 2004 and 2005, according to a study by the Allen Consulting Group.

## **9. Cleaner Prawn Farmers Clean Up**

Investment in improved environmental performance by Australia's prawn farms has topped \$15m and is delivering a superior product to consumers and higher returns to industry and the nation.

One breakthrough by the Cooperative Research Centre for Aquaculture has enabled prawn farmers virtually to double production from the same amount of feed, while at the same time preventing the environmental pollution which prawn culture has led to in other countries.

## **10. Clearer Beer, Smoother 'Shakes' and Longer Lifespans**

Clearer beer, smoother milkshakes and a healthier life are among the achievements of Australia's Cooperative Research Centre for Bioproducts.

Experts from the CRC have used their ingenuity and skills to solve critical industrial problems relating to unwanted hazes in beer – saving industry \$5m – and instability in dairy products. They have also created novel technologies to produce “bioproducts” with beneficial health properties.

## **11. Aussie Synthetic Vaccines Go Global**

Australian researchers have developed innovative technologies for making synthetic vaccines to prevent or treat infectious diseases, cancers, asthma, allergies and autoimmune disorders in humans and animals.

The synthetic peptide vaccines developed in the in the Cooperative Research Centre for Vaccine Technology (CRC-VT) produce strong and long-lasting immune responses, and can be targeted at a range of diseases and cancers. The program was identified in the Allen Report as potentially one of the biggest commercial successes from the CRC Programme.

## **12. New “Waxy” Wheat for Healthy Eating**

Australian grain growers are growing a new waxy wheat which can be used in a range of bakery products, novel breakfast cereals and health foods.

The waxy wheat is part of an array of novel wheat varieties, breeding technologies, grain diagnostics and food processing technologies developed by the Cooperative Research Centre for Value Added Wheat (CRC VAW) in collaboration with George Weston Foods. The Allen report found it has strong economic promise.

## **13. Five Star Beef Brings Home the Bacon**

A unique beef grading scheme designed and created by the Australian beef industry and Beef Cooperative Research Centre has significantly increased the value of every slice of roast beef, barbecue steak and rib fillet graded through the scheme by guaranteeing tenderness.

A new study has found MSA, a Meat and Livestock Australia initiative, has delivered \$159 million to the Australian beef industry between 1999 and 2005 with a projected benefit of almost \$85m in 2005/06. This is more than three and a half times the total government funds provided to the Beef CRC over the 20 years to 2012.

## **14. Super Fodders deliver \$45M Yield**

Several scientific world-firsts have resulted in nine new “superfodders” – disease-resistant animal feed crops of high yield – which have delivered more than \$45m in benefits to Australia.

The new varieties of lucerne, stylo, cowpea and oats were developed in the Cooperative Research Centre for Tropical Plant Protection (CRC TPP). The new crop varieties have been hailed as a major advance for the nation’s \$1 billion farm fodder industry and its fast-growing seed and fodder export business which is targeting a \$US10 billion trade in Asia.



## **15. Aboriginal Health Improving**

Health in Aboriginal communities is slowly improving. Even the increases in death rates from chronic disease have slowed down, a new study in the *Medical Journal of Australia* has found.

The report from the Aboriginal Health CRC analysed data from 1977-2001. This shows an easing of the increases in death rates, or even falling death rates, for the common chronic diseases since the end of the 1980s.

## **16. Teamwork: Australia's Secret Weapon**

Australia's Cooperative Research Centres are among the most successful experiments in scientific collaboration worldwide in the past 15 years, says CRC Chairman Tony Staley.

CRCs are partnerships between leading research bodies, companies and often government agencies focused on specific national challenges in water, energy, food production, industry, IT, resources, health and the environment.

Evidence for this claim has come in the form of a recent study which found that Australia is \$1.1 billion wealthier, or \$0.60 better off for every \$1 invested by the taxpayer in CRC research.

# **SCIENCE IN *ACTION* 06**

## **FULL REPORTS**

# 1. Mining Technology Hits Paydirt

Advanced Australian technology has capped a year of excellent returns for the nation's mining sector, according to a new national study.

By early 2006 five draglines have been retrofitted with the Universal Dig and Dump (UDD) technology developed by CMTE and now commercialised through CRCMining. A further two draglines are scheduled for UDD retrofits. According to a report by the Allen Consulting Group on the economic impact of Australia's Cooperative Research Centres, plans for the retrofitting of two draglines a year will save \$8m per annum.

Draglines are the workhorse machines of the \$26 billion open cut coal industry and UDD is an innovative rigging and control system which greatly improves their productivity. This technology alone could bolster the national economy by as much as \$500m in the next ten years according to industry-based estimates, CRCMining says.

The retrofitted machines are part of the BHP Billiton Mitsubishi Alliance (BMA) coal fleet and are now delivering productivity increases of between 13 and 21 per cent, says BMA research manager Alan Davis.

While it costs several million dollars to retrofit each machine with UDD, every 6 to 7 machines converted delivers the equivalent of a brand-new 50 cubic metre dragline – at a significantly lower cost than the \$80m purchase price.

“At this stage five of BMA's fleet of 33 draglines have been converted and there are plans to convert as many as 20 of these huge machines - which provide the main capability to remove rock and overburden to uncover more than 50 million tonnes of high quality coking coal that BMA exports annually,” Mr Davis says.

The UDD technology has been commercialized through five spin-off companies from CRCMining: UniDig PL, UniDig 2 PL, UDDTek PL, INETE PL, and MineWare PL. Between them, they provide electrical, electronic, mechanical, structural and mining engineering services associated with retrofitting the UDD technology. Additional services provided by these companies include training of dragline personnel, supply of electronic equipment including the CRC's new dragline monitor (Pegasys). Together they have a potential combined market value of \$150 million.

“This is a clear case where cooperative research has benefited both ends of the business spectrum,” says CRCMining CEO Dr Mike Hood. “On the one hand it is increasing profitability for giants like BMA, and on the other we have set up five small to medium enterprises (SMEs) that will be very profitable in their own right.”

In total, CRCMining has spun out 9 new start-up companies based on new technologies it has developed – a clear indication of how research is generating

new business for Australia, Dr Hood says. But it is also having an impact at the largest scale.

“For example, our new shovel monitor can potentially lift productivity by 10 per cent or more across the mining industry, enabling shovels to work more productively, reducing downtime and preventing overloading of trucks. There is significant overseas interest in buying both products. Australian mining technology exports are now worth several billion a year and are on par with the wine industry.”

In a further major technological advance, CRCMining's novel Tight Radius Drilling (TRD) technology is expected to dramatically increase the nation's reserves of accessible natural gas from coalbeds.

Developed by the CRC in partnership with BHP Billiton and BHP Billiton Mitsui Coal through the spin-off company CBM Innovations PL, TRD uses a waterjet-powered drill which can penetrate the coal seam horizontally with greater flexibility than conventional drills.

This will not only increase the yield of natural gas from coal, but may also enable the safe storage of carbon dioxide in depleted coal seams, in a bid to reduce the greenhouse impact of fossil fuel use.

The UDD and Tight Radius Drilling technologies both address Australia's National Research Priority 3 – frontier technologies for transforming industry.

Overall, Australia is \$1.14 billion better off, or \$0.60 wealthier for every \$1 invested by the Federal Government in CRC research, according to the Allen Consulting Group report. This found that real consumption in the economy was up by \$763 million, real investment by \$417 million and tax revenue by \$66m as a result of CRC research.

More information: 07 3365 5637

## **2. Beef Vaccines Deliver Healthy Profit**

Vaccines for a major disease of cattle in Australian feedlots are generating healthy profits as well as a healthy herd.

Two new vaccines to control Bovine Respiratory Disease were commercially released, in September 2003 and in late 2004.

Although available only for a short time, sales of the vaccines alone reached \$6 million by late 2005, according to a study carried out by the Allen Consulting Group.

Chief Executive of the Cooperative Research Centre for Beef Genetic Technologies, Dr Heather Burrow, says the development of the vaccines is creating immediate financial reward as well as substantial long-term benefits to the industry.

“Bovine Respiratory Disease (BRD) is a serious disease of Australian feedlot cattle; losses and treatment cost \$60 million per year, as well as the costs which result from export restrictions and loss of trade,” she says.

“Two vaccines were developed as a result of research by the Beef CRC. Bovilis MH and Pestigard are quick, cheap and effective means of controlling the disease complex,” says Dr Burrow.

The two vaccines fulfill slightly different roles in the management of beef cattle, says Dr Burrow. Respiratory disease in feedlot cattle may be triggered by transport and mixing of cattle in sale yards, change of surroundings, or other factors producing stress.

“A vaccinated herd doesn’t just stay healthy,” says Dr Burrow. “Using the Pestigard vaccine, there’s a marked improvement in reproductive performance of the vaccinated breeding herd and in the growth of individual animals relative to infected cattle.”

“The vaccines have also led to major savings by reducing the need for antibiotics in feedlot cattle,” she says.

“From the consumer’s point of view, it is also important to be able to show that by using the vaccines, we are eliminating possible antibiotic residues from the steak on the family barbecue.”

The Allen Consulting Group notes that, although quantification of cost savings has not been made, feedlot managers report reduced requirements for antibiotics. Their report notes “Significant benefits are now being realized through the increased efficiency of Australian feedlots and minimization of potential problems with exports.”

According to Dr Burrow the CRC has played an important role in other improvements in beef production, which have been noted by the Allen group.

“Net feed efficiency (NFE) has been a long-term area of research involving the former NSW Agriculture and Meat Research Corporation (MRC),” says Dr Burrow. “Since then NFE has been a major area of research for the CRC.”

Dr Burrow says that an emerging area of vaccine research which will have significant financial benefits is using newly-available data on the cattle tick genome to protect beef and dairy cattle from this important pest. Cattle ticks cause production losses as well as hosting a number of serious diseases in cattle which lead to severe economic losses in beef and milk production.

“The figure for Queensland alone is losses of close to a hundred million dollars per year due to cattle tick infestation,” says Dr Burrow. “While the research is still in its early stages, the project promises to identify new vaccine candidates to protect beef and dairy cattle from the cattle tick and the diseases it transmits, with very large savings to the cattle industry.”

Dr Burrow says that although the economic impact of some areas of rural research remain unquantified, the real and measurable economic benefit of the CRC program has been rigorously investigated. The study by the Allen Consulting Group (2005) shows that for every \$1 spent by the Commonwealth Government on the CRC program, GDP is cumulatively \$0.60 higher than it would have been had that \$1 been allocated to general Government expenditure.

More information: 02 6773 3501

### **3. Composites in \$4b Aerospace Return**

Australian companies will play a key role in the performance of the world's most advanced passenger aircraft, in a contract expected to generate \$4 billion for the national economy over the next 25 years.

In one of the largest contracts ever landed by Australia's aerospace sector, technology developed in the CRC for Advanced Composite Structures (CRC-ACS) is enabling the local aerospace industry to design and construct all the wing trailing-edge devices for a latest generation commercial airliner.

Ailerons, flaperons and flaps will be made in Australia from advanced composites of carbon fibres in epoxy resin using new diaphragm forming and liquid moulding technologies developed in CRC-ACS.

“This material is much stronger, lighter, less expensive, corrosion- and fatigue-resistant, permits greater automation and reduces the need for rivets,” CRCACS Chief Executive Professor Murray Scott explains.

“This contract is the outcome of a serious research effort over ten years in the CRC in which we have developed a cheaper and more efficient way to mould advanced composites.

“Along the way we have developed a total of 62 separate composites technologies and capabilities, many of which are being commercialised right now by our partners.”

Successful technology transfer from the CRC to local industry has already included:

- resin transfer moulding for missile fins
- double diaphragm forming for various parts on commercial and military aircraft
- co-curing techniques

“The extensive use of composites means not only lighter, more fuel-efficient aircraft, but also greater passenger comfort.”

“Because composites don’t corrode, cabin humidity levels can be higher, so passengers become less dehydrated. They also allow higher cabin pressures because of their outstanding properties in tension.”

Another CRC innovation is a fast and efficient way to weld carbon-epoxy composites which has attracted international interest from several of the world's aerospace OEMs and could save the aerospace industry \$15-30m a year in aircraft assembly costs.

CRC-ACS has also devised an expert system for analysing composite structures designed to operate beyond their initial buckling loads, which predicts the loading at which the structure will fail and where the failure will occur.

“It’s all about saving weight,” Prof. Scott says. “You could say we are among the leaders of Australia’s national weight-loss program, because we are designing composite materials for aircraft, ships, vehicles and even sports equipment that all reduce the weight without any sacrifice in strength or safety.

“For example, using our novel structural health monitoring systems and composites it is possible to cut weight in an aircraft by as much as 20 per cent, with big savings in fuel – leading potentially to cheaper air travel. If oil prices remain high, demand for these lighter, strong materials will continue.”

Around the world industries dealing with advanced transport applications are starting to look to Australia for expertise in the new, more affordable composites, and this higher profile is leading to more international contracts, he says.

Australian Defence Industries Ltd, in partnership with the CRC, has also generated \$6m over three years from sale of products which use the new composite technologies, according to a report by the Allen Consulting Group on the economic impact of CRC science.

More information: 03 9646 6544

## 4. Now Hear This: Hearing Returns

A very large proportion of the people in the world who wear a new hearing aid now benefit from software developed in Australia – a growing business that is starting to deliver a solid financial return.

Associate Professor Bob Cowan, Chief Executive of the Cooperative Research Centre for Cochlear Implant and Hearing Aid Innovation (CRC HEAR), says that throughout the world, more people have their hearing aids fitted to them using the formulae and software developed by CRC HEAR and the National Acoustic Laboratories (NAL) than by any other method. This is just one of many projects conducted by the CRC and its partners.

A report by the Allen Consulting Group (2005) found that CRC HEAR's research has not only assisted Cochlear Limited to maintain its world-leading competitive position in the high technology hearing implant field, but it had also generated measurable economic benefits.

These include gross revenues in 2004/05 of \$1 million from the CRC's own commercial company HearWorks Pty Ltd, and \$2.7 million by the venture-capital backed CRC HEAR spin-off Dynamic Hearing Pty Ltd.

Dr Cowan says that commercialisation of the CRC HEAR's 'trainable hearing aid' concept is well advanced, and is expected to capture a significant share of the world market (total annual sales of over \$2 billion) and return significant royalties to Australia. As well as increasing quality of life, this technology should also produce efficiencies in health service provision.

HearWorks and NAL are currently negotiating the commercialisation of HEARLab, a PC-based objective testing system, which has interested a number of major international audiological equipment suppliers. HEARLab has great potential for ongoing sales of novel CRC HEAR-developed test modules worth up to \$1 million annually.

Technology licensed by CRC HEAR to the Victorian company Polaris Communications Pty Ltd has resulted in sales of more than \$15 million of SoundShield, the world's first acoustic shock protection device for telephonists and call-centre staff who routinely wear acoustic headsets. SoundShield has been the industry leader in this newly developing field, and has enabled Polaris to move from an importer-distributor of overseas products to manufacturing and export of Australian-developed hearing protection technology.

All technology developed by CRC HEAR in the implant field is licensed to Cochlear Ltd, notably the Contour electrode array which has now been implanted in over 30,000 patients world-wide. Cochlear Ltd returned sales of \$348 million in 2004/05, with royalty income to CRC HEAR of over \$1 million.



“Hearing loss affects 1 in 5 Australians, and costs Australia twelve billion dollars a year, mainly in lost productivity,” says Dr Cowan. “CRC HEAR’s principle focus is providing the means for improved lifelong hearing retention and improved communication for every individual. In particular, with our ageing population, an increasingly large proportion of the community will be affected by hearing loss, and in need of solutions to keep them ageing productively.

“There are a number of promising technologies which will enable our industry and clinical partners to offer improved technology devices and clinical services,” says Dr Cowan. “CRC HEAR’s research program ranges from exploring the use of ‘intelligent polymers’ to developing new tests for managing infants receiving cochlear implants’. CRC HEAR also works with Cochlear Ltd to provide professional training courses and workshops for overseas surgeons and clinicians involved in carrying out cochlear implants. To date we have trained more than 2500 surgeons and clinicians from over 22 countries who have gone on to use Cochlear’s products.”

Dr Cowan predicts that hearing technology will follow the familiar path of computer technology, becoming faster, smaller, and more individualized.

“The future generation of hearing devices will be so small that they may be fully-integrated with the body of the user,” he says. “They will also be self-programming and automatically adjust to the requirements of the user in any particular circumstances.”

A parallel development will be the ‘intelligent earmuff’. “Noise-induced hearing loss continues to create economic burdens for Australia,” says Dr Cowan, “both as a result of people wearing personal headsets and for people working in noisy environments. The intelligent headset or earmuff will selectively amplify specific sounds such as speech, while dampening deafening noise.”

This will not only preserve the hearing of the wearer, but it will also improve their ability to carry out their job, whether it is in a call-centre, on an aerodrome, or manning a fire-truck.

“It may well even enable a night-club patron to hear what their dancing partner is saying, over the pounding ambient beat,” says Dr Cowan.

Dr Cowan says that the ability of CRC HEAR to generate economic returns to Australia is largely due to its flexible structure, allowing it to meet the needs of its industry and clinical service partners.

“Decisions are made in an industry context, and programs and projects can evolve as required”, he says, “allowing us to make better scientific and economic decisions throughout each project,”.

The work of CRC HEAR supports Australia's National Research Priority No. 2, Promoting and Maintaining Good Health.

**More information:** 03 9667 7539

## 5. Turning 'Noise' Into Dollars

Australian scientists are helping to build a profitable new industry which turns 'noise' into money.

The 'noise' is the vast amount of unprocessed data that accumulates whenever something is monitored with a sensing device – be it a security camera, a radar network, a water supply, a cancer-detection technology or a mineral process.

The profit lies in coming up with technologies that can make sense of the data, and see patterns in it that enable people – or machines – to take appropriate action, says Professor Matthew Cuthbertson, CEO of the CRC for Sensor Signal and Information Processing (CSSIP).

Although CSSIP sun-sets this year after 14 years in action, its legacy of profitable small to medium enterprises and technology products lives on.

A recent study by Allen Consulting on the economic impact of CRC research found that CSSIP had earned \$3 million from sales to Australia's defence sector between 2002-04 and \$12.5 million in sales to the mining sector in 2004-05.

Because of its work with the defence sector, Australia's eyes and ears are a lot sharper. This has included:

- enhancing the performance of Australia's over-the-horizon radar in picking up incursions into our 200-km offshore zone
- new prototype software for real-time air threat assessment, to assist critical command decisions.
- advanced protocols for target tracking and data fusion using multiple types of sensors
- novel ways to generate 3D images from radar data
- advanced algorithms for ship-classification using standard nautical radar

But CSSIP has also developed potentially lifesaving techniques to detect unstable slopes in open-cut mines, new ways to detect pre-cancerous cells from microscope images, better ways to deliver water to farmers and smart networking

of security cameras so they can detect criminal or terrorist activity and track the suspects.

Among the CRC's most notable results is a spinoff called GroundProbe which is marketing slope-stability radar to open-cut mines worldwide. This startup turned over \$12.5 million in its second year and could achieve \$20 million in 2005/06. Its technology detects if a sloping piece of ground is becoming unstable enough to collapse, and more than 30 have been deployed worldwide so far.

"There are also many other potential applications for this technology beyond the mining sector, in countries which are prone to landslips or in engineering situations like tunnelling where a surface structure may be undermined."

However Prof. Cuthbertson considers that one of CSSIP's largest payoffs is likely to come from its work in developing intelligent networks for security cameras. There is worldwide interest in the technology, which has been trialed on two of Sydney's most famous landmarks – the Harbour and ANZAC bridges – and on the Adelaide University campus.

"Instead of have hundreds of cameras reporting to hundreds of monitors watched by a handful of people, there is potential to have the entire network 'thinking' as one – looking for suspicious behaviour or objects, tracking potential suspects and alerting security people to anything untoward. It sounds simple but the challenges involved are far from trivial," he says.

The work of CSSIP supports Australia's National Research Priorities 3 and 4, frontier technologies for industry and national security.

More information: 03 9647 5447

## **6. Big Returns from Clearer Vision**

Over 60 million people around the world who wear contact lenses will soon have better vision and greater comfort, thanks to polymers developed by an Australian research collaboration.

"A hundred and twenty five million people wear contact lenses, and half of them will be wearing silicone hydrogel lenses within the next five years," says Professor Deborah Sweeney, Chief Executive Officer of the Vision Cooperative Research Centre.

"Ten million people are already wearing the lenses, which provide more oxygen to the front surface of the eye to ensure ocular health," she says.

CRC researchers, working with the global vision company CIBA Vision<sup>®</sup>, developed the NIGHT & DAY<sup>®</sup> lens launched in 1999, and the O<sub>2</sub>OPTIX<sup>™</sup> lens which was launched in the US in 2004 and in Australia in 2005.

“The key was the development of polymers that allow the eye to breathe and that are soft and clear enough to be used as contact lenses,” says Professor Sweeney. “This was a puzzle which had occupied researchers around the world for thirty years.”

The breakthrough highly oxygen permeable soft contact lenses provide safe, convenient vision correction and enhance eye health. The NIGHT & DAY contact lenses enabled lenses to be worn for extended periods for the first time, while the O<sub>2</sub>OPTIX lenses were designed to be more affordable to bring the benefits of increased oxygen within the reach of daily lens wearers.

A recent report by the Allen Consulting Group (2005) found that the Vision CRC and its international partners have gained a significant share of the global market. The worldwide contact lens market is currently US\$4.6 billion. It is predicted that silicone hydrogel lenses will capture at least half of the market. It is also expected that the convenience of extended wear will entice spectacle wearers to contact lenses, triggering market growth.

“The sales of O<sub>2</sub>OPTIX and NIGHT & DAY lenses generated US\$10m in royalties for the Vision CRC in 2004-05. That figure is expected to rise significantly over the life of the patents, which extend to 2014,” says Professor Sweeney.

The royalty income will be reinvested in CRC research, development and education.

Other work by the CRC includes the development of contact lenses for specific problems such as myopia and presbyopia, including a multifocal contact lens for ageing eyes, and contact lenses that may slow or prevent the development of myopia.

Another major project of the CRC, with anticipated returns of some \$150 million, is the corneal onlay program, which is developing a permanent method of vision correction through the implantation of a lens just under the surface of the cornea.

The CRC also conducts educational programs for eyecare practitioners throughout the world. “Hundreds of practitioners and PhD students each year are helped by Vision CRC educational programs,” says Professor Sweeney. “The aim is expansion of knowledge of the improved technology, and worldwide improvement in eyecare.

“We also ensure that a proportion of our royalties is directed back to participant organisations that are involved in humanitarian activities,” she says.

The work of the Vision CRC supports Australia's National Research Priority No. 2, Promoting and Maintaining Good Health.

More information: 02 9385 7406.

## **7. The Scambusters**

Australia's new scambusters are taking world stock exchanges and security markets by storm, using a combination of high technology and maths to launch an international assault on securities fraud.

In barely two years, a new anti-fraud product "Compliance Explorer" developed by the Capital Markets Cooperative Research Centre has captured 95% by volume of the Australian broker market and has made significant inroads into markets in New Zealand, Singapore, Hong Kong, the United Kingdom and Canada.

The new broker anti-fraud technology complements systems already supplied by the CRC and its partners to 26 stock exchanges and regulators in 20 countries worldwide, to provide three-point, round-the-clock online surveillance.

With good money to be made in fraud prevention, revenues from the CRC's new spinoff venture, Capital Markets Surveillance Services (CMSS) are already approaching \$2 million a year with projections it will grow to \$30-40m a year by 2010, says Capital Markets CRC CEO Professor Mike Aitken. Of significant importance is that expansion of the company has been largely self-funding meaning that the CRC has not yet had to seriously dilute its holding in CMSS. This means greater returns for Australia, says Prof. Aitken.

The rapid uptake of the new anti-stock fraud venture follows the CRC's earlier success in developing and taking to market a new system for picking up fraudulent health insurance claims called Dtechtive, which tackles a problem estimated to cost the Australian industry as much as \$2 billion a year. This has been commercialized through Dtecht Pty Ltd.

A recent report by the Allen Consulting Group (2005) found that the CRC Capital Markets' four new spinoff companies generated earnings of \$1.2 million in 2005.

This will rise to \$4m in 2006, Prof Aitken says.

The systems behind the smart detection technology have been under development since 1994 and are based on Australian innovations in managing,

mining and interpreting vast volumes of data in real time, scrutinizing them for patterns which betray a fraud in progress.

“The basic problem is that there is so much information pouring through stock exchanges and health funds all the time that it is beyond human ability to scan it and spot anomalies that point to someone trying to rot the system in time to catch them. Our researchers have developed an intelligent system that can ring the alarm bell very quickly if something odd shows up,” Prof. Aitken says.

“Assembling hundreds of data sets across 80 countries was a major challenge that had baffled quite a few of our competitors for years. Our solution was for our industry partner, SMARTS, to use their existing relationships with exchanges in many countries to secure one data source for all brokers for a particular country. This saved huge costs, as in most markets only one data bridge to the exchange was needed to service all brokers.”

Another breakthrough was in data management. The CRC optimized the data structure so 10,000s of transactions could be monitored every second, providing real-time feedback to broker compliance divisions on what their traders are doing. This service has been outsourced along with an industry training package so brokers can ‘plug and play’ after as little as a 90-minute training session.

“This isn’t just protecting the assets of the wealthy, either,” Prof Aitken adds. “40 per cent of Australia’s superannuation funds are invested in local securities markets, so this is literally helping to guard the life-savings of the nation.”

The system has benefits for small as well as large securities markets. The Newcastle Stock Exchange, for example, can comply with anti-fraud regulations for a mere fraction of the costs of larger more established exchanges, reducing the cost of regulation which has traditionally been a barrier to the entry of new players.

“From indications so far, we consider it may be possible for our technology to capture up to half of the global market for anti-securities fraud, which is worth around \$2 billion a year, and we can add further value to that,” Prof. Aitken says, “by using the same data to provide other information services to stakeholders within the securities community. Further, new fraud detection services for other stakeholders (accountants and Auditors and fund managers are also about to be released deploying similar technology and knowhow that gave rise to the recent health insurance fraud spin-off.”

The CRC’s other major commercial product, Dtechtive, is aimed at curbing an alleged \$500m in private healthcare and potentially up to \$2 billion in overall fraudulent health transaction claims every year in Australia alone. The technology was spun off into Dtecht Pty Ltd in October 2005, and several major health insurance funds have trailed its services in recent months.

“Dtecht stands to be the market leader in data mining technology in the health insurance industry over the long term and is very well positioned to gain substantial revenue from saving even a small proportion of the current losses,” he says.

The CRC’s research addresses National Research Priorities two, three and four – a healthy Australia, frontier technologies for transforming industry and a secure Australia.

More information: 02 9233 7999

## **8. Fireproof Polymer Blazes a Trail**

A world-first Australian plastic that transforms itself into a tough, fireproof ceramic-like substance in a blaze is making a big impact in the global fire-prevention market.

First developed by the Cooperative Research Centre for Polymers (CRCP) and Olex Australia as a revolutionary fire-resistant electrical cable, sales of products made from the novel polymer and other polymer-based cable compositions, commercialised by another participant in the CRC, generated \$16.6 million in 2004 and 2005, according to a study by the Allen Consulting Group.

The revolutionary product is expected to make a major contribution to Australia’s \$8 billion polymer industry, including expanding exports and replacing imports.

In a fire, the polymer composites starts to transform into a ceramic structure once a temperature of around 300 degrees is reached. The technology has been successfully commercialised by Olex Australia ([www.olex.com.au](http://www.olex.com.au)) as insulation for their Pyrolex® Ceramifiable® high performance fire cable, and by spinoff company Ceram Polymerik for other fire-prevention applications.

The cable is flexible under normal conditions but forms a protective ceramic barrier when exposed to heat and fire, says CRCP chief executive Dr Ian Dagley. “Even after 2 hours at 1000° C, the cable can continue to conduct electricity because of the protection provided by the ceramic cover.

“The technology works in a wide range of plastics and rubbers. These composites can be flexible or rigid to meet the particular requirements of a fire protection component or material.

“It is particularly valuable for passive fire protection, which refers to products in buildings, structures or transport vehicles that enhance their fire resistance. The aim is to contain the movement of heat and smoke between floors, rooms or

compartments by sealing penetrations, prolonging stability or creating barriers to the passage of fire, heat or smoke.”

Potential fire protection applications of the composites include:

- door and window components
- gap seals for concrete wall panels
- ducting and building penetrations
- structural steel protection
- fire protection in marine and transport
- partitions, ceilings and wall linings
- equipment security
- fire barriers for material storage
- protection from incendiary devices

Ceram Polymerik is currently working on bringing to market products targeting a number of these applications and has recently raised a follow-on investment round for this purpose.

CRCP’s research addresses National Research Priorities three and four – frontier technologies for transforming industry and a secure Australia.

**More information:** 03 9518 0400

## 9. Cleaner Prawn Farmers Clean Up

Improved environmental performance by Australia’s prawn farms is delivering a superior product to consumers – and higher returns to farmers and the nation.

One breakthrough has enabled prawn farmers virtually to double production from the same amount of feed, while at the same time preventing the environmental pollution caused by prawn culture in other countries.

“For the past decade we have been finding ways which improve both the economic and the environmental performance of prawn farms,” says Dr Nigel Preston of CSIRO and the Cooperative Research Centre for Aquaculture.

Scientists have investigated water usage, nutrients, and discharge licensing problems. Prawn farmers are also using software designed by the CRC to assist with farm business management.

“From the prawn farmers’ standpoint, it is a matter of taking on board the improvements which science has made available. Researchers have been



working closely with farm managers, trying to understand the processes of the farm in real time and in a real environment.”

A recent (2005) study by The Allen Consulting Group found the prawn industry has invested more than \$15 million to improve its environmental performance, using practices developed by the CRC.

“The results of the research provided new insights into prawn pond and discharge water management,” says Duncan Buckeridge, formerly with Allens. “This had significant, quantifiable impacts on industry practices.”

Dr Preston says that today, all Australian prawn farms use discharge water treatment systems which meet the nutrient discharge rate established by CRC research, and that this has much more than an environmental benefit.

“As the ‘used’ water is discharged, it is recaptured and re-circulated, leading to substantial savings in water and pumping costs, but more importantly giving the prawns a second chance to absorb the nutrients in the water.

“Up to three quarters of prawn farming costs are feed,” says Dr Preston. “Only part of the food pellets are initially eaten by the prawns themselves – the rest feed various micro-organisms, phytoplankton, fungi and so on.

“All of these small organisms which have eaten the prawn food are themselves food for prawns – if they are not washed away in the pond discharges.

Recapturing the effluent, allowing the sediment to settle, and pumping it back to the prawns gives them a second chance to extract the nutrients that originated from prawn feeds.

“This means that the prawn farmer doubles the value of the expensive feed which is fed to the prawns in the first place.”

Dr Preston says that much of the research leads to better hands-on management, but the research itself involves sophisticated tracking of isotopes of nitrogen and phosphorus throughout the farming cycle.

“To make practical improvements, we needed some very fine analysis,” he says. “We needed to be sure that the isotopes we were tracking were in fact from the introduced nutrient, rather than from naturally-occurring algae or other sources.”

Dr Preston says that unlike most farmed animals, the parents of farmed prawns still need to be captured in the wild. All farmed prawns are originally wild stock captured by trawlers at sea. A key issue for the industry is to progress beyond their current reliance on wild broodstock to the use of domesticated, selectively bred stocks.

“Having successfully developed the world’s best practices in the environmental management of prawn farming, the industry is now focusing on other critical issues including a major initiative by the Australian Prawn Farmers Association to achieve commercial domestication of the Australian black tiger prawn,” he says.

“The first commercial trials are now in progress, but there is still a complex program of research to be completed, as there are still many unknowns: the preferred environment for black tiger prawns; how susceptible will they be to diseases; what are their rates of reproduction? – the sorts of questions that all livestock producers have faced during the development of their respective industries”

Dr Preston says that a combination of Australia’s scientifically-based prawn farm management, plus the anticipated success of a black tiger prawn breeding program, will consolidate Australia’s position at the forefront of world aquaculture.

**More information:** 08 8207 5302

## **10. Clearer Beer, Smoother ‘Shakes and Longer Lifespans**

...are among the outcomes of Australia’s Cooperative Research Centre for Bioproducts.

Experts from the CRC have used their ingenuity and skills to solve critical industrial problems relating to unwanted hazes in beer and instability in dairy products, previously costing industry millions of dollars. They have also created several novel technologies to produce “bioproducts” with well-known beneficial health properties.

Bioproducts are natural products from plant or animal material. The CRC has focused on plant bioproducts and several strands of the CRC’s work have been devoted to the study of biopolymers – which is another word for vegetable gums.

A new understanding of the structure of beer particles developed for a major brewery by the CRC led to new ways to improve the temperature stability and clarity of beer. The knowledge saved the company \$5 million, according to a recent study by the Allen Consulting Group, and led to further collaboration between the CRC and the brewery to develop novel biopolymer fining agents to further improve the brewing process. This work was conducted with financial support from a National Food Industry Strategy Food Innovation Grant (“FIG” grant).

In another major problem-solving exercise, a large food ingredients company was experiencing difficulties with stabiliser systems developed for dairy applications. The CRC was able to demonstrate where the trouble lay, and the resolution of the problem resulted in \$3million per year savings, according to the same Allen Consulting Group report.

But the CRC has not just spent its time solving other people's problems. In a major breakthrough, the CRC developed a novel fermentation process to make resveratrol from grape cells. Resveratrol has been called the "elixir of life", is a powerful anti-oxidant, and is allegedly responsible for the "French Paradox", which is where despite high fat diets, French people live longer. Resveratrol has been shown to reduce hypertension and blood cholesterol levels and promote longevity. The key to the CRC process is the use of special fermentation conditions to produce resveratrol at sufficiently high concentrations to make the process economically attractive.

"Normally, resveratrol occurring in grape skins is extracted into red wine at low, part per million concentrations, and to get the benefits, you would have to drink several gallons a day – which would result in some undesirable side effects", says CRC Business Manager, Dr Richard Thwaites. "Our process enables resveratrol to be incorporated into functional foods, beverages, and even in cosmetic products – without the headaches".

Another promising natural product investigated by the CRC is lycopene. Lycopene is reported to stop prostate cancer. It occurs mainly in tomatoes. The CRC investigated ways of extracting lycopene from tomato skins which otherwise would have been thrown away. "The idea is to create value from waste products", says Dr Thwaites. The lycopene recovered in this way can be combined back into soups, sauces and salsas, increasing the health benefits of these popular dishes.

The CRC's most important advance, however, is a novel process to convert waste orange peel into pectin. Pectin is a biopolymer, a natural fibre, which has been used in the food industry for decades if not centuries. Its main uses are in jams, jellies, beverages, lollies and dairy products. It is also used in a number of pharmaceutical products.

The CRC's process has several competitive advantages over conventional industrial processes, in particular lower capital and operating costs; pectin users have found that pectin made using CRC technology has a number of application benefits, too. Investor groups are currently reviewing the CRC's technical package with a view to commercialising the technology.

"Australia currently imports its total requirements of pectin. We also produce some 100 to 150,000 tonnes of orange peel each year which are either discarded or fed to cattle. This technology creates the opportunity to launch a cost-

competitive major food ingredient on world markets based on low-value inputs”, Dr Thwaites says. “A new pectin production plant in Australia would be ideally situated to capture not only a significant share of the 400 tonne domestic market, but also the expanding export markets in Asia. The cows wouldn’t miss out either,” he added, “as the spent peel could still be used in cattle feed after extracting the pectin.”

The work of the CRC for Bioproducts demonstrates the huge potential that exists in Australian plant products using advanced scientific methods, according to Dr Thwaites. In addition to the examples referred to above, the CRC has worked on heat activated cross-linking thermosetting biopolymer systems which can be used to make complex ceramic shapes, and fermentation processes to produce active ingredients in various herbal remedies. It has worked with a number of listed companies to produce natural plant extracts with food and pharmaceutical potential, and continues to make its unique fermentation facilities available to industry.

More information: 03 9396 8749

## **11. Aussie Synthetic Vaccines Go Global**

Australian researchers have developed innovative technologies for making synthetic vaccines to prevent or treat some infectious diseases, cancers, asthma, allergies and autoimmune disorders in humans and animals.

The synthetic vaccines produce strong and long-lasting immune responses, and can be targeted to enable treatment of chronic diseases and cancers. They are potentially safer, less expensive and more convenient than existing therapies, especially for patients with chronic diseases.

Researchers in the Cooperative Research Centre for Vaccine Technology (CRC-VT) have developed two technologies that enable short synthetic peptides to induce immunity.

“The immune system does not normally notice short peptides”, says Professor Anne Kelso, Chief Executive of the CRC. “One reason is that they are usually invisible to the white blood cells that help other immune cells to produce antibodies or become killer T cells. The other reason is that most peptides do not contain danger signals that alert the immune system to respond to a threat.”

Associate Professor David Jackson and his collaborators in the CRC-VT have discovered ways to overcome both of these barriers to the use of synthetic peptide vaccines.

First, they identified short peptides ('helper epitopes') in the canine distemper virus that can activate helper T cells in several animal species, including different breeds of dogs. They showed that these helper epitopes boost the immune response when they are linked to target peptides from viruses, bacteria, cancers or even some hormones.

In December 2005, the global pharmaceutical company Pfizer International LLC signed a licensing agreement with the CRC-VT to acquire the rights to non-human animal uses of the helper epitope technology.

The CRC-VT team's second discovery was that linking certain lipid (fat) molecules to the centre of the peptide vaccine in a branched structure greatly increased the efficacy of prototype vaccines. Professor Jackson says: "The lipid acts as a danger signal, fooling the immune system to respond as though it was being attacked by a harmful agent."

"Synthetic vaccines that incorporate both the lipid and our helper epitopes have a number of advantages over traditional vaccines made from viruses or bacteria," says Professor Kelso. "They are synthesised chemically as pure, defined products without any infectious material. They also offer potential safety advantages over many traditional vaccines."

In 2004, the CRC-VT licensed human uses of both the lipid technology and the helper epitope technology to the start-up company VacTX Pty Ltd, formed by the CRC-VT and Australian biotechnology company EQiTX Limited to develop synthetic peptide vaccines for a range of human diseases.

"A project of this nature takes time and sustained funding," says Professor Kelso. "Support from the Australian Government's CRC Programme gave us the resources, extended funding and research links needed to develop and patent our intellectual property and to undertake long-term vaccine trials in animals, before licensing to commercial partners. We think this is the way to bring maximum health and economic benefits to Australia from our research."

A recent (2005) study by The Allen Consulting Group identified the CRC-VT's synthetic vaccine technology as one of the important prospective outcomes of the Commonwealth's CRC Programme.

"In the absence of the collaborative research framework provided by the CRC organizational structure, the technological breakthroughs that generated these outcomes would have been unlikely to occur in the timeframe under consideration. These benefits are therefore additional to those that would have been likely to eventuate if the Commonwealth had not provided CRC funding and if all other contributors of resources to the CRCs had instead used those resources internally on their own research activities." (Allen Report p.19).

The work of the CRC for Vaccine Technology supports Australia's National Research Priority No. 2, Promoting and Maintaining Good Health, and Priority 3, Frontier Technologies for Building and Transforming Australian Industries.

More information: 07 3362 0430

## **12. New “Waxy” Wheat for Healthy Eating**

Australian grain growers are growing a new waxy wheat which can be used in a range of bakery products, novel breakfast cereals and health foods.

The waxy wheat is part of an array of new wheat varieties, breeding technologies, grain diagnostics and food processing technologies developed by the Cooperative Research Centre for Value Added Wheat (CRC VAW) in collaboration with George Weston Foods.

A recent study by the Allen Consulting Group found these had strong economic promise, in addition to the \$1.14 billion in measured benefits which it identified as having flowed from Australia's CRCs.

Research Director of the Cooperative Research Centre for Value Added Wheat, Dr Bill Rathmell, says that our researchers are leading the world in developing wheat-breeding technology – without needing to use genetic modification.

“Scientists from the Wheat CRC are using cutting-edge biotechnology to accelerate the rate at which wheat can be improved and selectively modified, without using genetic modification as such,” he says.

Dr Rathmell says that the newly developed ‘waxy wheat’ is now undergoing commercial trials in bakery products.

The new wheat is likely to be used in a range of innovative products aimed at the modern consumer.

“Unlike durum wheat for pasta, which is a different species of wheat, the new ‘waxy’ wheat is the result of breeding for specific starch properties in conventional wheat,” he says.

Dr Rathmell says that breeders and growers have enthusiastically adopted molecular marker technology, which has enabled them to accelerate breeding programs for improved wheat strains without the use of genetically modified plants.

The marker technology was developed by the CRC in a user-friendly form with Australian grain farmers in mind, he says.

“Both wheat and barley breeders have adopted the marker program, meaning they are able to achieve better crops from improved varieties,” he says. “This technology is also world-first for Australia, and many overseas orders have been received.”

Dr Rathmell says that Australian grain growers are highly skilled users of leading edge technology, compared with their colleagues in Europe and the USA.

Dr Rathmell says that he has great confidence in the future of grain growing in Australia, even with the growing threat of climate change and dryland salinity.

“At present we have some ten million hectares of wheat, producing twenty million tonnes per year, and we usually export more than three quarters of this,” he says. “The CRC is devoted to creating and developing technology which will ensure that the wheat industry remains sustainable in Australia and is able to adapt to the changes which will inevitably occur.”

A recent (2005) study by The Allen Consulting Group identified the Wheat CRC's research and commercialisation projects as holding particular promise for future economic benefits for Australia.

The Report noted especially the development of new soft wheat varieties and germplasm; new wheat breeding technologies including a whole-genome, high throughput, low-cost genotyping service; diagnostic tests and instruments, and bakery control technology.

Overall, Australia is \$1.14 billion better off, or sixty cents wealthier for every dollar invested by the Federal Government in CRC research, according to the Allen Consulting Group report. This found that real consumption in the economy was up by \$763 million, real investment by \$417 million and tax revenue by \$66m as a result of CRC research.

The work of the CRC for Vaccine Technology supports Australia's National Research Priority No. 2, Promoting and Maintaining Good Health, and Priority 3, Frontier Technologies for Building and Transforming Australian Industries.

More information: 02 9490 8488

## 13. Five-Star Beef Brings Home the Bacon

A unique beef grading scheme designed and created by the Australian beef industry and research from the Federal Government's Cooperative Research Centre Programme has significantly increased the value of every slice of roast beef, barbecue steak and rib fillet graded through the scheme.

Underpinned by science conducted by the Beef Cooperative Research Centre, Meat Standards Australia (MSA) is a beef grading scheme which, depending on how the beef is cooked, guarantees tenderness.

A new study has found MSA, a Meat and Livestock Australia initiative, has delivered \$159 million to the Australian beef industry between 1999 and 2005 with an estimated benefit of almost \$85m for the 2005/06 financial year. This represents more than three and a half times the total Commonwealth funds provided to the Beef CRC for a period of twenty years through to 2012.

"The value amounts to twenty cents for each kilogram of beef graded through MSA," says Allan Bloxsom, Program Manager of Industry Systems in Meat and Livestock Australia (MLA). "At the same time it offers increased consumer benefits from better quality assurance and improved production processes."

Mr Bloxsom says the MSA model is unprecedented in accuracy and takes into account all the Critical Control Points (CCPs) of beef production that impact on palatability. From the farm to the abattoir and even during the value-adding phase, MSA predicts how well the beef will eat when it is cooked at home by the consumer using a star grading system where 3 star is 'good every day', 4 star is 'better than every day' and 5 star is 'premium'.

"Leading meat sellers are now increasingly using MSA to assess product, and producers in-turn are receiving good returns to produce good quality, guaranteed tender beef."

A new phase for MSA is currently being investigated by the Beef CRC, using research to quantify the effect of novel gene markers for tenderness in terms of consumer taste panel scores.

"In the future, if an animal has the appropriate gene markers for tenderness or palatability the MSA model could allocate additional points to the individual cuts of meat," says Dr Heather Burrow, CEO of the Beef CRC.

The new research will use data collected by the Beef CRC and MSA, where results for meat quality tests and DNA were collected on a large number of cattle from different experiments.

"In total, about twenty thousand cattle have been genetically characterised by the Beef CRC," says Dr Burrow, "and this will allow genes for economically important



traits to be identified in the Australian herd, and also become indicators for high quality product as part of Meat Standards Australia.”

More Information: 02 6773 3795

## **14. Superfodders Deliver \$45m Yield**

A string of scientific world-firsts has resulted in nine new “superfodders” – disease-resistant animal feed crops of high yield – which have delivered more than \$45m in benefits to Australia.

The new varieties of lucerne, stylo, cowpea and oats were developed in the Cooperative Research Centre for Tropical Plant Protection (CRC TPP) by a team led by Chief Executive Officer Professor John Irwin.

The new crop varieties have been hailed as a major advance for the nation’s \$1 billion farm fodder industry and its fast-growing seed and fodder export business which is targeting a \$US10 billion export trade in Asia.

The new varieties have also helped to open up export markets for Australian seed in Argentina, Saudi Arabia and Tunisia.

At home they are expected to boost Australian dryland lucerne production by 10 per cent and irrigated lucerne by up to 30 per cent over the next 5-10 years.

In the process, Australian researchers also made a significant contribution to world plant breeding science, says Professor Irwin.

“To develop these crops we made a series of discoveries and advances which have added significantly to the world’s ability to produce more disease-resistant and higher yielding crops in the future.”

These included identifying molecular markers for yield and disease-resistance which will greatly facilitate the breeding of improved strains of lucerne, one of the world’s most important fodder crops.

The more than 50 useful genetic markers identified by the team can be used in future breeding programs to bolster lucerne’s productivity and hardiness.

The team also produced a detailed genetic map for winter-active lucerne, which will provide a roadmap for future genetic improvement of this forage plant.

Another important discovery was the identification of two new races of anthracnose, a devastating fungal disease of lucerne in Australia.

The team was able to breed new lucerne varieties that were resistant to these new races, and which will be commercially available in 2008.

“This means Australia has the only variety of lucerne in the world which is resistant to all three races of anthracnose disease,” Prof. Irwin says.

The new fodder crop varieties are resistant to a wide range of root and leaf diseases, combined with an increase in yield potential of 10-30 per cent over existing varieties grown on farm.

The new varieties are also significant to wider agricultural productivity as lucerne, with its deep roots, is one of the Australian farmer’s chief weapons in the fight against dryland salinity – as it reduces the amount of water infiltrating the soil to raise salty groundwater levels.

It is also widely used as a soil-improver and valuable rotational crop, which improves soil fertility for subsequent grain crops.

An independent cost-benefit analysis conducted by Agtrans Research in 2004 estimated the net present benefits derived from the two most recently developed of the nine super fodders, based purely on increased production, at almost \$45 million – for an original research investment of around \$1 million. This research was extensively supported by the Grains R&D Corporation.

However it took 14 years to reach the breakthroughs for the four different crops and develop the nine new varieties, underlining the long and patient investment required to make significant scientific advances, Prof. Irwin says.

The nine varieties have since been commercialised by three leading seed companies – Pacific Seeds, Heritage Seeds and Keith Seeds.

The research addresses National Research Priorities one and three – a sustainable Australia and technologies to transform industry.

More information: 07 3365 2790

## 15. Aboriginal Health Improving

Health in Aboriginal communities is slowly improving. Even the increases in death rates from chronic disease have slowed down, a new study in the *Medical Journal of Australia* has found.

The study by the CRC for Aboriginal Health builds on earlier work which found that deaths from all causes were falling in every age group in the Northern Territory Indigenous population since the late 1960s. Improving death rates could be seen in infectious diseases and injuries but not yet in chronic diseases.

The new report, which analysed data from 1977-2001, has shown an easing of the increases in death rates, or even falling death rates, for the common chronic diseases since the end of the 1980s.

- The annual 13.5% increase in diabetes death rates in 1977-89 was slowed to a 3.2% annual increase in 1990-2001.
- The annual increase in the ischaemic heart disease death rate (the biggest killer) was cut from 5.7% to only a 1.1% annual increase.
- The annual 3.5% increase in chronic obstructive pulmonary disease (chronic bronchitis and emphysema) death rates was turned around so that there was a 5.7% fall in these death rates in the 1990s.
- More modest improvements were found in the more static death rates for stroke and rheumatic heart disease.

“These early small changes give reason to hope that some improvements (possibly in medical care) have been putting the brakes on chronic disease mortality amongst Aboriginal and Torres Strait Islander peoples,” the report states. Meanwhile, adverse changes in diet and physical activity were still adding upward pressure to mortality from some chronic diseases.

“This report has some really good news which supports a view that the work of dedicated Aboriginal health workers, nurses and doctors in Aboriginal communities is having an impact on chronic disease deaths. There is still a widening gap between Indigenous health and that of the general population – but we now have signs of real progress in the former.” says study leader Dr David Thomas of the Menzies School of Health Research and University of Melbourne.

The report findings are of national significance. They are confirmed by Western Australian data, and probably apply to Indigenous peoples in other states also, although the lack of detailed Indigenous statistics from these states makes it hard to confirm these NT trends.

Dr Thomas cautioned against attributing too much of the improvement to recent policy changes, as they may take 10-20 years before they impact on chronic disease death rates.

Pat Anderson, Chair of the Cooperative Research Centre for Aboriginal Health, said that the report challenges the popular belief that Aboriginal health is getting worse.

“These figures don’t say for sure that we have turned the corner on the most difficult task of preventing and treating these chronic diseases, but they give us very strong encouragement that we can do so if we persist in improving health service delivery to Aboriginal communities,” she said.

“The results contradict a widely-held opinion in the Australian community that increasing the spending on Aboriginal healthcare has made little difference. In fact they show the opposite. It appears that improved access to primary healthcare has been making a positive impact on these chronic diseases just as it did earlier on childhood infections. ”

“There must be no complacency about these results,” Pat Anderson warned. “Australian death rates are still declining faster than NT Aboriginal death rates, so the gap between Aboriginal health and Australian health is still widening.

“We need to keep up the effort to ensure we turn around the Aboriginal health situation in this country, and start to close the gap between the health of Aboriginal and other Australians.”

The researchers in this study come from three member organisations of the CRC for Aboriginal Health: the University of Melbourne, Menzies School of Health Research, and the NT Department of Health Community Services. The researchers were supported by funding from the NHMRC.

More information: 08 89 227954

## **16. Teamwork: Australia’s Secret Weapon**

*By Tony Staley\**

Innovation is the powerhouse for today’s global economy and a new ‘arms race’ is under way as nations vie with one another to find the most successful formula.

In this hotly-competitive arena, Australia has gained a rare advantage – our experience in working together across industry, science and government, to bring our best minds to bear on the vital challenges that confront us. In many countries, suspicion and lack of cooperation still abound between these sectors.

Among the most successful experiments in collaboration in the past 15 years has been Australia's Cooperative Research Centres, or CRCs – partnerships between leading research bodies, companies and often government agencies focused on specific national challenges in water, energy, food production, industry, IT, resources, health and the environment.

Evidence for this claim has come in the form of a recent study which found that Australia is \$1.1 billion wealthier, or \$0.60 better off for every \$1 invested by the taxpayer in CRC research.

Measuring the benefits that flow from research is exceptionally difficult. They occur over long periods of time, trickle into many parts of the economy and society, and are, of course, part of a wider process of innovation and investment in which it is hard to pinpoint particular success factors.

So the study, by the Allen Consulting Group, applied especially stern criteria to the work of Australia's 70-odd CRCs. It included only research where the benefits had been delivered, were clearly attributable to CRC research, were validated by industry or other users and would not otherwise have occurred.

The outcome was reassuring: collaboration works. And it delivers the goods, both to industry and to society.

The study highlighted case studies of science programs which had delivered measurable benefits:

- \$8 million a year in net cost savings to coal miners who fitted CRC Mining's dragline automation technology to their machines
- Annual cost savings of \$20 million in gas pipeline laying through use of new welding technology developed by the CRC for Welded Structures
- A \$99 million reduction in capital costs and annual savings of \$20.6 million from advanced thickener technology in the mineral processing industry developed by the AJ Parker CRC for Hydrometallurgy
- A \$26 million sale of new heart repair technology developed in the CRC for Cardiac Technology
- sales of \$16.6 million in new fire-proof electric cable technology developed by the CRC for Polymers
- A \$6 million reduction in Commonwealth drug spending due to research on corticosteroids by the Asthma CRC
- \$6 million in revenue generated from the commercialisation of beef vaccines and gene marker tests developed by the CRC for Cattle and Meat Quality.

Not included were the multi-billion Australian composites contract to help build the next generation Boeing 777 "dreamliner", and the famous cochlear hearing implant which the CRC has helped make a global success story - because it was

not possible to say that the outcomes were wholly attributable to the existence of the CRCs.

Just as the modern athlete needs a team of experts behind them – coach, manager, dietician, biophysicist, physiotherapist, doctor, sports psychologist to name but a few – CRCs have shown in science what we know from sport: good teams are winners. Today's scientific enterprise includes lawyers and marketers, business analysts and project managers, investors and technicians, engineers and scientists. The researcher in the white lab coat no longer labours alone.

Australia has shown over 15 years and some 150 CRCs that it can put together complex teams from across sectors, industries and fields of professional expertise like almost no other country. The CRC model is admired internationally for dissolving barriers to collaboration that traditionally exist between these - and now it has the financial runs on the board to prove its effectiveness.

Not only that, but partnership science and public-private partnering generally has become a feature of the way Australians get things done nowadays, thanks significantly to the success of the CRC model. The old obstacles, suspicions and inhibitions about 'sleeping with the enemy' are disappearing and being replaced by a more cooperative spirit for the 21<sup>st</sup> Century.

The most valuable commodity this century is going to be knowledge, and the best way to produce and adopt it is to muster teams of experts from many different fields who are motivated to work together collaboratively. The society that can do this best has a head start in the race to innovate. Australia, thanks to CRCs, is already on the blocks.

*\* The Hon Tony Staley is Chairman of the CRC Association and a former federal Minister.*

## Appendix A: Index of Stories by Participating CRCs

Media release title	<i>CRC</i>	Media release date	Science in Action Page # Summaries	Science in Action Page # Full
1. Mining Technology Hits Paydirt	<b>CRCMining</b>	17 <sup>th</sup> January 2006	4	10
2. Beef Vaccines Deliver Healthy Profit	<b>CRC for Beef Genetic Technologies</b>	2 <sup>nd</sup> February 2006	4	11
3. Composites in \$4bn Aerospace Return	<b>CRC Advanced Composite Structures</b>	14 <sup>th</sup> February 2006	4	13
4. Now Hear This: Hearing Returns	<b>CRC for Cochlear Implant and Hearing Aid Innovation</b>	28 <sup>th</sup> February 2006	4	15
5. Turning “Noise” into Dollars	<b>CRC for Sensor Signal and Information Processing</b>	15 <sup>th</sup> March 2006	5	17
6. Big Returns from Clearer Vision	<b>Vision CRC</b>	28 <sup>th</sup> March 2006	5	18
7. The Scambusters	<b>Capital Markets CRC</b>	11 <sup>th</sup> April 2006	5	20
8. Fireproof Polymer Blazes a Trail	<b>CRC for Polymers</b>	25 <sup>th</sup> April 2006	6	22
9. Cleaner Prawn Farmers Clean Up	<b>CRC for Sustainable Aquaculture of Fin Fish</b>	9 <sup>th</sup> May 2006	6	23
10. Clearer Beer, Smoother ‘Shakes’ and Longer Lifespans	<b>CRC for Bioproducts</b>	23 <sup>rd</sup> May 2006	6	25
11. Aussie Synthetic Vaccines Go Global	<b>CRC for Vaccine Technology</b>	9 <sup>th</sup> June 2006	6	27
12. New “Waxy” Wheat for Healthy Eating	<b>CRC for Value Added Wheat</b>	20 <sup>th</sup> June 2006	7	29
13. Five Star Beef Brings Home the Bacon	<b>CRC for Beef Genetic Technologies</b>	5 <sup>th</sup> May 2006	7	31
14. Super Fodders Deliver \$45m Yield	<b>CRC for Tropical Plant Protection</b>	27 <sup>th</sup> July 2006	7	32
15. Aboriginal Health Improving	<b>CRC for Aboriginal Health</b>	7 <sup>th</sup> August 2006	8	34
16. Teamwork: Australia’s Secret Weapon	<b>Cooperative Research Centres Association</b>	*	8	35

\* Opinion editorial – submitted to the Canberra Times but not published.

## Appendix B: Contact Details of CRCA CRCs (6/9/06)

### Sector: Manufacturing Technology

#### **CRC Advanced Automotive Technology**

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#### **CRC Advanced Composite Structures**

CEO: Professor Murray Scott

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#### **CRC for Bioproducts (finished 30 June 2006)**

CEO: Dr Doug Hawley

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#### **CAST CRC**

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#### **CRC for Construction Innovation**

CEO: Prof. Keith Hampson

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#### **CRC for Functional Communication Surfaces**

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#### **CRC for Polymers**

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#### **CRC for Railway Engineering & Technologies**

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#### **CRC for Wood Innovations**

CEO: Professor Tom Spurling

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W: <http://www.crcwood.unimelb.edu.au>

### Sector: Information & Communication Technology

#### **Australasian CRC for Interaction Design (ACID)**

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Ph: 07 3337 7821

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#### **Capital Markets CRC**

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#### **CRC for Integrated Engineering Asset Management (CIEAM)**

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## Appendix B: Contact Details of CRCA CRCs (6/9/06)

### **CRC for Smart Internet Technologies**

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W: [www.smartinternet.com.au](http://www.smartinternet.com.au)

### **CRC for Spatial Information**

CEO: Mr Peter Woodgate  
Ph: 03 8344 9200  
Fax: 03 9349 5185  
E: [pwoodgate@crsi.com.au](mailto:pwoodgate@crsi.com.au)  
W: [www.spatialinfocrc.org](http://www.spatialinfocrc.org)

## **Sector: Mining and Energy**

### **CRC Coal in Sustainable Development**

CEO: Mr Frank van Schagen  
Ph: 07 3871 4400  
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W: <http://www.ccsd.biz>

### **CRC for Greenhouse Gas Technologies**

CEO: Dr Peter Cook, CBE  
Ph: 02 6200 3366  
Fax: 02 6230 0448  
E: [pjcook@co2crc.com.au](mailto:pjcook@co2crc.com.au)  
W: <http://www.co2crc.com.au>

### **CRC Landscape Environments & Mineral Exploration**

CEO: Dr Steve Rogers  
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E: [steve.rogers@csiro.au](mailto:steve.rogers@csiro.au)  
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### **CRCMining**

CEO: Professor Michael Hood  
Ph: 07 3365 5640  
Fax: 07 3365 5636  
E: [info@crcmining.com.au](mailto:info@crcmining.com.au)  
W: <http://www.crcmining.com.au>

### **Parker CRC for Integrated Hydrometallurgy Solutions**

CEO: Mr Mark Woffenden  
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E: [hydrocrc@parkercentre.com.au](mailto:hydrocrc@parkercentre.com.au)  
W: <http://www.parkercentre.com.au>

### **CRC for Predictive Mineral Discovery**

CEO: Dr Robert Haydon  
Ph: 03 8344 6514  
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E: [b.allen@unimelb.edu.au](mailto:b.allen@unimelb.edu.au)  
W: <http://www.pmdcrc.com.au>

### **CRC for Sustainable Resource Processing**

CEO: Mr Stevan Green  
Ph: 08 6436 8734  
Fax: 08 6436 8557  
E: [stevan.green@csrp.com.au](mailto:stevan.green@csrp.com.au)  
W: <http://www.csrp.com.au>

## **Sector: Agriculture and Rural Based Manufacturing**

### **Australian Biosecurity CRC for Emerging Infectious Disease**

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Ph: 07 3346 8861  
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### **Australian Poultry CRC**

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### **CRC for Australian Sheep Industry**

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## Appendix B: Contact Details of CRCA CRCs (6/9/06)

### **CRC for Beef Genetic Technologies**

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W: <http://www.beef.crc.org.au>

### **Cotton Catchment Communities CRC**

CEO: Mr Guy Roth  
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E: [Guy.Roth@csiro.au](mailto:Guy.Roth@csiro.au)  
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### **CRC for Forestry**

Acting CEO: Ms Jo Neilson  
Ph: 03 6226 7947  
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W: <http://www.crcforestry.com.au>

### **Grain Foods CRC Ltd**

CEO: Dr Jan Mahoney  
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E: [j.mahoney@grainfoodscrc.com.au](mailto:j.mahoney@grainfoodscrc.com.au)  
W: <http://www.grainfoodscrc.com.au>

### **CRC for Innovative Dairy Products**

CEO: Dr Paul Donnelly  
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W: <http://www.dairycrc.com>

### **CRC for an Internationally Competitive Pork Industry**

CEO: Dr Roger Campbell  
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### **CRC for Molecular Plant Breeding**

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W: <http://www.molecularplantbreeding.com>

### **CRC National Plant Biosecurity**

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W: <http://www.crcplantbiosecurity.com.au>

### **CRC for Sugar Industry Innovation through Biotechnology**

CEO: Dr Peter Twine  
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Fax: 07 3865 4773  
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W: <http://www.crcsugar.com>

### **CRC for Sustainable Aquaculture of Fin Fish**

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W: <http://www.aquafincrc.com.au>

### **CRC for Tropical Plant Protection (finished 30 June 2006)**

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### **CRC for Value Added Wheat**

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### **CRC for Viticulture**

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## Appendix B: Contact Details of CRCA CRCs (6/9/06)

### Sector: Environment

#### Antarctic Climate & Ecosystems (ACE)CRC

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#### CRC for Australian Weed Management

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#### CRC for Bushfire

CEO: Mr Kevin O'Loughlin

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#### Desert Knowledge CRC

MD: Ms Jan Ferguson

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Fax: 08 8950 7187

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W: <http://www.desertknowledge.com.au>

#### Environmental Biotechnology CRC P/L

CEO: Dr David Garman

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W: <http://www.ebcrc.com.au>

#### eWater CRC

CEO: Professor Gary Jones

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#### Invasive Animals CRC

CEO: Dr Tony Peacock

Ph: 02 6201 2889

Fax: 02 6201 2352

E: [tony.peacock@invasiveanimals.com](mailto:tony.peacock@invasiveanimals.com)

W: <http://www.invasiveanimals.com>

#### CRC for Irrigation Futures

CEO: Mr Ian Atkinson

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Fax: 08 8303 8509

E: [atkinson.ian@saugov.sa.gov.au](mailto:atkinson.ian@saugov.sa.gov.au)

W: <http://www.irrigationfutures.org.au>

#### CRC for Plant-based Management of Dryland Salinity

CEO: Mr Kevin Goss

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Fax: 08 6488 2856

E: [kgoss@fnas.uwa.edu.au](mailto:kgoss@fnas.uwa.edu.au)

W: [www.crcsalinity.com](http://www.crcsalinity.com)

#### Sustainable Tourism CRC

CEO: Professor Terry De Lacy

Ph: 07 5552 8114

Fax: 07 5552 8171

E: [info@crctourism.com.au](mailto:info@crctourism.com.au)

W: <http://www.crctourism.com.au>

#### CRC Tropical Savannas Management

CEO: Professor Gordon Duff

Ph: 08 8946 6834

Fax: 08 8946 7107

E: [savanna@cdu.edu.au](mailto:savanna@cdu.edu.au)

W: <http://savanna.cdu.edu.au>

#### CRC for Water Quality and Treatment

CEO: Mr Keith Stallard

Ph: 08 8259 0351(pa)/0240 (direct)

Fax: 08 8259 0228

E: [keith.stallard@crcwqt.net](mailto:keith.stallard@crcwqt.net)

W: <http://www.waterquality.crc.org.au>

## Appendix B: Contact Details of CRCA CRCs (6/9/06)

### Sector: Medical Science and Technology

#### **CRC for Aboriginal Health**

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W: <http://www.crcah.org.au>

#### **CRC for Asthma and Airways**

CEO: Mr Philip Bert  
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E: [philipb@asthma.crc.org.au](mailto:philipb@asthma.crc.org.au)  
W: <http://www.asthma.crc.org.au>

#### **CRC for Biomedical Imaging Development**

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#### **CRC for Chronic Inflammatory Diseases**

CEO: Dr John Flack  
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E: [crc-cid@unimelb.edu.au](mailto:crc-cid@unimelb.edu.au)  
W: <http://www.crccid.com>

#### **CRC for Cochlear Implant and Hearing Aid Innovation**

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E: [r.cowan@unimelb.edu.au](mailto:r.cowan@unimelb.edu.au)  
W: <http://www.bionicear.com.au/crc>

#### **CRC for Diagnostics**

CEO: Mr Paul Barrett  
Ph: 07 3138 6143  
Fax: 07 3138 6447  
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W: <http://diagnosticsCRC.org>

#### **CRC for Oral Health Science**

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#### **CRC for Vaccine Technology (finished 30 June 2006)**

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#### **Vision CRC**

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