

innovate

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Major advances imminent for portable x-ray imaging equipment

Radical new x-ray technologies will soon be built into portable, affordable equipment, providing faster and safer x-ray systems for non-destructive testing, security, veterinary and medical applications.

Victoria University, Industrial Research Limited (IRL) and GNS Science are jointly researching new technologies that will offer superior performance to existing x-ray systems, opening up new commercial uses across a range of industries.

Andy Edgar, Grant Williams and Murray Bartle, key researchers in the programme, are developing a cost-effective, portable x-ray image reader that currently uses existing commercial x-ray imaging plates.

Imaging plates store x-ray radiation so that an image is held in a latent form, like invisible ink, within the

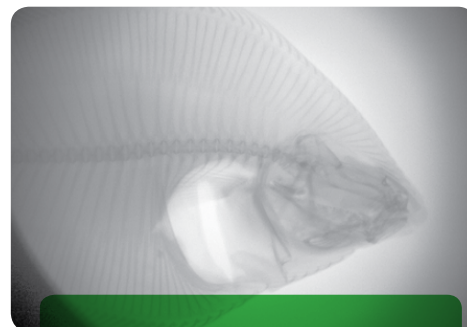
imaging plate. The image can then be read as soon as the plate is exposed, resulting in faster processing when compared with conventional film.

The new reader will fit into the boot of a car and will take digital images that can be downloaded onto a laptop computer for real-time, on-site analysis which can then be instantly transmitted back to the relevant control centre.

IRL's Grant Williams says that the new imaging reader could provide vets and emergency response staff with immediate information which would

be particularly useful in the racing industry and the care of animals, not to mention human accident victims.

"The instant read-out could diagnose a fracture or break, allowing treatment to begin straight



AN X-RAY IMAGE OF A FLOUNDER USING THE NEW PORTABLE IMAGE READER PROTOTYPE.

radiation dose in applications such as radiotherapy and environmental monitoring. The new technology aims to improve on current devices and methods by significantly increasing the accuracy, directionality and maximum detectable dose.

"These systems could be used for border security to identify drugs and items that are insensitive to existing x-ray screening systems..."

away without x-ray film processing delays," he says.

The group is also developing reusable fibre-optic dosimeters for measuring not only single radiation dose rates but also the cumulative

Commercialisation of both the portable x-ray image reader and the fibre-optic dosimeter is estimated to be about a year away and work has begun on prototypes and patenting options.



AN OPTICAL FIBRE WITH THE PORTABLE DOSIMETER MATERIAL ATTACHED TO THE END.

New Omega-3 sources could provide huge advantages

IRL is ramping up its already world-class fermentation technology and combining it with supercritical extraction as part of a long term project to develop new, high-value lipid products for use in functional foods, specialist aquaculture feed and cosmetics.

“A breakthrough ... will give New Zealand a competitive international advantage in the lucrative Omega-3 fatty acid market...”

The latest research is focusing on using IRL's patented supercritical fluid extraction processes to extract Omega-3 rich lipids and other high-value lipids from fermented micro organisms instead of relying on fish oils from declining fish stocks. By selection of the right micro organism, lipids enriched in single Omega-3 fatty acids can be produced, whereas fish oils contain a wide range of fatty acids.

Omega-3 compounds are in high demand internationally and considered essential for maintaining body cells, particularly for heart and brain function.

A breakthrough in developing high-value lipids and associated production and processing technologies will give New Zealand a competitive international advantage in the lucrative Omega-3 fatty acid market because the combined fermentation/supercritical extraction processes do not rely on organic solvent extraction, leave no solvent residues and eliminate the risk of heavy metal

contamination that can be a problem with oil sourced from fish.

Besides being renewable, sustainable and free of contaminants, microbial production also means there is no lingering fishy taste or smell in the final product. This form of production also allows for definitive manufacturing traceability, an important factor in guaranteeing quality.

Two new potential microbial sources of lipids are going to be part of this study.

The first is the extremely unusual bacteria high in polyunsaturated fatty acids that scientists believe are to be found in New Zealand's isolated and varied ocean topography.

“We're isolating a range of different bacteria normally resident in the guts of marine organisms that are known to produce a range of different Omega-3s,” says senior scientist in IRL's Fermentation

Microbiology team, Jason Ryan.

“I'm confident we will identify some unusual bacteria that are able to produce significantly increased levels of Omega-3 and that we can develop a cost effective way of extracting them,” he says.

The second potential source of Omega-3 fatty acids is New Zealand microalgae. IRL is collaborating

Briefly...

The IRL science and engineering team that cracked the difficult task of turning fragile high temperature superconducting wire into cable has won the **Royal Society of New Zealand's Cooper Medal**. IRL's cabling research is now being developed towards commercialisation in a joint venture known as General Cable Superconductors, and places New Zealand significantly ahead in the quest for a superconductor with the potential to carry high electrical currents and lower energy losses. The cable will enable power transformers, generators and motors to be made smaller and lighter with up to 50% less power loss and lower maintenance.

A new high-value contract has been signed with the **Medicines for Malaria Venture** of Geneva, Switzerland, which is funded by the Bill and Melinda Gates Foundation. This is a joint project between the Albert Einstein College of Medicine and IRL's Carbohydrate Chemistry Group and is an exciting step forward in the use of immucillins for the treatment of malaria in humans. The contract involves discovering new immucillin-based inhibitors of enzymes essential for growth of the malaria parasite and its intention is to identify new development candidates for progression to pre-clinical development.

with the Cawthron Institute in Nelson to identify microalgae that are rich in these fatty acids.

As well as the new sources of Omega-3 fatty acids, IRL has been fermenting micro organisms that produce astaxanthin, which is required for aquaculture feeds, and co-enzyme Q-10, which is used in many cosmetic products.

The work is part funded by a \$2 million investment from the Foundation for Research, Science and Technology and Jason Ryan says IRL is already talking with overseas markets interested in the new technology developments, as well as companies in New Zealand.

IRL's Group Manager, Integrated Bioactive Technologies, Owen Catchpole, says IRL's fermentation capability is not limited to lipid-bearing micro organisms but can be used to generate a new range of health probiotics, aquaculture feeds and biofuels.

“IRL is one of the only places in New Zealand that offers scale-up processing from the 'shake flask' stage to 1,000 litre scale,” he says.

Aspects of the IRL work are progressing from the pilot to the demonstration phase. IRL also has the capability to offer other companies tailored products and an ability to scale up.

“It is completely different to shift from 'shake flask' stage to production scale so we are able to provide testing and trialling for those working on product development,” Owen Catchpole says.



JASON RYAN WITH IRL'S SPECIALIST FERMENTATION UNIT.

New mobility hope for hip dysplasia children

A revolutionary new standing frame currently being developed in New Zealand could allow upright mobility for children who are forced to spend up to three months lying horizontal in an immobilising plaster cast, due to hip dysplasia or upper-leg fractures.

As any parent of a young child knows, it is almost impossible to keep them in one place for long. Children in a plaster cast, known as a hip spica cast, which encases them from toe to chest, have no option, however, but to remain prone throughout the recovery time as the only mobility product available on the market is a recliner wheelchair which is large, heavy and impossible to manoeuvre around the home.



THE NEW UPRIGHT MOBILITY FRAME WILL PROVIDE A BETTER QUALITY OF LIFE FOR CHILDREN RECOVERING FROM HIP AND LEG SURGERY.

Unsurprisingly, recovery time can seem endless and can be extremely stressful for all concerned.

As the result of a collaboration between Hawke's Bay Hospital, Wellington-based Medix21 — one of New Zealand's leading distributors of rehabilitation

trolleys, in an attempt to allow an easier life for their children, so for them this new frame is wonderful. I've also had some extremely positive feedback about it from the orthopaedic nursing staff here at the hospital so it's all very encouraging."

"Parents appreciated that their child could be upright to eat, to play with toys and computers, or to just give them a cuddle..."

equipment — and IRL's Assistive Devices group in Christchurch, a new upright mobility device is now being developed. The new standing frame will be lighter, smaller, fully adjustable and more manoeuvrable than any other product on the market, and most importantly, will allow children in a hip spica cast to enjoy upright mobility at home, outdoors and at school or pre-school.

Alistair More, Head of Occupational Therapy and a Wheelchair and Seating Therapist at Hawke's Bay Hospital, is delighted that his vision two years ago of a manoeuvrable standing frame for his young patients is now so close to becoming a reality.

"The results of the pilot studies conducted so far have been tremendously positive. Parents appreciated that their child could be upright to eat, to play with toys and computers, or to just give them a cuddle. And of course, it was wonderful being able to easily manoeuvre them around the home and garden.

"Some parents have had to resort to using things like potato barrows, skateboards and mechanics'

For David Rogan, Global Marketing and Export Manager, Medix21, this is a subject close to his heart.

"I'm 100% behind this product, I think it's absolutely fantastic. I have a young niece who had a hip operation, so I know first-hand the problems faced by families of children in hip spicas. To be able to have the child in different positions for eating, shopping and taking part in regular family life is just great."

David Rogan believes the new standing frame could be an excellent export product for New Zealand.

"There's a need out there and there's currently nothing like it on the market. We are in a partnership with Sidhil, major UK specialists in paediatric hospital equipment, and we have worldwide connections so we would be looking at international distribution."

The new design has been adapted by IRL, under the FRST TechNet scheme, from one of a suite of products in the Medix 21 range, the Gelårt XTRA. Marcus King, Team Leader of Assistive Devices, says further modifications are underway and he hopes a prototype will be available next year.

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Key to the development of these prototypes is the underpinning materials research of the group, which has led to critical patents that are required for the prototypes.

The research is in its second four-year phase and is receiving funding from the Foundation for Research, Science and Technology.

Grant Williams believes that further research within the current and associated programmes will lead to exciting commercial opportunities for completely new imaging systems.

"These systems could be used for border security to identify drugs and items that are insensitive to existing x-ray screening systems and they would also

be able to differentiate between explosives and items such as butter.

"This is extremely difficult to do with conventional dual-energy x-ray scanners currently deployed in places such as airports and high-security areas. While similar technologies exist, their size and cost makes them prohibitive for many uses."

Innovation matters: Black swans cast long shadows

This is the third of a series of articles by Professor Mark Ahn, chair of Science and Technology Entrepreneurship at Victoria University of Wellington. In this article he discusses how innovation models are moving from structured R&D into iterative and collaborative processes.

Black swans are flocking. Nassim Nicholas Taleb's book 'Black Swan' chronicled the period when the Western world thought that swans were only one colour — white. When they arrived in Australasia, however, they discovered the presence of black swans and their world was permanently changed. This story is used as an illustration of "our blindness with respect to randomness, particularly to large deviations." We're living in an interdependent world of unprecedented pace and intensity of change. From financial market

iterative and collaborative with customers. Google's nine points of innovation are:

1. Innovation, not instant perfection. Google's approach is to launch good ideas rather than perfect products, then morph the product by actively collaborating with customers.
2. Share everything you can. Team transparency, rather than hiding information in functional silos, characterises Google's culture.

"...bold and continuous innovation is our greatest hope for addressing mankind's biggest challenges..."

meltdowns to terrorism to climate change, the stakes are higher than ever and the long shadows of black swans seem to be everywhere.

We didn't leave the Stone Age because we ran out of stones. Turmoil and change is a great equalizer precisely because it shakes the foundations of the status quo. In short, disruptive innovation is unreasonable and perfect for the times in which we live. Customers are expecting unreasonable amounts of product performance at impossibly low prices. Investors and funders are unreasonable because they want predictable economic returns in a fundamentally unpredictable world of black swans.

Consider Google, for example, the internet giant that didn't exist a decade ago (when industry leaders like Bill Gates were eschewing the commercial viability of the internet). Beyond Google's cheeky vision statement "Do No Evil", is a company that has moved their innovation model from the old world of structured Research & Development into a process where innovation is

3. You're brilliant, we're hiring. Google's focus is on hiring extraordinarily talented generalists who can think laterally and problem solve, rather than hiring for a specific function which will inevitably become outdated.
4. Allow employees to pursue their dreams. Popular programmes like Google Earth were developed by employees spending up to 30% of their time on their own project ideas.
5. Ideas come from everywhere. Google relies on generating a flow of ideas and innovations both internally and externally.
6. Don't be politic – use data. Google's adage is that "Data beats opinion." How much time is lost internally debating rather than asking users?
7. Creativity loves restraint. A theme for the times. Google's approach is not only to aim high, but to also be slightly unreasonable by creating boundary conditions and 'forcing' ingenuity (this must have originated with a Kiwi employee!).



MARK J. AHN, PROFESSOR AND CHAIR, SCIENCE & ENTREPRENEURSHIP, FACULTIES OF COMMERCE & ADMINISTRATION AND SCIENCE, VICTORIA UNIVERSITY, WELLINGTON.

8. Get users and usage – the money will follow. Rather than focusing on margins, this approach recognises that "killer applications" are viral. That is, great products spread like wildfire throughout user networks resulting in economies of scale. Thus, focus on unique solutions and the right business model will evolve.
9. Don't kill projects, morph them. Google's approach is not simply to abandon ideas that don't work, but to actively examine them from different perspectives. Consider, for example, Wellington-based Starnow.com who originally designed their website for reality TV auditions, which didn't work, but changed their customers to actors and models resulting in a very successful business.

Are we ready for the challenges ahead? Whether you follow some or all of Google's rules for innovation or write your own set, bold and continuous innovation is our greatest hope for addressing mankind's biggest challenges which continue to attract significant resources. Consider, for example, that even in the current market turmoil venture capital investment in the three leading areas — biotechnology, information technology and clean technology — remains at near record levels.

Kiwi businesses have a long history of innovation and competitiveness. From Gallagher's literal use of electrified iconic number 8 wire to Navman's global satellite positioning technology, Kiwi creativity is poised to address the nation's most pressing needs and contribute to tackling the world's biggest problems. The world is flatter than ever and the only limitation is the degree of creativity, courage, and commitment we can muster.

To suggest a topic you would like to hear more about, please email t.heketa@irl.cri.nz. Your feedback is always valued.

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