CRC ASSOCIATION

Research Results in Action

Recent highlights of the Cooperative Research Centres Program

CRC AUSTRALIA

Established and supported under the Australian Government's Cooperative Research Centres Program

Foreword

The Cooperative Research Centres (CRCs) highlighted in this booklet have contributed significantly to achieving benefits for industry and the nation — in mining, manufacturing, agriculture, the environment, medical science and information technology.

The accompanying case studies, selected from CRCs Australia-wide, confirm the important role of the Commonwealth Government's CRC Program and the contribution it makes to innovation, research and development (R&D) and advancing technology development.

The distinguishing feature of the CRC is in its structure, in that it involves multiple participants, thereby strengthening collaboration between research organisations, government agencies, industry and other users. It overcomes problems that arise from the institutional and geographical spread of Australian research groups, and facilitates the movement of personnel between government research organisations, academia and industry.

The CRC Program also focuses strongly on technology transfer to accelerate the uptake of new technologies by industry. More than 200 companies have become partners in CRCs, while a further 800 companies are involved as supporting participants, or through specific project arrangements.

CRCs are part of the Commonwealth Government's business unit, AusIndustry, which is responsible for delivering, through its regional offices across Australia, 28 products and services with a total value of around $1.8 billion to about 18,300 customers annually. Currently, there are 65 CRCs receiving approximately $140 million per year.

The CRC Program demonstrates the Commonwealth Government's continuing commitment to maximising innovation in Australia through new, collaborative approaches to research management, technology transfer and commercialisation.

It has been my pleasure to visit several CRCs and I am encouraged by the successes that are emerging from their work, not only in innovation, but in generating employment — one CRC is expected to create 18,000 jobs within the next decade.

While the work of the CRCs is to be commended, we can't rest on the history of our achievements — we must continue down the R&D path and give Australia the opportunity to be as innovative as any nation in the world.

Senator Nick Minchin
Minister for Industry, Science and Resources
October 2000

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Introduction

Cooperative Research Centres (CRCs) are helping to deliver innovation for Australia; not only do they carry out focused, first-class research, but they help to ensure that the research is taken up and used.

The Program was set up in 1990 to foster collaboration between researchers and research users from a diversity of backgrounds — universities, business, industry, and Commonwealth and State research organisations. The Program has changed the culture of doing research in Australia — more collaboration, more team work. It is training more workplace-ready post-graduate students. The returns on the investment in the research and development can be measured not only financially but also in terms of the social and environmental benefits.

This publication, Research Results in Action, serves to illustrate this success through some fine examples. The CRC projects featured here were all entries in the Awards for Commercialisation and Utilisation of Research, presented at the CRC Association Conference 2000, held in Brisbane in May.

The awards were open to CRCs which could demonstrate:

- A research outcome that had been applied or commercialised with significant benefits for Australian industry or public policy implementation;
- That the outcome was clearly innovative and could not have arisen without the CRC Program; and
- That there was a close relationship between the CRC research team and the users of the research, both agreeing to the submission of the application for the Award.

The Awards were judged by an independent panel and three winners were selected.

The outcomes from the winning projects are indeed impressive: the advancements in optical fibre usage by the Australian Photonics CRC are expected to reach $2.5 billion by 2010 and will benefit a vast array of users of communication networks.

By successfully developing means to protect our lucrative pearl-bearing oysters and Atlantic salmon farms, the research from the CRC for Aquaculture is already protecting more than $15 million worth of stock using its newly developed, non-toxic products.

The third winner, the CRC for Diagnostic Technologies, has developed a technology which is crucial to a new approach to understanding the molecular basis of disease and, through its acquisition by an American firm, will provide substantial royalties while still being accessible for further Australian research and development to underpin new technologies to diagnose disease.

The other featured projects further emphasise the diverse nature of CRC outcomes, including: substantial cost reductions in labour for jet aircraft manufacture; the granting of self-regulation for the management of acid sulfate soils for the sugar industry in NSW; a revolutionary approach to adjusting hearing aids; a widely applicable new instrument for mineral analysis; and a humane means of keeping marsupial numbers in check — just to mention a few.

We hope you enjoy reading about our "Research Results in Action".

A listing of story contacts and current CRC Association Members is included at the end of this publication, or visit our website at <http://www.crca.asn.au>.

CRC Association

Sediment research aids the logging debate

Nothing could be easier in Australia today than to start an argument over forestry and logging. Unfortunately, such arguments usually generate more heat than light. Confrontation over seemingly irreconcilable positions appears to be the rule.

The CRC for Catchment Hydrology realised that the reason for the stalemate was that the scientific data were lacking to inform the participants on either side of the debate. Was it true, for instance, that logging caused sediment to run off in large quantities into waterways and that leaving the forest untouched would avoid this catastrophe?

The CRC's project 'Sediment Movement in Forest Operation' extended over two years, looking mostly at what happened on roads, tracks and general logging areas. A simulator was designed to discover the effects of various quantities and types of rainfall on different soils and inclines. The effectiveness of drains, banks, vegetation and other control devices was measured. In the end, the project produced a set of data unrivalled in the world for its comprehensiveness.

This massive amount of information meant that the debate could now operate on the basis of scientific knowledge rather than prejudice or special interest. To ensure that the knowledge is available to interested parties, the CRC has sponsored educational courses, field days and workshops where the implications of the data can be studied in a non-emotive atmosphere.

One immediate result has been substantial modification of the forestry management practice in Victoria and New South Wales. The new information achieved through the CRC's project is helping to break the impasse and establish the good faith of the industry, backed by scientific research. At the same time, environmental groups can share the same information and make considered judgments that will enable the debate to go forward productively.

Cottoning on

Australia's cotton industry earns the country more than $1 billion in export earnings every year, so anything that will improve its efficiency is well worthwhile.

Cotton requires close management during its growing season and is particularly attractive to pests. Added to this challenge is the ability of *Helicoverpa*, cotton's major pest, to develop resistance to pesticides.

Cotton growers and consultants are faced with many decisions with respect to the control of water use, pests, weeds, diseases and nutrition, while reducing the use of pesticides and protecting the environment. This is where the Australian Cotton CRC comes in — developing and promoting responsible, sustainable and viable management systems.

The Cotton CRC has developed sophisticated decision support systems to help growers, which link together three elements. The first is a package of desktop software developed by CSIRO, called CottonLOGIC. This helps growers make management decisions on a wide range of matters, especially in respect of pesticides, and to keep useful and comprehensive records.

Secondly, the Cotton CRC is developing a hand-held device that will allow the recording of necessary information in the field, for later downloading and analysis by CottonLOGIC. The final element is a website that keeps growers up to date on everything to do with cotton management and research, and also provides updates for CottonLOGIC.

All this is combined with a policy of constant personal contact so that the scientific developments are put to their fullest use. It has not taken growers long to 'cotton on' to the advantages of these innovations.

Keeping marsupial numbers down

Australia's marsupials are important national symbols but there are times when their numbers become a problem, to themselves if they are too numerous for their available resources, and also to farmers, graziers and forestry managers. Traditionally, culling has been carried out by shooting, trapping or poisoning the animals, but nowadays popular sentiment is increasingly opposed to such measures.

The CRC for Conservation and Management of Marsupials has found that the population of possums and wallabies can be controlled through the administration of a contraceptive vaccine. This is particularly good news in New Zealand where the introduced Australian brushtail possum has become a pest and A$4m and A$8m are spend on control and research, respectively. (Even so, possums are controlled over only about 20% of the country.)

The next step is to see whether the vaccine will work equally well for kangaroos and koalas, and whether it can be delivered to possums orally through a bait.

The trouble is that to get this new technology even to the pre-commercial stage of development is extremely expensive. The problem does not exist outside Australia and New Zealand, so big investments from international companies are hardly to be expected.

The CRC has started to get round this problem through an ingenious new method of recruiting funds from both the people who are researching the problem and those who will use the technology when it gets to the application stage.

Thus a joint Australian–New Zealand agreement has been reached which will provide about A$1m over the next few years to further the research — and those who put up the money will in return have commercial access to the product.

Strength in the air

Ever since human beings first took to the air, manufacturing flying machines, let alone designing them, has presented technical challenges. It's hard to make parts that are strong enough to withstand the pressures and buffeting of flight but still light enough to allow the plane to fly. You won't find rigid steel girders in aeroplanes!

In recent years, manufacturers have gone for more continuous parts that don't have to be welded or bolted together, and there has grown up an industry that makes these components from lightweight, composite materials, pre-impregnated with epoxy resins. Until recently, all of these highly-engineered components had to be prepared by hand. The work was labour-intensive and, in a high-wage country like Australia, expensive. It was hard to compete with other nations.

So the CRC for Advanced Composite Structures looked for a means of fabricating these components with machinery. After much practical research, and cost analyses, the answer was found in a new process called 'pulforming': a simple, low-cost, automated procedure for pulling, and forming composite materials into shape, through a die.

The process proved ideal for a part in the Boeing 737 jet called the trailing edge wedge. It had been awkward to manufacture by traditional manual methods because of its slender length and its complicated ply lay-up. With pulforming, the labour required to make this component reduced by 30%, which far exceeds the 20% cost reduction demanded by Boeing's airline customers. Over five years, the new process will save $500,000.

The CRC is not content with this, however. It is now developing an advanced tape-laying machine that will further automate the placement of fibres in the material and deliver even better products, at an even better price.

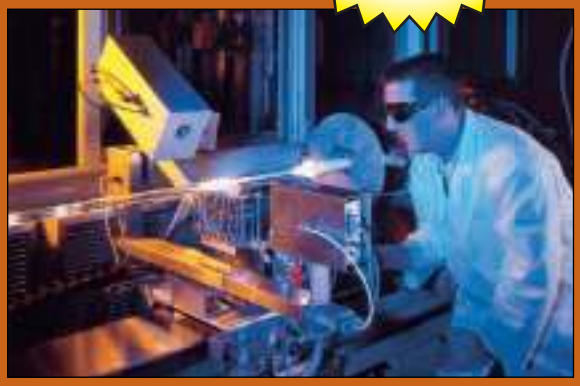
Bandwidth on the wires

AWARD FOR COMMERCIALISATION AND UTILISATION OF RESEARCH

Internet users get annoyed and frustrated if they can't make a connection because there are just too many people 'on the line'. Of course, we have all heard about optical fibres and expect them to solve the problem — but in fact the optical fibre in Australia's networks is only used to about 0.1% of its capacity.

Part of the reason is that Australian industry simply wasn't geared to make the best use of the new technology, photonics, when it appeared. So not only has it been underused, but the promise of new jobs and big exports has not been fulfilled either.

Enter the Australian Photonics CRC. Naturally, there was and still is much research to be done in this new and exciting field, but will anybody pick it up and run with it? In the case of Australian photonics the answer is 'yes'. What the CRC has done is to spin off companies that will put the research results to practical use and market the resultant products.



Under the brand name of Redfern, the CRC has given birth to five new companies which reflect the research it is doing. One develops, makes and sells application-specific optical fibre to component manufacturers. Another incorporates the fibre in devices and components. A third is developing optical circuits on a chip; a fourth is incorporating these products in its new wavelength management system; while the fifth is setting up a demonstrator network to showcase the Redfern products.

So the CRC is offering the world much-needed bandwidth. And if the Australian industry can develop even a small share of the expected worldwide demand, this could mean that by 2010 its turnover will have grown from $238m (1996) to $2.5 billion. And that would give Government a 50% return on its investment.

With an eye to the future

The CRC for Eye Research and Technology has long been working in a close and fruitful association with CIBA Vision. It is an association that involves a lot of sharing — of purchasing, of laboratories and clinical facilities, of support services and infrastructure, and of scientific and academic activities.

The big breakthrough that resulted from this cooperative effort consisted of the Focus Night and Day™ contact lens which, because it is highly oxygen permeable, can be worn night and day for a month. Another aim of the collaboration has been the development of an implantable contact lens, or artificial cornea.

In the course of the research into these products, the CRC and CIBA Vision developed and evaluated more than 40 polymers. One of them was exactly

what the team had been looking for in order to produce the extended wear contact lenses, but that did not mean the others had to go to waste.

A spin-off company has now been set up in the USA, with a wholly owned subsidiary in Australia, which aims to make use of the intellectual property developed by the first research projects. This means that the polymers that were produced can be put to the service of medical science in new and valuable ways.

The uses foreseen at this stage for the polymers include, among others, wound dressings with active ingredients for diabetic, venous or pressure ulcers, burns or trauma, scaffolds for tissue engineering, and drug delivery.

The future looks bright for the new company, BioCure, but even brighter for the patients, doctors and paramedical staff who will benefit from the products.

Mineral analysis made easy

Impurities present in minerals and related products adversely affect mining and production processes, leading to increased costs and inefficiencies. A new Australian instrument enables rapid determination of the elements that make up complex materials, such as minerals, metals and glasses, to detect both major components and contaminants.

The new instrument, known as the laser plasma spectrometer (LPS), has widespread application in industries that rely on maintaining a uniform quality of process materials to ensure the integrity of finished products and the trouble-free operation of manufacturing plants. It was developed by a research team at the CRC for Clean Power from Lignite in an intense collaboration with Monash University and industry researchers. The primary purpose was to enable the power industry to assess the quality of incoming coal. Its application has proven to be much wider than this, however. The technology can be adapted to such diverse tasks as sorting recycled glass bottles, monitoring environmental pollutants, and as an educational tool in universities.

The LPS has several superior features compared to other technologies capable of elemental analysis. For instance, it is sensitive to a wide range of elements that are not easily detected by alternative methods. The small amount of preparation required for analysis also enables a high throughput of samples to be maintained. This not only lowers analysis costs significantly, but also enables continuous, automated use in industry.

The developers built successive prototype versions of the LPS until the optimal design was achieved. Since then, several instruments have been installed in commercial laboratories for further testing and proving, and subsequent commercial design has been undertaken. In addition to improving the efficiency of Australian industries, the commercial importance of the technology is evident in the worldwide market of $500m per year in solid analysis products such as the LPS.

Pearls before salmon

AWARD FOR COMMERCIALISATION AND UTILISATION OF RESEARCH

Two very different industries have benefited from the research and development work of the CRC for Aquaculture. In both cases, the University of New South Wales, CSIRO and Wattyl Australia Ltd have been part of the partnership.

The Australian pearling industry, which produces pearls to the value of between $200m and $250m every year, has been worried because pearl shells are perishing after being attacked by a red sponge that destroys the calcium in the shell.

The product developed, PearlSafe®, is a biodegradable coating which, when applied to the pearl shells, removes the red sponge within two weeks. More than 30,000 shells have already been treated, and since the average value of one shell is $350, that means protection for more than $10m worth of stock.

Salmon, too, are prone to attack but by much bigger creatures — seals. The Atlantic salmon grown in Tasmania are in great demand and the industry earns more than $100m a year. The fish are grown in cages, and each cage can hold as much as $1m worth of fish.

The target, however, is irresistible to seals, which are smart enough to get at their prey by biting away sections of netting. Growers often surround each cage with a separate predator net to keep the seals out, but this is expensive and the seals can bite through that too.

The CRC and its partners have now produced NetSafe®, a non-toxic coating which renders the netting rigid and makes it impossible for seals to grab and bite it. This protects the salmon in the cage and eliminates the need for the predator net.

The product is new, but already it is protecting stock worth as much as $5m.

Water fit to drink

Providing drinkable water to Australian towns and cities requires a large and ongoing investment in infrastructure. The water supply industry spends $300m to $400m each year on capital works and about $1 billion on operations. Not surprisingly, the community wants to know whether such a huge investment is necessary to provide potable water (potable water is defined as water that is safe to drink for a lifetime life without any ill effects).

We all want clean, healthy and pleasant-tasting water to drink; but how clean is clean? And how do we know our water is healthy? Perhaps we are spending unnecessarily high amounts of money on making water not just clean, but super-clean. On the other hand, are we spending enough to protect public health from water quality 'incidents' and to supply an aesthetically pleasing water to an increasingly critical public?

This is where Australia's national drinking water agency, the CRC for Water Quality and Treatment, comes in. The CRC is developing sound scientific

knowledge about water quality, particularly as it relates to public health. This knowledge could lead to very large savings in public costs, while still providing Australians with water that is safe and pleasing to drink.

The CRC has initiated and led a national approach to the development and adoption of a National Water Quality Management System, currently being trialled by four water authorities.

In another project, the CRC addressed one question of water and health by undertaking a unique, double-blind study of 600 Melbourne families over nearly two years to discover the true relationship between water quality and endemic gastroenteritis in a community.

Other areas of research include the control of blue–green algae and the dreaded pathogen, *Cryptosporidium*. Overall, CRC research is helping the Australian water industry produce high quality water at an affordable price.

Fresh plants for pasture

For a long time, many farmers in southern Australia have practised a form of crop rotation called ley farming. A cereal crop was grown for several years, then a legume-based pasture was allowed to regenerate and grow for a year or two, before a crop was sown again.

This system worked well as long as farmers could profitably graze the paddock during its pasture phase; but as the prices for meat and wool recently declined, they had to curtail the pasture periods. Consequently, pasture quality declined as the seed reserve was unable to survive the longer cropping period, weeds flourished, and soil fertility declined from lack of nitrogen provided by the pasture.

The CRC for Legumes in Mediterranean Agriculture have searched for a solution, at least for farms where a pasture period was still maintained, however short. They sought plants that could be cheaply reestablished after cropping, were productive on and capable of improving poor soils, and could be readily harvested for their seed.

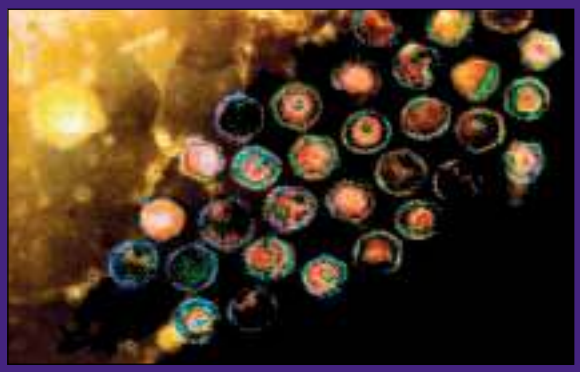
These requirements ruled out the traditional clovers and medics, but the CRC made rapid progress by re-evaluating the potential of alternative plants from parts of the Mediterranean where the climate is similar and the soil often poor. In only eight years, the CRC has developed and commercialised five new pasture varieties that now make it economical for farmers to rejuvenate diminished pastures, incorporate a disease and weed break into their cropping cycle, and increase the much-needed nitrogen in the soil.

One of the new plants, Cadiz French serradella, has been so successful that more than 200,000 hectares of it are expected to be sown during 2000.

The economic benefits to farmers are obviously very substantial, while the cost–benefit ratio of the CRC's pasture improvement program has been estimated at an astounding 25:1.

Kiss this disease good-bye

Research by the CRC for Vaccine Technology promises a substantial decrease in the incidence of 'kissing disease', otherwise known as glandular fever. This disease is caused by a virus called Epstein-Barr virus, or EBV for short. EBV is mainly spread by the transfer of saliva between individuals. Most people in developing countries, and more than 80% in developed countries, have been infected. People are usually infected with the virus during childhood but do not become ill because their immune system raises a satisfactory response. Those most likely to become ill with glandular fever are those who are first infected during or after adolescence.



The medical research team of the CRC, based at the Queensland Institute for Medical Research in Brisbane, have spent many years studying the immune response to EBV and have discovered how the immune system controls the virus.

Work is now well under way to develop a vaccine against glandular fever. It is hoped that the vaccine will mimic infection and so arm the immune system against the real thing.

The research team has been able to define a number of components in the viral proteins that are responsible for inducing the correct immune response. These components can be copied synthetically and are being used as the basis for an EBV vaccine.

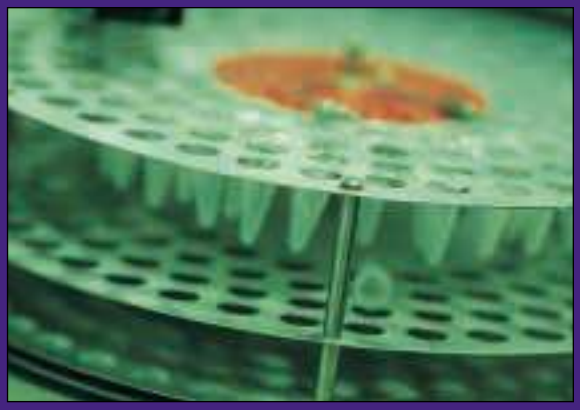
The work has now reached the stage of clinical testing of a prototype vaccine but there is still a lot of research and development to be done. This could eventually cost more than $100m. However, since as many as 2.5 million teenagers might be vaccinated every year, the benefits are likely to be colossal and the funds expended on this research will be more than adequately repaid.

Of genes, chips and illness

AWARD FOR COMMERCIALISATION AND UTILISATION OF RESEARCH

What makes us ill? Humans have over the centuries thought of answers to that question but only with the advent of modern science has a convincing and, above all, useful answer been approached. In particular, recent discoveries in the field of genetics have led to the possibility of determining at least some of the genetic basis of disease.

In the forefront of this work is Australia's CRC for Diagnostic Technologies. Throughout the world, scientists are using new discoveries about the human genome to understand the molecular basis of disease, and the CRC is very well placed to capitalise on these findings and from them develop new diagnostic technologies.



The details are complex and highly technical but at the heart of the CRC's current work lies a technology (called FNC) they have developed and patented which allows the rapid identification of variants of a specific gene at the molecular level. This opens the possibility of discovering the roots of specific diseases and of designing methods both to diagnose and to search for appropriate therapies.

However, the CRC sees the greatest potential as lying in the combination of FNC with the powerful 'microarray' or gene chip technologies which will make possible the speedy analysis of thousands of genes.

Now the CRC's FNC technology has been acquired by a rapidly growing US biotechnology company, Affymetrix, which has a market capitalisation of US$6–7 billion. Since the arrangement is exclusive, the Australian owners of the technology can rely on substantial royalties as well as retaining the right to use the technology in Australia both for research and for commercial purposes.

Black coal research to the rescue

When black coal is burnt in a boiler, a stony deposit called 'clinker' or 'slag' builds up on the boiler walls. Getting rid of it can be difficult, but nobody expects it to result in disaster.

Yet this was what happened to a company which was demonstrating to a customer the burning properties of their black coal. A trial shipment had been set to burn in three separate boilers, when massive sheets of clinker suddenly started falling off the walls of each boiler and blocking various parts of the machinery. The trial burn was hurriedly abandoned and the company turned for help to the only place that had the expertise to save the day: the CRC for Black Coal Utilisation.

The scientists started to look at the coal, at the previous history of the boilers, at the performance of the trial burn and anything else that seemed likely to offer clues to the cause of the disaster.

Eventually they discovered the root of the problem. The test coal was not faulty — if anything it was too good. The coal previously used had left the boilers with a thick coating of slag. The new coal left comparatively little slag which was did not adhere harmlessly to the older slag as it was less sticky. As a result, the weight built up without the adhesion and caused the clinkers to start coming away.

This was only discovered thanks to the expertise of the CRC, whose work provided the coal producer and the customer with a regime for avoiding the problem in the future and an assurance that they could confidently go through with the sale. Since this was worth $400m, there was considerable relief all round.

What did the rain do?

Growing winter wheat can be a profitable enterprise but, like most things agricultural, it has its risks. One of the major ones is that rain falling on the ripe grain before it is harvested may cause it to sprout. This reduces the value of the crop, especially as its suitability as human food is affected even with very mild sprouting.

Many growers try to spot the incidence and degree of sprouting before it is too late, but it is very difficult to assess the damage with the bare eye, especially as much of the damage is done before the germination of the grain can be seen.

In response to this problem, the Quality Wheat CRC used the expertise of its participants, NSW Department of Agriculture and CSIRO, to find a way of determining the level of weather damage quickly, accurately and cheaply.

The first attempt, which required laboratory inspection, proved too complicated for farmers to use confidently; moreover, the standard test used worldwide is not very portable and is too expensive for farmers; so another test was developed after a great amount of research.

The new test, marketed under the name of WheatRite™, fully matches the internationally used test, costs very little, and is extremely quick and simple to apply. On the farm, a few grains can be ground up in an ordinary coffee grinder and the test is ready to go. It somewhat resembles the litmus test familiar from school days, in that a mixture of salt solution containing ground-up grain is dropped onto a card which changes colour to reveal the extent of any sprouting.

Wheat growers and authorities in other parts of the world have already shown great interest in WheatRite™ and the CRC expects that the revenue from sales will be more than $4m by 2004.

Better aids to hearing

Hearing loss reduces a person's ability to communicate and interact in society. One in five Australians has a hearing loss, but this figure escalates to 70% in those over 70 years of age. Modern science has made advances in developing the cochlear implant for people with profound or total hearing losses. Many others, however, are not candidates for cochlear implants, but find that current, conventional acoustic hearing aids offer only a partial restoration of hearing.

The problem centres on how the hearing aid should be adjusted to suit an individual's particular hearing loss. Traditional fitting procedures have concentrated on trying to make normal the loudness of sounds across the speech spectrum by providing most amplification where the hearing loss is greatest. In contrast, the CRC for Cochlear Implant and Hearing Aid Innovation has focused on basic research into how hearing-impaired people understand speech.

The CRC's innovative result is a software package that enables audiologists to vary the amplification at different frequencies delivered by a hearing device by combining formulas using new theoretical calculation methods for optimising speech understanding and loudness. The possibilities are almost infinite and will help to overcome the common complaint that a hearing aid makes, say, voices audible but also renders street sounds intolerable or music muffled.

The technology has already been licensed to several major international hearing-aid companies which between them sell more than a million hearing aids a year — about 20% of the world market. The considerable income expected from license fees is being shared between the CRC and its partner, the National Acoustic Laboratories, to be ploughed back into yet further research for the benefit of the millions of persons in Australia and worldwide with a hearing loss.

Keeping the soil sweet

Sugar may be sweet, but the same cannot always be said for the soil in which it is grown. In northern New South Wales in the late 1980s, acid, iron and aluminium from acid sulfate soils, some of which were used to grow sugar cane, leached into the Tweed River, killing fish and other aquatic fauna. The NSW sugar industry and the CRC for Sustainable Sugar Production decided to tackle the problem. Their success is reflected in the industry being granted self-regulation of acid sulfate soil management.

The first question facing the industry was: how were farmers to know if their soil contained the undesirable components? The CRC developed a sampling program in which farmers and technicians cooperated to test for the threat of acid sulfate soils on each farm. Follow-up testing occurred in a purpose-built laboratory at the Broadwater Mill.

Laboratory soil testing is slow and expensive. The CRC therefore developed a quick field test that saves up to 90% of the previous expenses of laboratory testing and predicting lime requirements. This test is now available free to private consultants engaged by local authorities and councils.

Another major problem was that sugar growers needed to drain their canefields, and it was through the drainage ditches that much of the potentially deadly pollution reached the waterways. Drainage excavator operators were taught to recognise the signs of acid sulfate soils and a dredging bucket was specifically designed to minimise the environmental risks associated with this drain maintenance.

Acid sulfate soils have not been eliminated from cane-growing land in NSW, but the threat that they pose has been significantly reduced. Additionally, the granting of self-regulation to the sugar industry is a first for any rural industry in Australia — thanks to the cooperative approach facilitated by the CRC and the NSW Sugar Milling Cooperative.

Manufacturing Technology

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